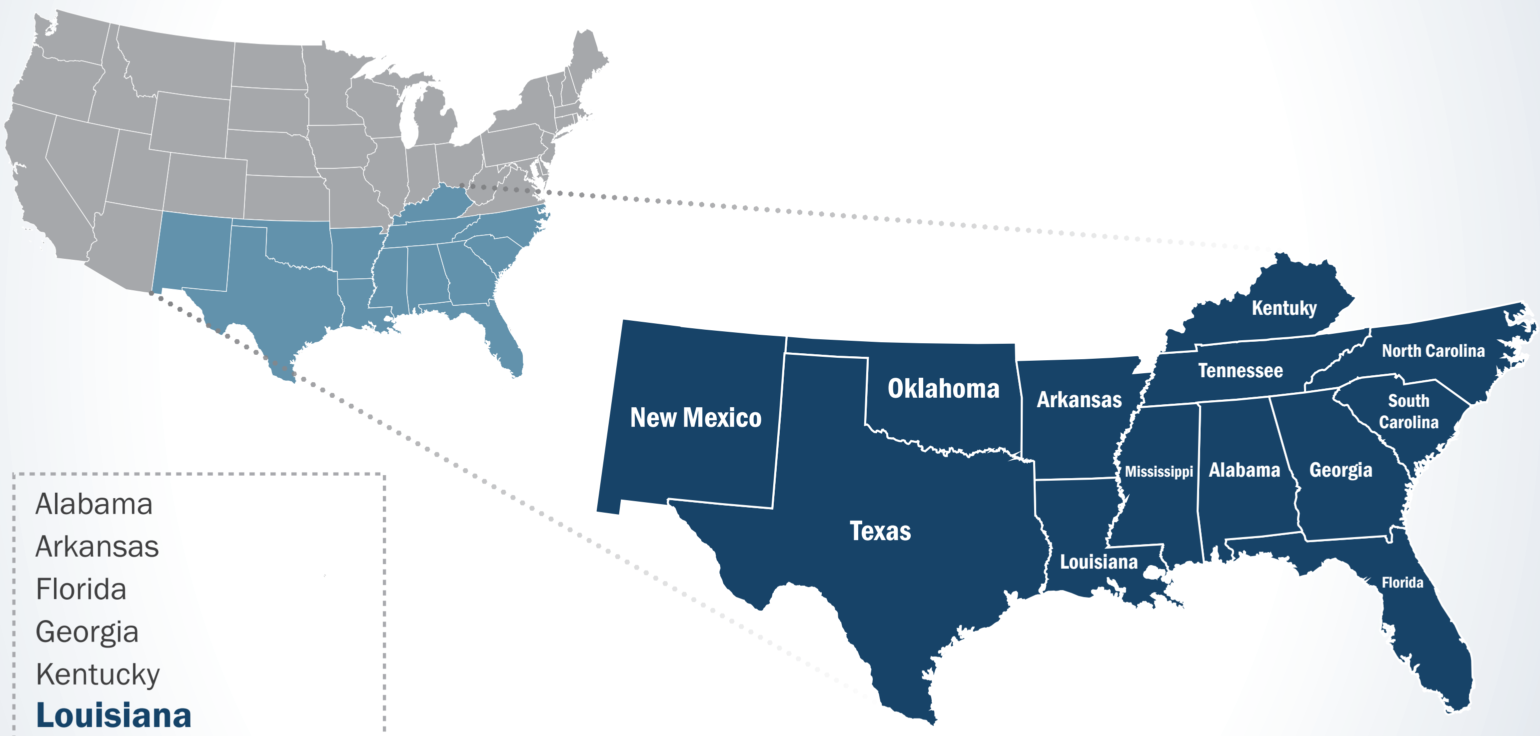
FirstNet®

Nationwide Public Safety Broadband Network
Draft Programmatic Environmental Impact Statement for the Southern United States

VOLUME 6 - CHAPTER 8



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First Responder Network Authority

Nationwide Public Safety Broadband Network
Draft Programmatic Environmental Impact Statement for the Southern United States

VOLUME 6 - CHAPTER 8

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Cooperating Agencies
Federal Communications Commission
General Services Administration
U.S. Department of Agriculture—Rural Utilities Service
U.S. Department of Agriculture—U.S. Forest Service
U.S. Department of Agriculture—Natural Resource Conservation Service
U.S. Department of Defense—Department of the Air Force
U.S. Department of Energy
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8 LOUISIANA

Louisiana was populated for centuries by American Indian tribes with a rich cultural history. Ten different nations have laid claim to Louisiana throughout its history, including France, Spain, Great Britain, the Republic of West Florida, and the Confederate States of America, before it finally became the 18th state to join the Union in 1812 (State of Louisiana, 2015). Although the tract of land bought from France by the United States in 1803 was referred to as the Louisiana Purchase, Louisiana is only one of several states eventually carved out of the territory. Louisiana is bordered by Arkansas to the north, Mississippi to the east, the Gulf of Mexico to the south, and Texas to the west. This chapter provides details about the existing environment of Louisiana as it relates to the Proposed Action.

General facts about Louisiana are provided below:

- **State Nickname:** The Bayou State
- **Land Area:** 43,204 square miles; **U.S. Rank:** 33 (U.S. Census Bureau, 2015a)
- **Capital:** Baton Rouge
- **Parishes:**[1] 64 (U.S. Census Bureau, 2015a)
- **2014 Estimated Population:** 4,649,676; **U.S. Rank:** 25 (U.S. Census Bureau, 2015a)
- **Most Populated Cites:** New Orleans, Baton Rouge, Shreveport, and Lafayette (U.S. Census Bureau, 2015a)
- **Major Rivers:** Mississippi River, Red River, Ouachita River, Atchafalaya River, Sabine River, Amite River, Bayou Bartholomew, Bayou Macon, Bayou Teche, Black Lake Bayou, Black River, Boeuf River, Bogue Chitto, Calcasieu River, Dugdemona River, Little River, Mermentau River, Pearl River, Tangipahoa River, Tensas River and Whiskey Chitto
- **Bordering Waterbodies:** Gulf of Mexico, the Mississippi River, the Sabine River and Reservoir
- **Mountain Ranges:** None
- **Highest Point:** Driskill Mountain (535 ft.) (USGS, 2015a)

[1] Louisiana is divided into parishes in the same way most other states are divided into counties.

8.1 AFFECTED ENVIRONMENT

8.1.1 Infrastructure

8.1.1.1 Definition of the Resource

This section provides information on key Louisiana infrastructure resources that could potentially be affected by FirstNet projects. Infrastructure consists of the systems and physical structures that enable a population in a specified area to function. Infrastructure is entirely manmade with a high correlation between the type and extent of infrastructure and the degree to which an area is characterized as "developed." Infrastructure includes a broad array of facilities such as utility systems, streets and highways, railroads, airports, buildings and structures, ports, harbors and other manmade facilities. Individuals, businesses, government entities, and virtually all relationships between these groups depend on infrastructure for their most basic needs, as well as for critical and advanced needs (e.g., emergency response, health care, and telecommunications).

Section 8.1.1.3 provides an overview of Louisiana's traffic and transportation infrastructure, including road and rail networks, airport facilities, and ports and harbors. Louisiana's public safety infrastructure could include any infrastructure utilized by a public safety entity[2] as defined in Title VI of the Middle Class Tax Relief and Job Creation Act of 2012 (Public Law [Pub. L.] No. 112-96, Title VI Stat. 156 (codified at 47 United States Code [U.S.C.] 1401 et seq.) (the Act), including infrastructure associated with police, fire, and emergency medical services (EMS). However, other organizations can qualify as public safety services as defined by the Act. Public safety services in Louisiana are presented in more detail in Section 8.1.1.4. Section 8.1.1.5 describes Louisiana's public safety communications infrastructure and commercial telecommunications infrastructure. An overview of Louisiana utilities, such as power, water, and sewer, is presented in Section 8.1.1.6.

8.1.1.2 Specific Regulatory Considerations

Multiple Louisiana laws and regulations pertain to the state's public utility and transportation infrastructure and its public safety community. Table 8.1.1-1 identifies the relevant laws and regulations, the affected agencies, and their jurisdiction as derived from the state's applicable statutes and administrative rules referenced in column one. Appendix C, Environmental Laws and Regulations, identifies applicable federal laws and regulations.

[2] The term 'public safety entity' means an entity that provides public safety services." (7 U.S.C. § 1401(26)).

Table 8.1.1-1: Relevant Louisiana Infrastructure Laws and Regulations

State Law/Regulation	Regulatory Agency	Applicability
Louisiana Administrative Code: Title 55 Public Safety	Department of Public Safety	Assumes responsibility for homeland security and emergency preparedness in the state; plans for the prompt and effective response to disaster or emergency.
Louisiana Revised Statutes (LRS) Title 45 Public Utilities and Carrier	Public Service Commission	Supervises and regulates canals, electric utilities, pipelines, railroads, and telecommunications utilities.
LRS Title 1 Aeronautics; Title 48 Roads, Bridges, and Ferries	Department of Transportation and Development	Supervises and directs all aeronautics activities and facilities; issues rules and regulations relative to highways and their construction, maintenance, and use.

8.1.1.3 Transportation

This section describes the traffic and transportation infrastructure in Louisiana, including specific information related to the road networks, airport facilities, rail networks, ports, and harbors (this -PEIS defines "harbor" as a body of water deep enough to allow anchorage of a ship or boat). The movement of vehicles is commonly referred to as traffic, as well as the circulation along roads. Roadways in the state can range from multilane road networks with asphalt surfaces, to unpaved gravel or private roads. The information regarding existing transportation systems in Louisiana are based on a review of maps, aerial photography, and federal and state data sources.

The Louisiana Department of Transportation and Development (DOTD) has jurisdiction over freeways and major roads, airports, railroads, mass transit, and ports in the state; local parishes have jurisdiction for smaller streets and roads. The mission of the DOTD is to "deliver transportation and public works systems that enhance quality of life and facilitate economic growth" (DOTD, 2015a).

Louisiana has an extensive and complex transportation system, consisting of:

- 61,427 miles of public roads (FHWA, 2014) and 12,982 bridges (FHWA, 2015a);
- 2,730 miles of rail network that includes passenger rail and freight (DOTD, 2015b);
- 481 aviation facilities, including airstrips and heliports (FAA, 2015a);
- 40 harbors (U.S. Harbors, 2015); and
- 32 coastal and river ports (Ports Association of Louisiana, 2016).

Road Networks

As shown in Figure 8.1.1.-1, the major urban centers of Louisiana are Alexandria, Baton Rouge, Lafayette, Lake Charles, Monroe, New Orleans, and Shreveport (USDOC, 2013a). Louisiana has six federal interstates connecting metropolitan areas to one another and to other states (Table 8.1.1-2). Travel outside the major metropolitan areas is conducted on interstates, state, and county roads. Per the national standard, even numbered interstates run from west to east with the lowest numbers beginning in the south; odd numbered interstates run from north to south with the lowest numbers beginning in the west (FHWA, 2015b). State and parish roads compose the remainder of Louisiana's road network.

Figure 8.1.1-1: Louisiana Transportation Networks

Table 8.1.1-2: Louisiana Interstates

Interstate	Southern or western terminus in Louisiana	Northern or eastern terminus in Louisiana
I-10	TX line at Vinton	MS line near Slidell
I-12	I-10 in Baton Rouge	I-10 in Slidell
I-20	TX line near Greenwood	MS line at Delta
I-49	I-10 in Lafayette	AR line near Ida
I-55	I-10 in Laplace	MS line near Kentwood
I-59	I-10 in Slidell	MS line at Pearl River

In addition to the Interstate System, Louisiana has both National Scenic Byways and State Scenic Byways. National and State Scenic Byways are roads that are recognized for one or more archaeological, cultural, historic, natural, recreational, and scenic qualities (FHWA 2013). Figure 8.1.1-1 illustrates the major transportation networks, including roadways, in Louisiana. Section 8.1.8, Visual Resources, describes the National and State Scenic Byways found in Louisiana from an aesthetic perspective.

National Scenic Byways are roads with nationwide interest. The Federal Highway Administration (FHWA) designates and manages these byways. Louisiana has two National Scenic Byways (FHWA, 2015c):

- Creole Nature Trail: 180 miles in southwest Louisiana.
- Great River Road: 2,069 miles through Arkansas, Illinois, Iowa, Kentucky, Louisiana, Minnesota, Mississippi, Missouri, Tennessee, and Wisconsin.

Louisiana State Scenic Byways are roads with statewide interest. Some State Scenic Byways may be designated on portions of National Scenic Byways. Louisiana designates 17 State Scenic Byways (Louisiana Travel, 2016):[3]

- Bayou Tech Byway
- Boom or Bust Byway
- Cajun Corridor
- Cane River National Heritage Trail
- Creole Nature Trail All-American Road
- Dixie Overland
- Flyway Byway
- Longleaf Trail Byway
- Louisiana Colonial Trails Byway
- Louisiana Great River National Scenic Byway
- Myths and Legends Byway
- San Bernardo Byway
- Southern Swamps
- Toledo Bend Forest Scenic Byway
- Tunica Trace Byway
- Wetlands Cultural Byway
- Zydeco Cajun Prairie Byway

Airports

The Louis Armstrong New Orleans International Airport (MSY) provides air service to the state. Located 11 miles west of downtown New Orleans, MSY is owned by the City of New Orleans and operated by the New Orleans Aviation Board (MSY, 2015). In 2014, MSY served 9,785,394 passengers, facilitated 50,226 aircraft operations, and handled 88,450,655 pounds of cargo (MSY, 2014). MSY is the 37th busiest airport in the nation, in terms of the number of passengers

[3] The total number of State Scenic Byways may not include those segments of National Scenic Byways that are also designated as State Scenic.

served (FAA, 2015b). Figure 8.1.1-1 shows the location of the airport in the state. Section 8.1.7, Land Use, Recreation, and Airspace, provides detail on airports and airspace in Louisiana.

Rail Networks

Louisiana is connected to a network of passenger rail (Amtrak) and freight rail. Figure 8.1.1-1 illustrates the major transportation networks, including rail lines, in Louisiana.

Amtrak runs three lines through Louisiana, all of which begin/end in New Orleans (Amtrak, 2015a). The Crescent makes daily runs between New York and New Orleans, serving two stations in Louisiana. The City of New Orleans line provides daily service between Chicago and New Orleans and also serves two stations in Louisiana. The Sunset Limited operates three days a week between New Orleans and Los Angeles, making five stops in Louisiana. In 2012, Amtrak served 258,000 passengers in Louisiana; 223,000 of those passengers utilized the New Orleans train station (DOTD, 2015b). Table 8.1.1-3 provides a complete list of Amtrak lines that run through Louisiana.

Table 8.1.1-3: Amtrak Train Routes Serving Louisiana

Route	Starting Point	Ending Point	Length of Trip	Cities Served in Louisiana
Crescent	New York, NY	New Orleans, LA	30 hours	Slidell, New Orleans
City of New Orleans	Chicago, IL	New Orleans, LA	19 hours	Hammond, New Orleans
Sunset Limited	New Orleans, LA	Los Angeles, CA	48 hours	New Orleans, Schriever, New Iberia, Lafayette, Lake Charles

Source: (Amtrak, 2015a) (Amtrak, 2015b)

All 2,730 miles of railroad track in Louisiana are owned and operated by freight rail companies (DOTD, 2015b). Six Class I freight railroads operate in the state, as well as 14 smaller local, switching, and terminal railroads (DOTD, 2015b). The six Class I freight railroads own the majority of Louisiana’s tracks, with 2,340 miles; the remaining 390 miles of track are owned by the state’s short line railroads (DOTD, 2015a). In 2009, freight rail moved over 120 million tons of freight (DOTD, 2015a).

Harbors and Ports

Louisiana’s many natural and manmade waterways, natural resource (including fisheries and mineral resources), as well as its proximity to the Gulf of Mexico and waterways serving interiors states, make the state’s harbors and ports substantial elements of local, regional, and national economies. There are 12 major rivers in the state (LDWF, 2005d):

- Atchafalaya
- Barataria
- Calcasieu
- Mermentau
- Mississippi
- Ouachita
- Pearl
- Pontchartrain
- Red
- Sabine

- Terrebonne
- Vermilion-Teche

The USACE Mississippi Valley Division (USACE Mississippi Valley Division, 2013) and New Orleans District (USACE, 1976) identify 40 “navigable waters” in Louisiana under Section 10 of the Rivers and Harbors Act of 1899.

- Amite River
- Atchafalaya River
- Baptist Collette Bayou
- Barataria Bay Waterway
- Bayou Chene
- Bayou D’Arbonne
- Bayou Desert
- Bayou Dorcheat
- Bayou Lafourche
- Bayou Macon
- Bayou Pierre
- Bayou Teche
- Black Bayou
- Boeuf Bayou
- Boeuf River
- Bogue Chitto River
- Caddo Lake
- Calcasieu River
- Cane River
- Catahoula Lake
- Choctaw Bayou
- Corney Bayou
- Dorchest Bayou
- Freshwater Bayou
- Hero Canal
- Highway 51 Borrow Canal
- Hog Bayou
- Kenta Canal
- Little Black Bayou
- Little River
- Loggy Bayou
- Lake Bistineau
- Little Bayou D’Arbonne
- Mermentau River
- Old West Pearl River
- Red River
- Saline Bayou
- Tensas River
- Twelve-Mile Bayou
- Whiskey Chitto Creek

The Mississippi River, which is navigable for large vessels from Minnesota to the Gulf of Mexico, includes has major port at Baton Rouge, Gramercy and New Orleans, and numerous small harbors and commercial and recreational infrastructure along its entire length in Louisiana (Figure 8.1.1-1). The Port of New Orleans (Port NOLA, 2015a), Port of Greater Baton Rouge (Port GBR, 2015a), and facilities at Gramercy (Johnston Enterprises, 2015), provide the large majority overseas shipping operations along the Mississippi (U.S. Census Bureau, 2015b). Other large overseas shipping ports in the state are the Port of Morgan City is at the juncture of the Bayou Shaffer and the Atchafalaya River (Port MC, 2015a) and Port of Lake Charles along the Calcasieu River Channel (Port LC, 2015a).

The Port of New Orleans (Figure 8.1.1-1) is the “only seaport in the United States to be served by all six Class-One railroads, which allows customers direct access to a 133,000 mile rail network.” The Port of New Orleans is served by Burlington North Santa Fe (BNSF) Railway, Canadian National, CSX Intermodal, Norfolk Southern, Union Pacific, and Kansas City Southern Lines (Port NOLA, 2015b). It handles containerized and bulk cargo, including steel, rubber, paper, food products, and clothing. The Port of New Orleans is a leader in steel importation, and is the top port in the United States for the import of natural rubber (Port NOLA, 2015c). In 2013, the Port of New Orleans imported $22.6 billion in cargo, weighing 31,132 million tons and exported $36.2 billion in cargo, weighing 76,013 million tons (U.S. Census Bureau, 2015b).

The Port of Greater Baton Rouge (Figure 8.1.1-1) serves seven major rail companies at its facilities: Canadian National- Illinois Central Railroad, Canadian National Railroad, Kansas City

Southern Lines, New Orleans Public Belt Railroad, Norfolk Southern Corporation, Union Pacific System, and USA Rail Terminals (Port GBR, 2015d). The port has 45-foot deep-water docks and an "unlimited turning basin for ocean-going vessels" (Port GBR, 2015b). Common cargo handled by the port includes "asphalt, barite, aggregates, limestone, carbon black, coal, coffee, coke, grain, forest products, biomass products, plastics, liquid bulk chemicals, molasses, oats, ores, pipe, steel, and sugar" (Port GBR, 2015c). In 2013, the Port of Greater Baton Rouge imported $8.6 billion worth of international cargo, weighing 15,894 million tons and exported $5.1 billion in cargo weighing 9,510 million tons (U.S. Census Bureau, 2015b).

The Port of Gramercy (Figure 8.1.1-1) is a specialized facility on the Mississippi River that handles green and calcined petroleum coke.[4] The facility has 1,200 feet of dock space for barges and ships, two calcined coke storage facilities with a combined capacity of 60,000 tons, and a "green petroleum coke pad with a total capacity of approximately 150,000 tons" (Johnston Enterprises, 2015). In 2013, the Port of Gramercy brought in $7.8 billion in cargo, weighing 21,135 million tons, and exported $14.5 billion weighing 38,688 million tons (U.S. Census Bureau, 2015b).

The Port of Morgan City (Figure 8.1.1-1) is located where the Bayou Shaffer and the Atchafalaya River meet. Rail service to the port is provided by BNSF Railway, which connects to Union Pacific rail lines (Port MC, 2015a). The port has 1,200 feet of waterfront docking and a 20,000 square feet warehouse for cargo storage. The Port of Morgan City regularly handles forest products, coated pipe, and structural steel cargo (Port MC, 2015b). In 2013, the Port of Morgan City brought in $22.4 billion worth of cargo goods, weighing 32,265 million tons, and exported $2.131 billion, weighing 440 million tons (U.S. Census Bureau, 2015b).

The Port of Lake Charles (Figure 8.1.1-1) is on the Lake Charles Harbor, along the Calcasieu River Ship Channel. The channel runs is 68 miles, from Lake Charles to the Gulf of Mexico (Port LC, 2015a). Port facilities include two marine terminals and two industrial parks. Cargos include bagged rice, aluminum, forest products, petroleum coke and other products and flour (Port LC, 2015b). In 2013, the Port of Lake Charles imported $13 billion worth of cargo, which weighed 22,263 million tons, and exported $5.8 billion, weighing 9,439 million tons (U.S. Census Bureau, 2015b).

Among the numerous other facilities along the Mississippi River and elsewhere in the state are international shipping facilities in Avondale, St. Rose, Good Hope, Port Sulphur, Lafourche Parish, and Destrehan (U.S. Census Bureau, 2015b). Many of these are located in small inlets or harbors along the Mississippi River as it passes through central Louisiana.

8.1.1.4 Public Safety Services

Louisiana public safety services generally consist of public safety infrastructure and first responder personnel aligned with the demographics of the state. Table 8.1.1-4 presents Louisiana's key demographics including population, land area, population density, and number

[4] Calcined coke: Raw material required to produce carbon anodes used in aluminum smelting (Argonne National Laboratory, 1998).

of municipal (parish, city, or town) governments. More information about these demographics is presented in Section 8.1.9, Socioeconomics; however, these demographics are key to understanding the breadth of public safety services throughout the state.

Table 8.1.1-4: Key Louisiana Indicators

Louisiana Indicators	
Estimated Population (2014)	4,649,676
Land Area (square miles) (2010)	43,204
Population Density (persons per sq. mile) (2010)	104.9
Municipal Governments (2013)	303

Sources: (U.S. Census Bureau, 2015c) (U.S. Census Bureau, 2013) (National League of Cities, 2007)

Table 8.1.1-5 presents Louisiana's public safety infrastructure, including fire and police stations. Table 8.1.1-6 identifies first responder personnel including dispatch, fire and rescue, law enforcement, and medical personnel in the state.

Table 8.1.1-5: Public Safety Infrastructure in Louisiana by Type

Infrastructure Type	Number
Fire and Rescue Stations [a]	1,335
Law Enforcement Agencies [b]	348
Fire Departments [c]	419

[a] Data collected by the U.S. Fire Administration in 2015.
[b] Number of agencies from state and local law enforcement include: local police departments, sheriffs' offices, primary state law enforcement agencies, special jurisdictional agencies, and other miscellaneous agencies, collected by the U.S. Bureau of Justice Statistics in 2008.
[c] Data collected by the U.S. Fire Administration in 2015.
Sources: (U.S. Fire Administration, 2015) (U.S. Bureau of Justice Statistics, 2011)

Table 8.1.1-6: First Responder Personnel in Louisiana by Type

First Responder Personnel	Number
Police, Fire and Ambulance Dispatchers [a]	1,820
Fire and Rescue Personnel [b]	18,746
Law Enforcement Personnel [c]	25,311
Emergency Medical Technicians and Paramedics [d e]	2,820

[a] BLS Occupation Code: 43-5031.
[b] BLS Occupation Codes: 33-2011 (Firefighters), 33-2021 (Fire Inspectors and Investigators), 33-1021 (First-Line Supervisors of Fire Fighting and Prevention Workers), and 53-3011 (Ambulance Drivers and Attendants, Except Emergency Medical Technicians). Volunteer firefighters reported by the U.S. Fire Administration.
[c] Full-time employees from state and local law enforcement agencies, which include local police departments, sheriffs' offices, primary state law enforcement agencies, special jurisdictional agencies, and other miscellaneous agencies, collected by the U.S. Bureau of Justice Statistics in 2008.
[d] BLS Occupation Code: 29-2041.
[e] All BLS data collected in 2015.
Sources: (U.S. Fire Administration, 2015) (U.S. Bureau of Justice Statistics, 2011) (BLS, 2015a)

8.1.1.5 Telecommunications Resources

There is no central repository of information for public safety communications infrastructure and commercial telecommunications infrastructure in Louisiana; therefore, the following information and data are combined from a variety of sources, as referenced.

Communications throughout the state are based on a variety of publicly and commercially owned technologies, including coaxial cable (traditional copper cable), fiber optics, hybrid fiber optics/coaxial cable, microwave, wireless, and satellite systems providing voice, data, and video services (BLS, 2016).

Figure 8.1.1-2 presents a typical wireless configuration including both a narrowband public safety land mobile radio network (traditional radio network) and a commercial broadband access network (wireless technology); backhaul (long-distance wired or wireless connections), core, and commercial networks including a long term evolution (LTE) evolved packet core (modern broadband cellular networks); and, network applications (software) delivering voice, data, and video communications (FCC, 2016a).

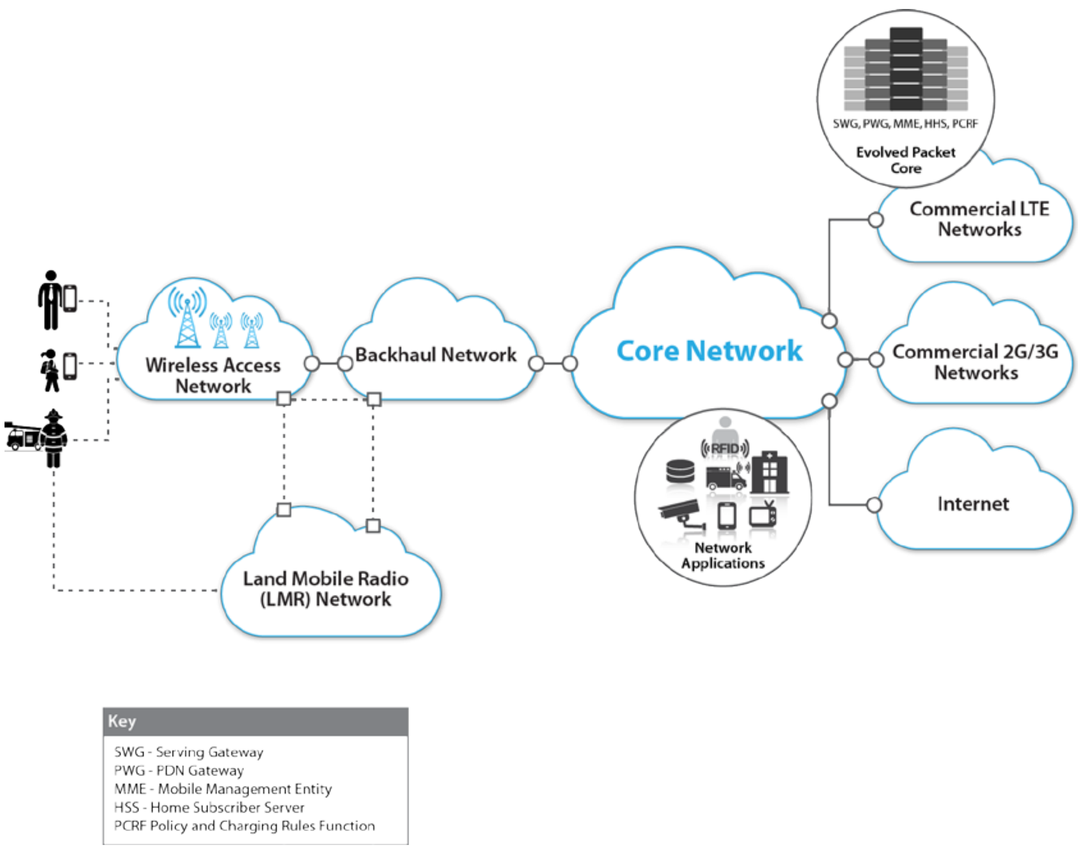

Figure 8.1.1-2: Wireless Network Configuration

Prepared by: Booz Allen Hamilton

Public Safety Communications

To protect and best serve the public interest, first responder and law enforcement communities must be able to communicate effectively. The evolution of the communications networks used by public safety stakeholders toward a broadband wireless technology, such as LTE (See Section 2.1.1), has the potential to provide users with better coverage, while offering additional capacity and enabling the use of new applications that would likely make their work safer and more efficient. Designing such a network presents several challenges due to the uniqueness of the deployment, the requirements, and the nationwide scale (NIST, 2015). Historically, there have been many challenges and impediments to timely and effective sharing of information. Chief among these factors affecting information sharing are network coverage gaps, land mobile radio system infrastructure diversity, insufficient budgets, and diverse radio frequencies. Communication interoperability has also been a persistent challenge, along with issues concerning spectrum availability, embedded infrastructure, and differing standards among stakeholders (NTFI, 2005). This has caused a fragmented approach to communications implementation across the United States, including Louisiana.

There are five key reasons why public safety agencies often cannot connect through existing communications (NTFI, 2005):

- Incompatible and aging communications equipment;
- Limited and fragmented funding;
- Limited and fragmented planning;
- A lack of coordination and cooperation; and
- Limited and fragmented radio spectrum.

To help enable the public safety community to incorporate disparate Land Mobile Radio networks with a nationwide public safety LTE broadband network, the U.S. Department of Commerce (USDOC) Public Safety Communications Research Program (PSCR) – Boulder Laboratories, in 2015, prepared a locations-based services (LBS) research and development roadmap to examine the current state of location-based technologies, forecast the evolution of LBS capabilities and gaps, and identify potential research and development opportunities that would improve the public safety community's use of LBS within operational settings. This is the first of several technology roadmaps that PSCR plans to develop over the next few years to inform better investment decisions (PSCR, 2015).

Public safety network communications in Louisiana reflect a combination of older Very High Frequency (VHF)[5] and Ultra High Frequency (UHF)[6] analog radios operating across multiple frequency bands. Like most states, Louisiana's public safety land mobile radio (LMR) network environment is facing transition and reflects the challenges of the need for greater system capabilities. These increasing capabilities require investment in 700 Megahertz (MHz)/800 MHz site maintenance and upgrades, incremental site resiliency and reliability improvements, the

[5] VHF band covers frequencies ranging from 30 MHz to 300 MHz (NTIA, 2005).
[6] UHF band covers frequencies ranging from 300 MHz to 3000 MHz. (NTIA, 2005).

sustainment of the statewide Project 25 (P-25) Louisiana Wireless Information Network (LWIN), and planning for the adoption of broadband and new data services.

LWIN is a LMR digital network that spanning the entire state of Louisiana, serving public safety and state agencies (RadioReference.com, 2015a). The Governor’s Office of Homeland Security & Emergency Preparedness summarizes the technology and coverage capabilities of the network as follows: “The LWIN is an Internet Protocol (IP) network-based and Project 25 compliant trunked system (P25 system). It operates primarily in the 700 MHz and 800 MHz bands and is capable of providing voice and data. The P25 system operates 95 percent or better coverage when using a portable radio inside a building within the metropolitan areas of the State as identified in the Plan and 95 percent or better coverage when using a portable street-level radio in all other areas of the State” (Governor's Office of Homeland Security & Emergency Preparedness, 2015).

According to a Department of Homeland Security interoperability case study profiling LWIN its management, and governance structure, “In 2008, Louisiana codified the establishment of the Statewide Interoperability Executive Committee (SIEC), a 20-member governing board that provides governance over LWIN. The board includes six emergency response associations, five state agencies, and nine local representatives. Seventy-five percent of the governing board is comprised of local emergency responders” (DHS, 2011).

Statewide/Multi-Parish Public Safety Networks

LWIN provides coverage across the state’s 64 parishes. The system operates on digital P-25 technology at 700 MHz and 800 MHz and currently has 128 active LMR tower sites (Governor's Office of Homeland Security & Emergency Preparedness, 2015). Figure 8.1.1-3 below depicts the coverage of the LWIN (Governor's Office of Homeland Security & Emergency Preparedness, 2015).

The LWIN system consists of 128 wireless towers, 4 mobile tower sites, 2 mobile repeater sites to extend coverage, and 4 mobile satellite dishes (Governor's Office of Homeland Security & Emergency Preparedness, 2015). LWIN supports a wide cross-section of Louisiana state and local public safety agencies, state agencies, as well as federal users (Governor's Office of Homeland Security & Emergency Preparedness, 2015)

LWIN supports a number of statewide and regional public safety talk groups delivering interoperable communications. Major statewide and regional talk group users include; the Louisiana State Police Interoperability Talk groups, the Gulf Coast Interoperability Talk group users (16 individual talk groups), and Statewide Coordination Talk groups (4 individual talk groups). In addition, LWIN provides LMR communications to local and parish public safety personnel including sheriff, fire, and EMS personnel (RadioReference.com, 2015a).

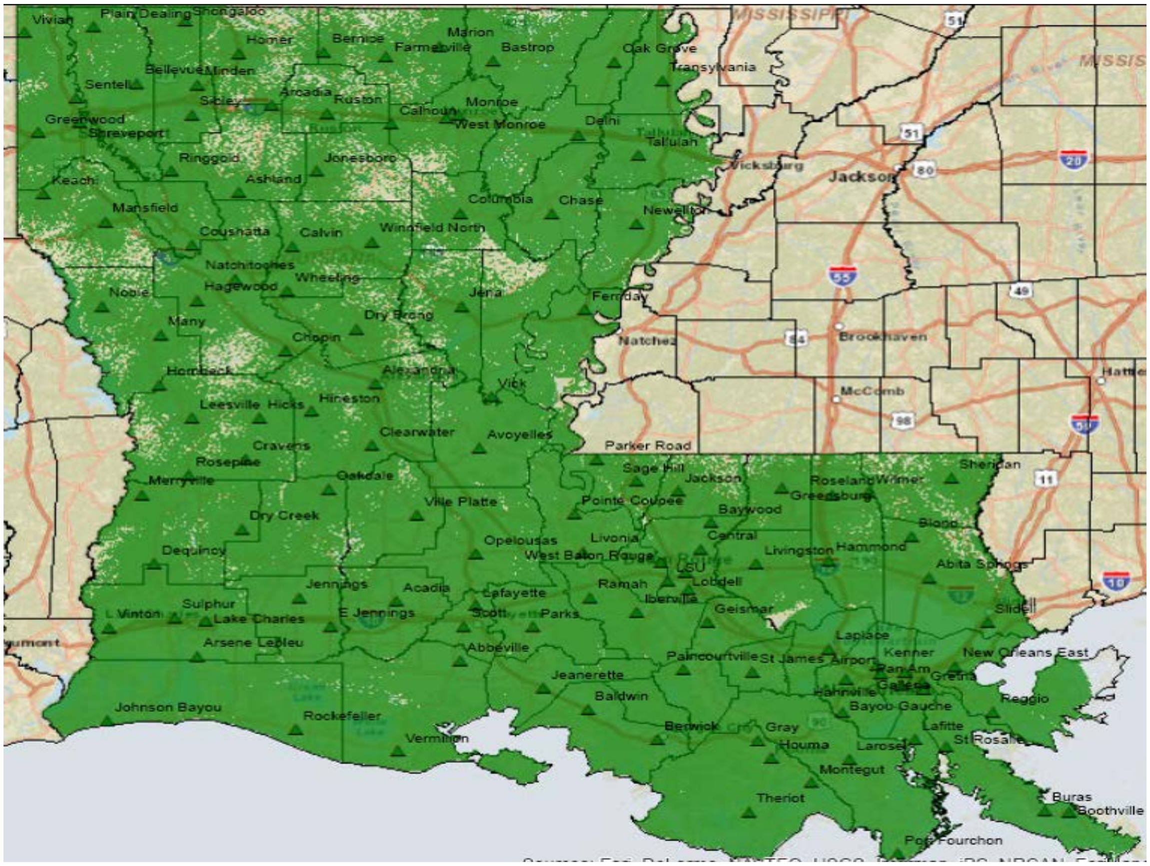

Figure 8.1.1-3: LWIN Coverage Map

Source: (Governor's Office of Homeland Security & Emergency Preparedness, 2015)

Parish/City Public Safety Networks

There are seven digital P25 systems operational in Louisiana using a number of frequencies, including 700 MHz/800Mhz. Table 8.1.1-7 below lists the public safety systems that includes Louisiana's participation in the P-25 Joint National Capital Region network (Project25.org, 2015a) (Project25.org, 2015b).

Table 8.1.1-7: Louisiana Public Safety P-25 Networks

P-25 Public Safety Systems	Frequency Band
Ascension/St. James/St. John Public Safety	800 MHz
City of New Orleans Government	800 MHz
Joint National Capital Region	UHF Lo
LWIN	700 MHz/800MHz
Jefferson Parish Government--Jefferson Parish	800 MHz
Port of New Orleans—Orleans Parish	800 MHz

Source: (Project25.org, 2015a) (Project25.org, 2015c)

The 800 MHz City of New Orleans Government system employs a two-site LMR system that provides coverage in both Orleans Parish and Jefferson Parish, including to the New Orleans international airport (RadioReference.com, 2015b).

The parish 800 MHz LMR systems listed in the table above provides communications services to both public safety users such as sheriff, local police, and fire/EMS departments (RadioReference.com, 2015c).

In addition to the parish P-25 systems, Louisiana parishes, cities, and towns have access to the LWIN P25 system, which enjoys widespread local public safety user adoption within the state, supported by the fact that of the 79,000 users on the LWIN system, 70 percent are local users (Governor's Office of Homeland Security & Emergency Preparedness, 2015).

Public Safety Answering Points (PSAPs)

According to the Federal Communication Commission’s (FCC) Master PSAP registry, there are 109 PSAPs in Louisiana serving Louisiana’s 64 parishes (FCC, 2015a).

Commercial Telecommunications Infrastructure

Louisiana’s commercial telecommunications industry and infrastructure is robust with multiple service providers, offering products and services via the full spectrum of telecommunications technologies (FCC, 2014a) (FCC, 2014b). The following sub-sections present information on Louisiana’s commercial telecommunications infrastructure, including information on the number of carriers and technologies deployed; geographic coverage; voice, Internet access, and wireless subscribers; and the quantity and location of telecommunications towers, fiber optic plant, and data centers.

Carriers, Coverage, and Subscribers

Louisiana’s commercial telecommunications industry provides the full spectrum of telecommunications technologies and networks, including coaxial cable (traditional copper cable), fiber optics, hybrid fiber optics/coaxial cable, microwave, wireless, and satellite systems. Table 8.1.1-8 presents the number of providers of switched access lines,[7] internet access,[8] and mobile wireless services including coverage.

[7] “A service connection between an end user and the local telephone company’s switch; the basis of plain old telephone services (POTS).” (FCC, 2014b)
[8] Internet access includes Digital Subscriber Line (DSL), cable modem, fiber, satellite, and fixed wireless providers.

Table 8.1.1-8: Telecommunications Access Providers and Coverage in Louisiana as of December 31, 2013

Commercial Telecommunications Access Providers	Number of Service Providers	Coverage of Households
Switched access lines [a]	133	97.3% of households [b]
Internet access [c]	58	42% of households
Mobile Wireless [c]	9	100% of population

[a] Switched access lines are a service connection between an end user and the local telephone company's switch (the basis of older telephone services); this number of service providers was reported by the FCC as of December 31, 2013 in Table 17 in "Local Telephone Competition: Status as of December 31, 2013" as the total of ILEC and non-ILEC providers (FCC, 2014b).
[b] Household coverage data provided by the FCC in "Universal Service Monitoring Report" as a Voice Penetration percentage (percentage of household with a telephone in the unit) and is current as of 2013.
[c] Internet access providers are presented in Table 21 by technology provided; the number of service providers is calculated by subtracting the reported Mobile Wireless number from the total reported number of providers. Household coverage is provided in Table 13 (FCC, 2014a).
[d] Mobile wireless provider data was retrieved from the FCC National Broadband Map website (www.broadbandmap.gov/data-download). The process of the data collection is explained in the broadband footnote.
Sources: (FCC, 2014a) (FCC, 2014b) (NTIA, 2014)

Table 8.1.1-9 shows the wireless providers in Louisiana along with their geographic coverage. The following three maps: Figure 8.1.1-4, Figure 8.1.1-5, and Figure 8.1.1-6 show: the combined coverage for the top two providers; Sprint and T-Mobile's coverage; and the coverage of all other providers with less than 5 percent coverage area, respectively.[9]

Table 8.1.1-9: Wireless Telecommunications Coverage by Providers in Louisiana

Wireless Telecommunications Providers	Coverage
AT&T Mobility LLC	99.08%
Verizon Wireless	93.77%
Sprint	59.63%
T-Mobile	45.78%
Other [a]	13.68%

[a] Other: Provider with less than 5 percent coverage area. Providers include: Cricket Wireless; Radio Communications Service; Computer Sales & Services, Inc.; Kayse Wireless; Fulair Wireless; KTC PACE; Acadiana Wireless; Newbreak Communications.
Source: (NTIA, 2014)

[9] The broadband map utilized data collected as part of the broadband American Recovery and Reinvestment Act initiative. The data was retrieved from the FCC National Broadband Map website (www.broadbandmap.gov/data-download). Each state's broadband data was downloaded accordingly. The data pertaining to broadband data/coverage for census blocks, streets, addresses, and wireless were used. Census blocks, roads, and addresses were merged into one file and dissolved by similar business and provider names. Square miles were calculated for each provider. The maps show all providers over 5% on separate maps; providers with areas under 5% were merged and mapped as "Louisiana Other Fiber Providers". All Wireless providers were mapped as well; those with areas under 5% were merged and mapped as "Louisiana Other Wireless Providers". Providers under 5% were denoted in their respective tables.

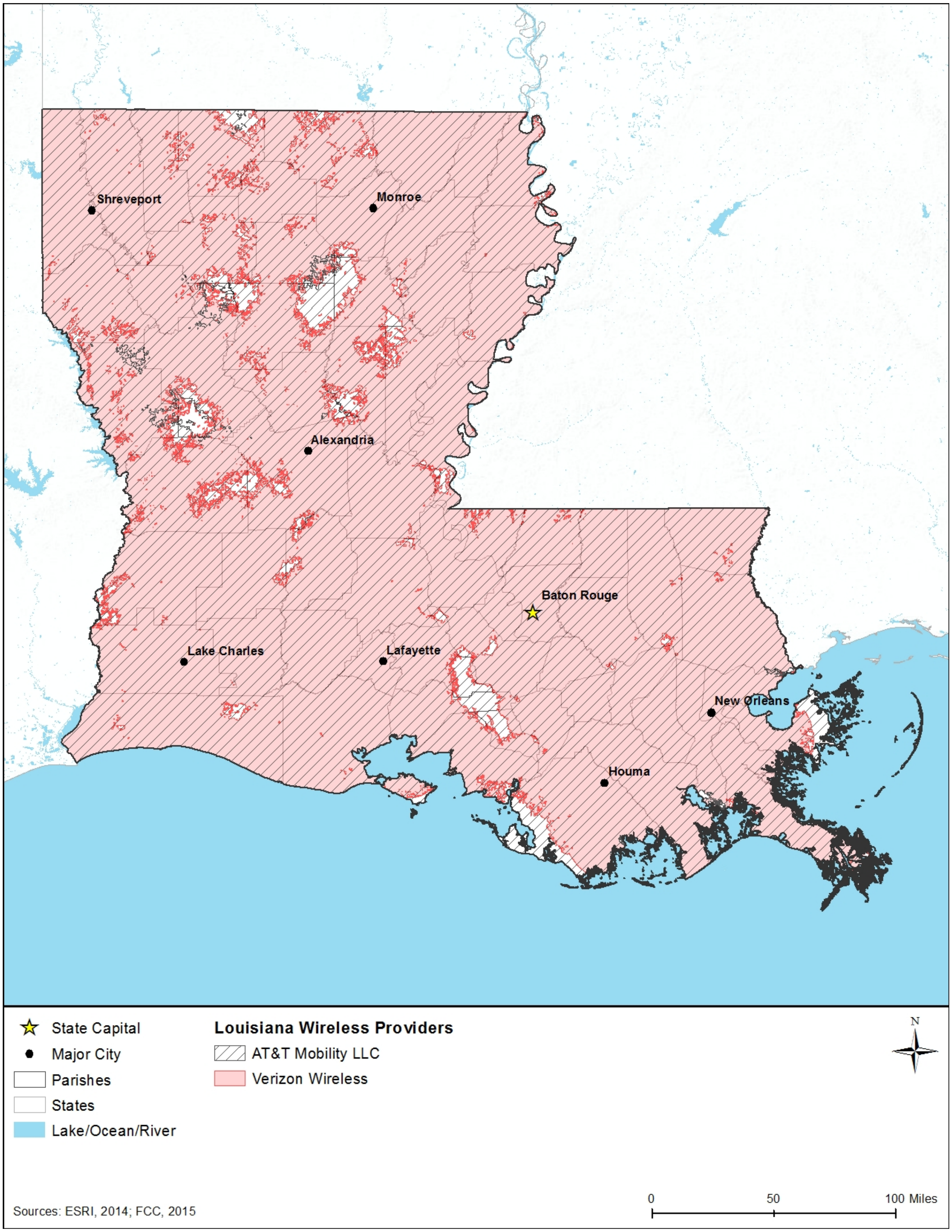

Figure 8.1.1-4: Top Wireless Providers Availability in Louisiana

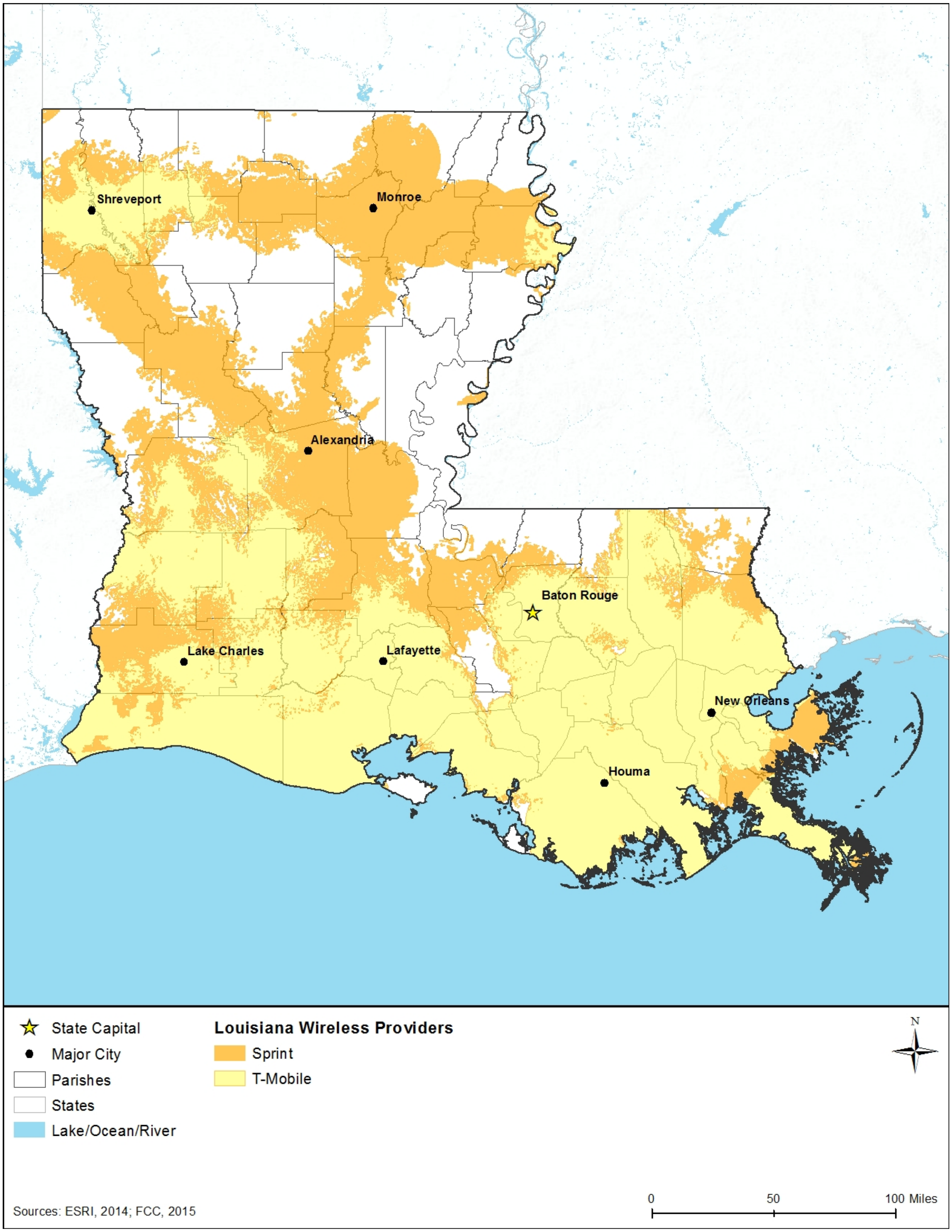

Figure 8.1.1-5: Sprint and T-Mobile Wireless Availability in Louisiana

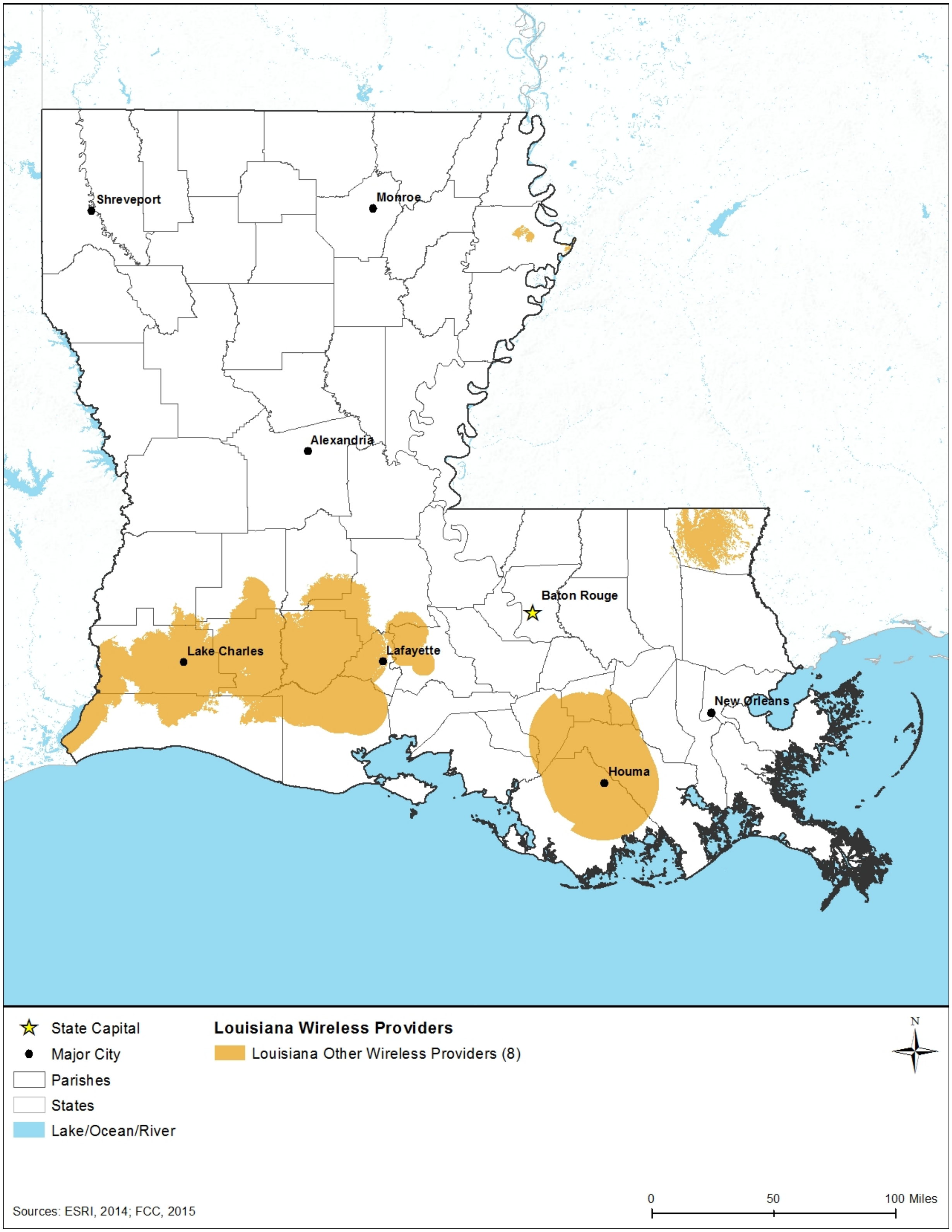

Figure 8.1.1-6: Other Providers Wireless Availability in Louisiana

Towers

There are many types of domestic towers employed today by the telecommunications industry, government agencies, and other owners. Towers are designed and used for a variety of purposes, and the height, location, and supporting structures and equipment are all designed, constructed, and operated according to the technical specifications of the spectrum used, the type of equipment mounted on the tower, geographic terrain, need for line-of-sight transmissions to other towers, radio frequency needs, and other technical specifications. There are three general categories of stand-alone towers: monopole, lattice, and guyed. Typically, monopole towers are the smallest, followed by lattice towers at a moderate height, and guyed towers at taller heights (with the guyed wires providing tension support for the taller heights) (CSC, 2007). In general, taller towers can provide communications coverage over larger geographic areas, but require more land for the actual tower site, whereas shorter towers provide less geographic coverage and require less land for the tower site (USFS, 2009a). Figure 8.1.1-7 presents representative examples of each of these categories or types of towers.

Monopole
100 – 200 feet
Source: http://laps.noaa.gov/birk/laps_intranet/site_photos/Monarch/tower.jpg

Lattice
200 – 400 feet
Source: Personal Picture

Guyed
200 – 2,000 feet
Source: http://www.esrl.noaa.gov/gmd/ccgg/insitu/

Figure 8.1.1-7: Types of Towers

Telecommunications tower infrastructure proliferates throughout Louisiana, although tower infrastructure is concentrated in the higher and more densely populated areas of the state. Owners of towers and some types of antennas are required to register those infrastructure assets with the FCC (FCC, 2016b).[10] Table 8.1.1-10 presents the number of towers (including broadcast towers) registered with the FCC in Louisiana by tower type, and Figure 8.1.1-8 presents the location of those structures, as of June 2015.

[10] An antenna structure must be registered with the FCC if the antenna structure is taller than 200 feet above ground level or may interfere with the flight path of a nearby airport. (FCC, 2016b)

Table 8.1.1-10: Number of Commercial Towers in Louisiana by Type

Constructed[a] Towers[b]		Constructed Monopole Towers	
100 ft. and over	743	100 ft. and over	0
75 ft. – 100 ft.	888	75 ft. – 100 ft.	1
50 ft. – 75 ft.	439	50 ft. – 75 ft.	39
25 ft. – 50 ft.	199	25 ft. – 50 ft.	32
25 ft. and below	43	25 ft. and below	12
Subtotal	**2,312**	**Subtotal**	**84**
Constructed Guyed Towers		**Buildings with Constructed Towers**	
100 ft. and over	134	100 ft. and over	3
75 ft. – 100 ft.	75	75 ft. – 100 ft.	1
50 ft. – 75 ft.	17	50 ft. – 75 ft.	3
25 ft. – 50 ft.	3	25 ft. – 50 ft.	5
25 ft. and below	1	25 ft. and below	1
Subtotal	**230**	**Subtotal**	**11**
Constructed Lattice Towers		**Multiple Constructed Structures[c]**	
100 ft. and over	27	100 ft. and over	1
75 ft. – 100 ft.	116	75 ft. – 100 ft.	1
50 ft. – 75 ft.	47	50 ft. – 75 ft.	0
25 ft. – 50 ft.	21	25 ft. – 50 ft.	0
25 ft. and below	0	25 ft. and below	0
Subtotal	**211**	**Subtotal**	**2**
Constructed Tanks[d]			
Tanks	5		
Subtotal	**5**		
Total All Tower Structures		**2,855**	

[a] Planned construction or modification has been completed. Results will return only those antenna structures that the FCC has been notified are physically built or planned modifications/alterations to a structure have been completed (FCC, 2016d).
[b] Self-standing or guyed structure used for communication purposes (FCC, 2012).
[c] Multiple constructed structures per antenna registration (FCC, 2016c).
[d] Any type of tank – water, gas, etc. with a constructed antenna (FCC, 2016c).
Source: (FCC, 2015b)

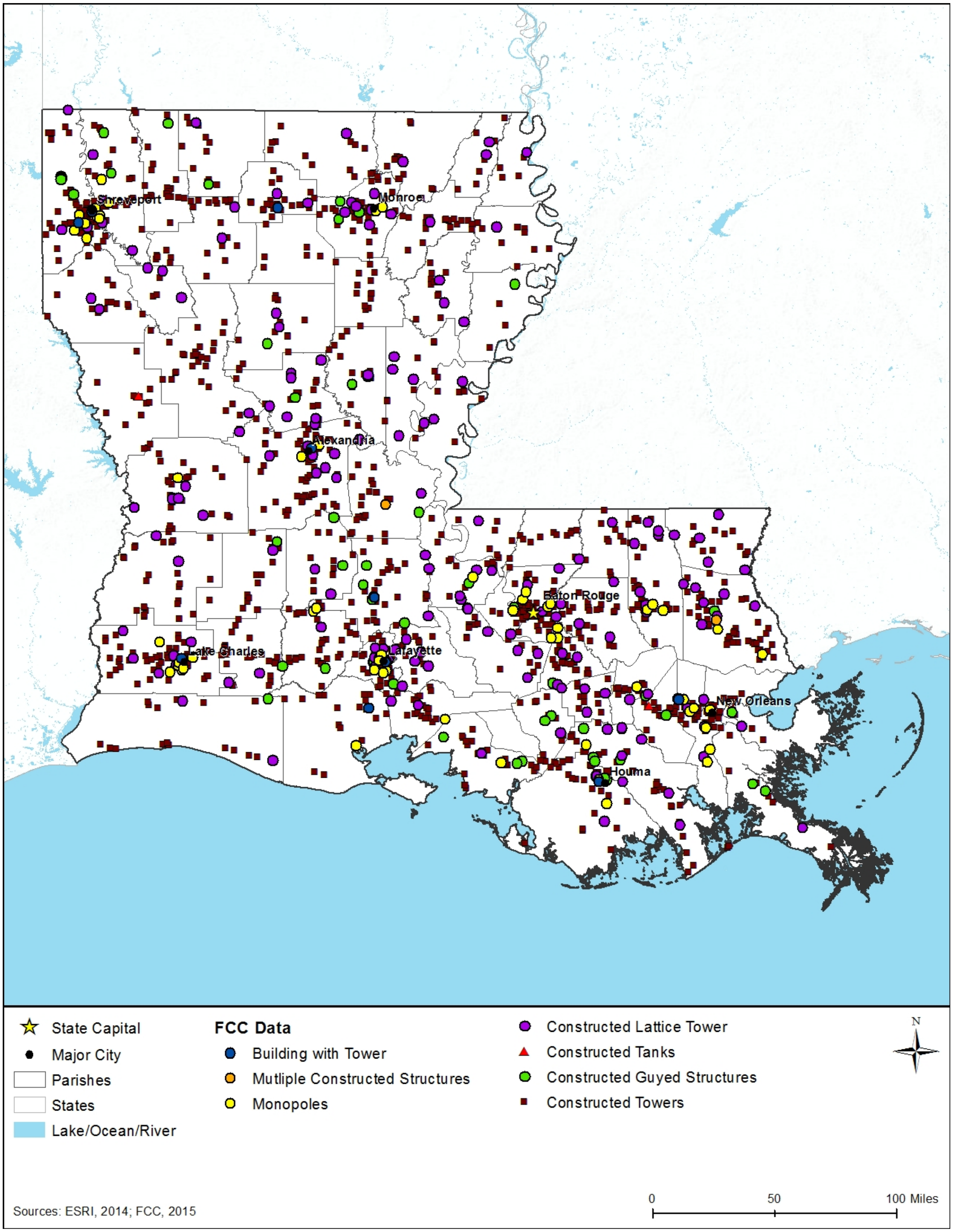

Figure 8.1.1-8: FCC Tower Structure Locations in Louisiana

Fiber Optic Plant (Cables)

Fiber optic plant, or cables, can be buried directly in the ground; pulled, blown, or floated into ducts, conduits, or innerduct (flexible plastic protective sleeves or tubes); placed under water; or installed aerially between poles, typically on utility rights-of-way. A fiber optic network includes an access network consisting of a central office, distribution and feeder plant (cables of various sizes directly leaving a central office and splitting to connect users to the network), and a user location, as shown in

Figure 8.1.1-9. The network also may include a middle mile component (shorter distance cables linking the core network between central offices or network nodes across a region) and a long haul network component (longer distance cables linking central offices across regions) (FCC, 2000).

Last Mile Fiber Assets

In Louisiana, fiber access networks are concentrated in the highest population centers as shown in the figures below. In Louisiana, there are 33 fiber providers that offer service in the state, as listed in Table 8.1.1-11. Figure 8.1.1-10 shows coverage for AT&T Louisiana, Figure 8.1.1-11 shows coverage for Charter Communications Inc. and CenturyLink, and Figure 8.1.1-12 shows the coverage for other providers with a coverage area less than 5 percent, respectively.

Table 8.1.1-11: Fiber Provider Coverage

Fiber Provider	Coverage
AT&T Louisiana	14.06%
Charter Communications Inc.	4.77%
CenturyLink	4.04%
Other[a]	14.02%

[a] Other: Provider with less than 5 percent coverage area. Providers include: Cox Communications; Suddenlink Communications; Comcast; Cameron Communications; MegaPath Corporation; Campti Pleasant Hill Telephone Company; Vision Communications; Star Communications; NEWWAVE Communications; East Ascension Telephone Company LLC; Reserve Telecommunications; NORTHEAST LOUISIANA TELEPHONE CO., INC.; KTC PACE; Spillway Communications Inc.; Vyve Broadband; Audubon Cablevision; AllensTV; Fidelity Communications; CP-Tel Network Services; LUS Fiber; NTS Communications, Inc.; Delcambre Telephone Co., LLC; Bayou Cable Inc.; Level 3 Communications, LLC; Media3; Computer Sales & Services, Inc.; Clear Choice Communications; American Warrior Network; Cable ONE; TW Telecom of Louisiana LLC; Cogent Communications, Inc.
Source: (NTIA, 2014)

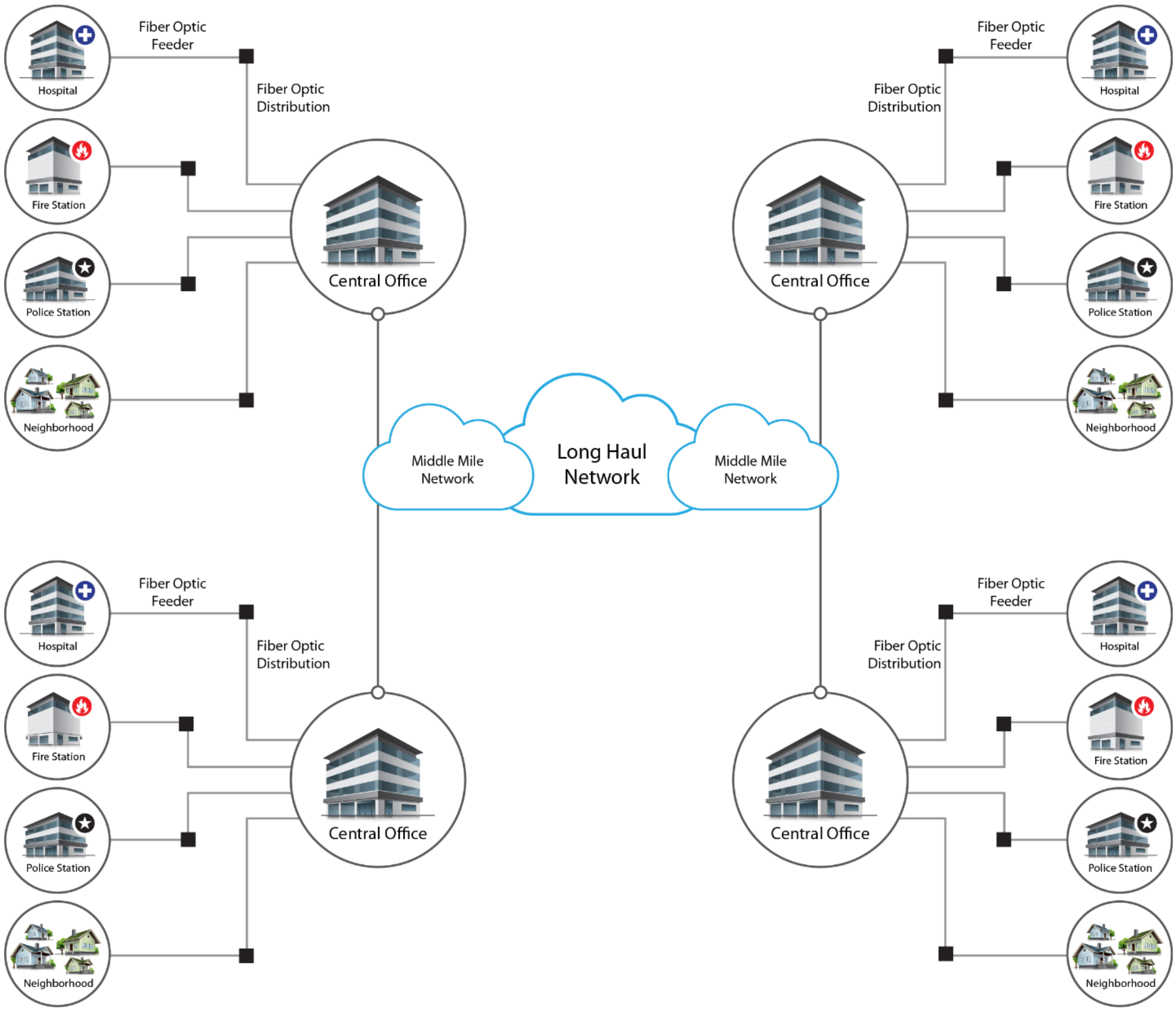

Figure 8.1.1-9: Typical Fiber Optic Network in Louisiana

Prepared by: Booz Allen Hamilton

Source: (ITU-T 2012)

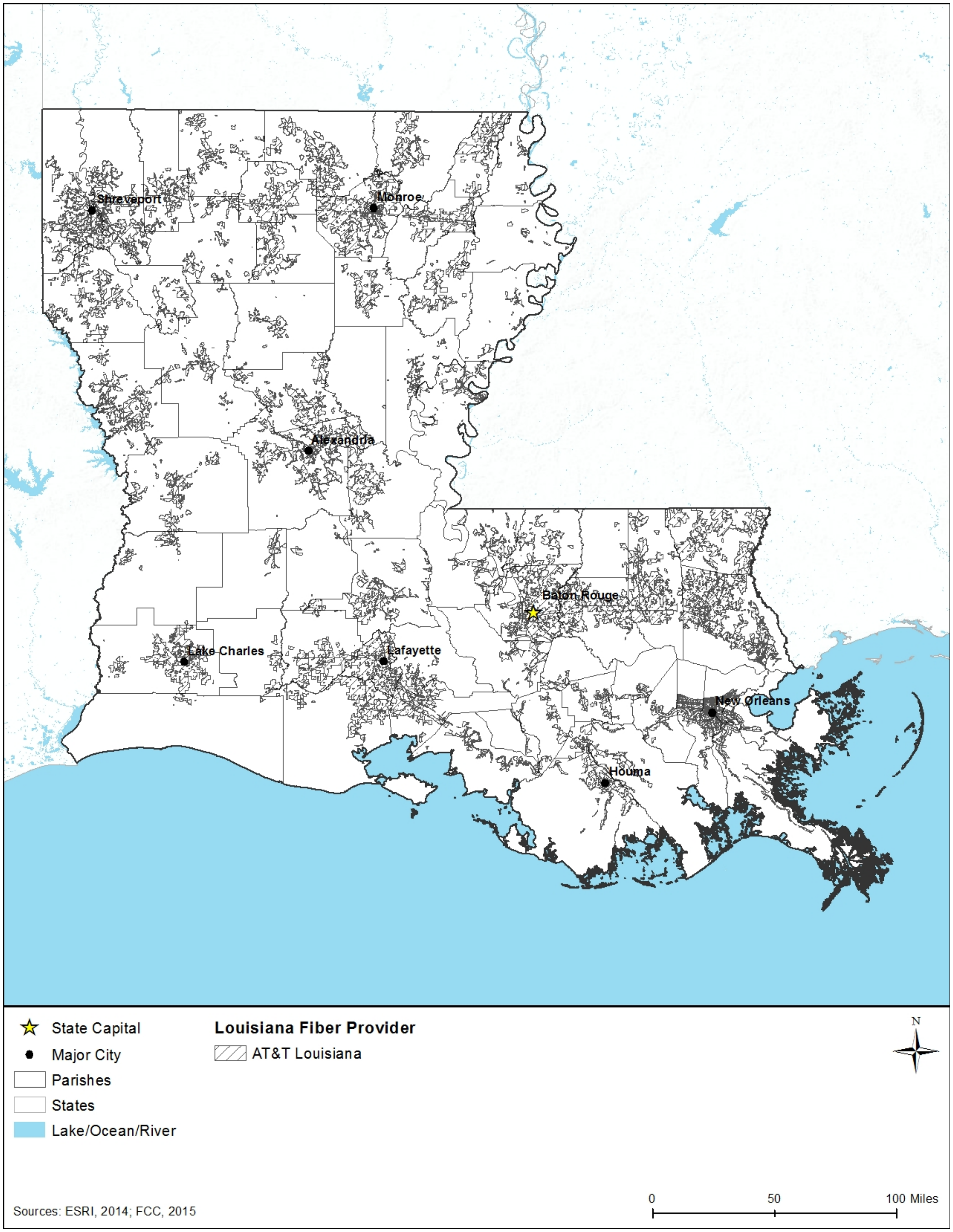

Figure 8.1.1-10: Fiber Availability in Louisiana for AT&T Louisiana

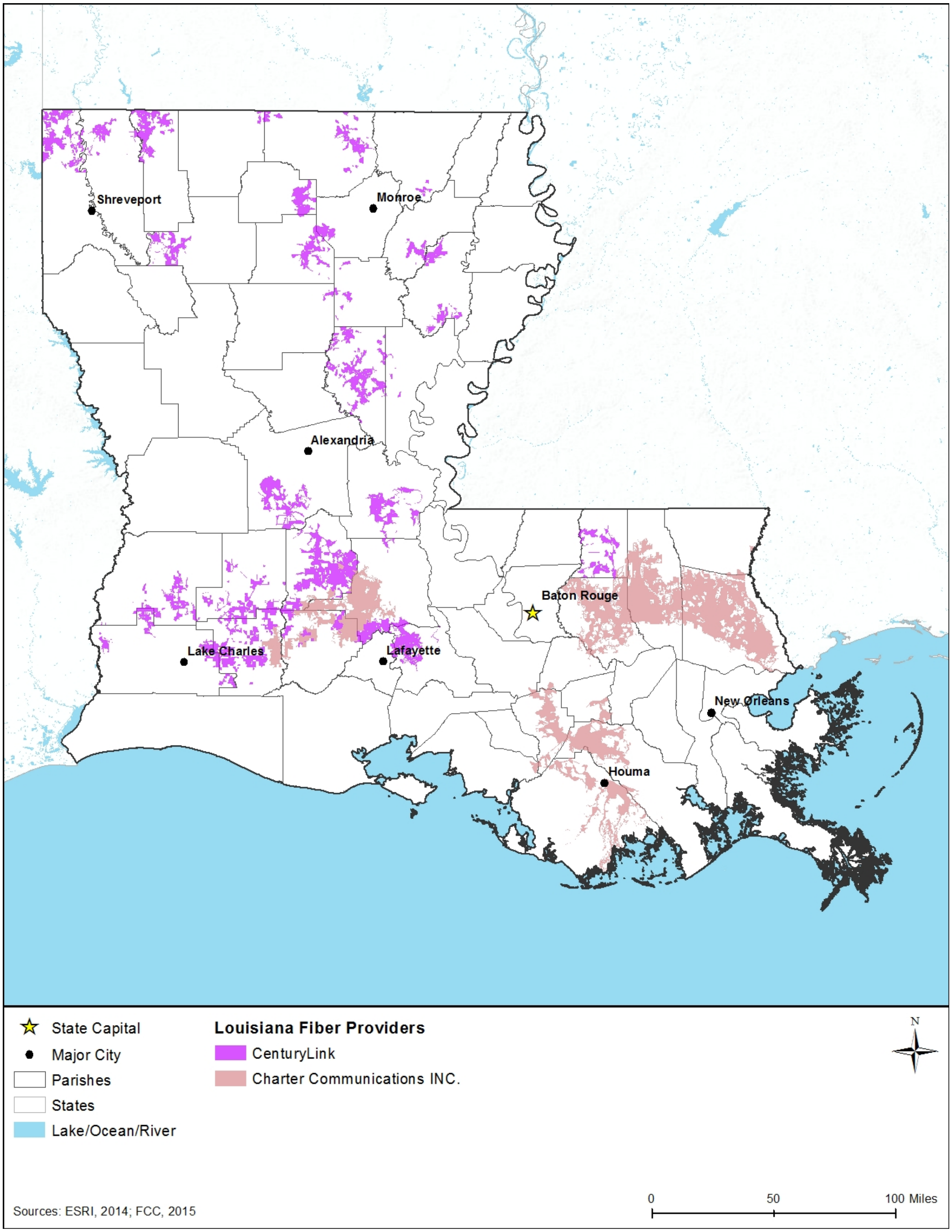

Figure 8.1.1-11: CenturyLink's and Charter Communications Inc.'s Fiber Availability in Louisiana

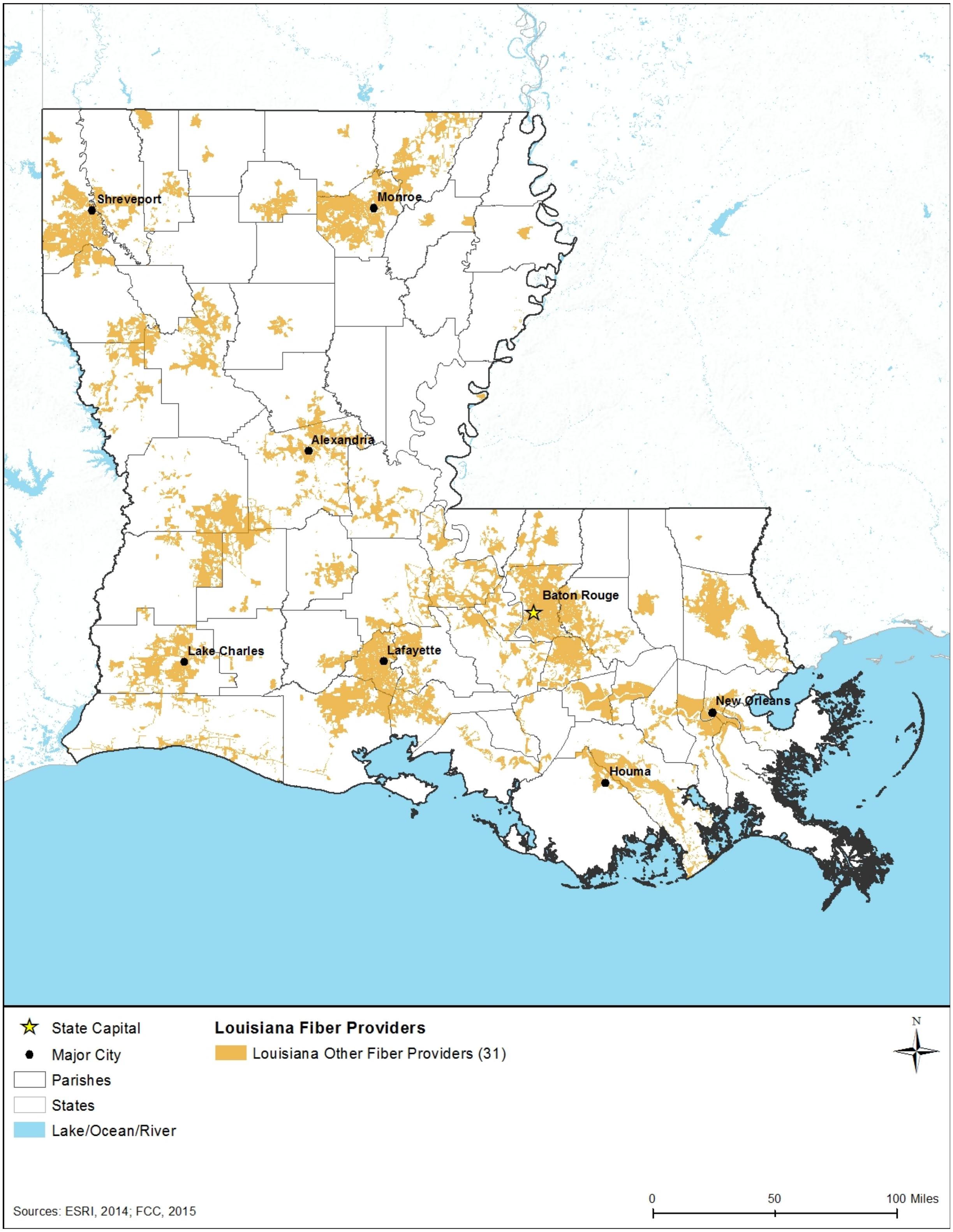

Figure 8.1.1-12: Other Provider's Fiber Availability in Louisiana

Data Centers

Data centers (also known as network access points, collocation facilities, hosting centers, carrier hotels, and Internet exchanges) are large telecommunications facilities that house routers, switches, servers, storage, and other telecommunications equipment. These data centers facilitate efficient network connectivity among, between telecommunications carriers, and between carriers and their largest customers. These facilities also provide racks and cages for equipment, power and cooling, cabling, physical security, and 24x7 monitoring (CIO Council, 2015; GAO, 2013). Ownership of data centers may be public or private; comprehensive information regarding data centers may not be publicly available as some are related to secure facilities.

8.1.1.6 Utilities

Utilities are the essential systems that support daily operations in a community and cover a broad array of public services, such as electricity, water, wastewater, and solid waste. Section 8.1.4, Water Resources, describes the potable water sources in the state.

Electricity

The Louisiana Public Service Commission (LPSC) regulates electric utilities in the state of Louisiana. This body ensures a “regulatory balance that enables utilities to provide customers with safe, adequate, and reliable service, at rates that are just and reasonable, equitable and economically efficient, and that allow utilities an opportunity to earn a fair rate of return on their investment” (LPSC, 2015a). Their authority extends to publicly owned companies and electric cooperatives, but not to municipal utilities (LPSC, 2015a). There are 12 electric cooperatives and three investor owned utility companies in Louisiana (LPSC, 2015b). The majority of the state’s electricity comes from generation facilities fueled by natural gas, followed by coal and nuclear power as a distance second and third (EIA, 2015a). In 2014 the state produced 104,229,402 megawatthours[11] of electricity. Of this, 56,120,564 megawatthours (54 percent) came from facilities using natural gas as a fuel source. An additional 17,311,330 megawatthours (16 percent) came from nuclear power sources and 19,221,019 megawatthours (18 percent) came from coal fueled generation plants. Petroleum produced 5,231,074 megawatthours (5 percent), while other gasses, hydroelectric power, and biomass all provided between 1090,038 and 2,685,727 megawatthours (EIA, 2015a). Louisiana’s industrial sector uses a significant portion of the state’s electricity. In 2013, the industrial sector used 69.7 percent of the power, while the transportation sector used 15.7 percent, the residential sector used 8.2 percent, and the commercial sector used just 6.4 percent (EIA, 2015b).

Water

Water utilities in Louisiana are regulated by the LPSC. Their regulation extends to the reliability and rates of service, as well as ensuring that utility companies are still financially stable (LPSC,

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[11] One megawatthour is defined as “one thousand kilowatthours or one million watthours.” One watthour is “the electrical energy unit of measure equal to one watt of power supplied to, or taken from, an electric circuit steadily for one hour” (EIA, 2016b).

2015a). The LPSC regulates publicly owned utility companies; in the case of water utilities, this includes for-profit and not-for-profit companies (LPSC, 2015b). There are 54 for-profit water utility companies and 220 not-for-profit water utilities under the jurisdiction of the LPSC. The quality of this water is monitored and regulated by the Safe Drinking Water Program (SDWP) of the Louisiana Department of Health and Hospitals (DHH) (DHH, 2015a). Their major activities include the monitoring of contaminants in public water, inspection of drinking water systems and sites, and the review and permitting of construction projects for new or existing water systems. Additionally, there are 1,406 of these public water systems in Louisiana (DHH, 2015a). Compliance records for public drinking water systems are available to the public via the DHH website (DHH, 2015b). Community water systems must also provide a report directly to their customers. These Consumer Confidence Reports (CCR) are used to deliver information on the quality of their water and any contaminants that may be found in it (DHH, 2015c).

Wastewater

The Louisiana Department of Environmental Quality (DEQ) and DHH regulates Louisiana's wastewater discharge and management with permits and certifications. Louisiana Pollutant Discharge Elimination System (LPDES) permits are required by the state for facilities that wish to discharge pollutants or wastewater "from any point source into waters of the state of Louisiana" (DEQ, 2015a). The LPDES permit program operates as a state delegated administration of the National Pollutant Discharge Elimination System (NPDES) program, which requires wastewater permitting by all states (DEQ, 2015a). The LPDES program offers both general and individual permits. General permits are used for facilities with similar specifications and needs, such as permits for "Cement Concrete and Asphalt Facilities" or "Potable Water Treatment Facilities." Individual permits are used for facilities with site-specific requirements related to their pollutants or receiving waters, such as the "Sanitary wastewater discharges: 25,000 gallons per day or greater discharging in the Vermillion-Tech River Basin" (DEQ, 2015b).

State regulations also require that the operators of wastewater facilities be certified by DHH. In the interests of protecting public health, this process helps to ensure that wastewater operators are properly educated and trained (DHH, 2015d). The certification process consists of several steps. Prospective operators must have a valid high school diploma or GED, as well as the necessary experience and wastewater education prior to applying for a certification examination. Only after passing the exam may an individual begin this application process for an operator certification (DHH, 2015e).

Solid Waste Management

The DEQ is the regulatory body in charge of the state's solid waste. They set rules and regulations for the permitting of solid waste management facilities, as well as setting standards and handling enforcement (DEQ, 2007). Much of their management is done through solid waste permits for: Landfills (Type 1 or 2), land farms, wood waste landfills, and composting facilities (DEQ, 2015c). There are 116 landfills in the state, a mixture of industrial, commercial, residential and construction/demolition facilities (DEQ, 2015d) (DEQ, 2013a). As of 2013, the state's 36 industrial solid waste landfills had a combined 307,934,512 cubic yards of remaining capacity. Some of these facilities accept municipal waste, although industrial waste makes up the bulk of their content. Dedicated municipal waste landfills received 9,691,845 wet-tons of waste in 2013, leaving 144,436,746 cubic tons of space in the 17 publicly owned landfills. Louisiana's eight private facilities had a combined 163,675,368 cubic tons of remaining capacity (DEQ, 2013a). A voluntary survey conducted in 2012 characterized recycling participation in Louisiana. The survey was responded to by 25 entities (though two of these reported no activities), that represented 2,128,564 people. The respondents indicated that they recycled a combined 527,250 tons of material (DEQ, 2013b). Of this, 112,471 tons came from compost and yard waste and 155,008 tons were used oil (DEQ, 2013b).

8.1.2 Soils

8.1.2.1 Definition of the Resource

The Soil Science Society of America defines soil as:

(i) "The unconsolidated mineral or organic material on the immediate surface of the Earth that serves as a natural medium for the growth of land plants." (NRCS, 2015a)

(ii) "The unconsolidated mineral or organic matter on the surface of the Earth that has been subjected to and shows effects of genetic and environmental factors of: climate (including water and temperature effects), and macro- and microorganisms, conditioned by relief, acting on parent material over a period of time. A product-soil differs from the material from which it is derived in many physical, chemical, biological, and morphological properties and characteristics." (NRCS, 2015a)

Five primary factors account for soil development patterns. A combination of the following variables contributes to the soil type in a particular area (University of Minnesota, 2001):

- *Parent Material*: The original geologic source material from the soil formed affects soil aspects, including color, texture, and ability to hold water.
- *Climate*: Chemical changes in parent material occur slowly in low temperatures. However, hot temperatures evaporate moisture, which also facilitates chemical reactions within soils. The highest degree of reaction within soils occurs in temperate, moist climates.
- *Topography*: Steeper slopes produce increased runoff, and, therefore, downslope movement of soils. Slope orientation also dictates the microclimate to which soils are exposed, because different slope faces receive more sunlight than others do.
- *Biology*: The presence/absence of vegetation in soils affects the quantity of organic content of the soil.
- *Time*: Soil properties are dependent on the period over which other processes act on them.

8.1.2.2 Specific Regulatory Considerations

The Proposed Action must meet the requirements of the National Environmental Policy Act and other applicable laws and regulations. Applicable federal laws and regulations that apply for Soils, such as the Farmland Protection Policy Act of 1981, are in Appendix C, Environmental

Laws and Regulations. A list of applicable state laws and regulations is included in Table 8.1.2-1 below.

Table 8.1.2-1: Relevant Louisiana Soils Laws and Regulations

State Law/Regulation	Regulatory Agency	Applicability
LPDES Permits LAR100000 and LAR200000	DEQ	Erosion and sediment control measures are required as part of the LPDES General Permits for any construction activities one acre in size or greater.

8.1.2.3 Environmental Setting

Louisiana is composed of three Land Resource Region (LRR)[12], as defined by the National Resources Conservation Service (NRCS) (NRCS, 2006):

- Atlantic and Gulf Coast Lowland Forest and Crop Region;
- Mississippi Delta Cotton and Feed Grains Region; and
- South Atlantic and Gulf Coast Cash Crops, Forest, and Livestock Region

Within and among Louisiana's three LRRs are 11 Major Land Resource Areas (MLRA),[13] which are characterized by patterns of soils, climate, water resources, land uses, and type of farming (NRCS, 2006). The locations and characteristics of Louisiana's MLRAs are presented in Figure 8.1.2-1 and Table 8.1.2-2.

Soil characteristics are an important consideration for FirstNet insomuch as soil properties could influence the suitability of sites for network deployment. Soil characteristics can differ over relatively short distances, reflecting differences in parent material, elevation, and position on the landscape, biota[14] such as bacteria, fungi, biological crusts, vegetation, animals, and climatic variables such as precipitation and temperature. For example, expansive soils[15] with wet and dry seasons alternately swell and shrink, which presents integrity risks to structural foundations (Rogers, Olshansky, & Rogers, 2004). Soils can also be affected by a variety of surface uses that loosen topsoil and damage or remove vegetation or other groundcover, which may result in accelerated erosion, compaction, and rutting[16] (discussed further in the subsections below).

[12] Land Resource Region: "A geographical area made up of an aggregation of Major Land Resource Areas (MLRA) with similar characteristics" (NRCS, 2006).
[13] Major Land Resource Area: "A geographic area, usually several thousand acres in extent, that is characterized by a particular pattern of soils, climate, water resources, land uses, and type of farming" (NRCS, 2006).
[14] All living organisms of an area. (USGS, 2013b)
[15] Expansive soils are characterized by "the presence of swelling clay minerals" that absorb water molecules when wet and expand in size or shrink when dry leaving "voids in the soil" (Rogers, Olshansky, & Rogers, 2004).
[16] Rutting is indentations in soil from operating equipment in moist conditions or soils with lower bearing strength (USFS, 2009b).

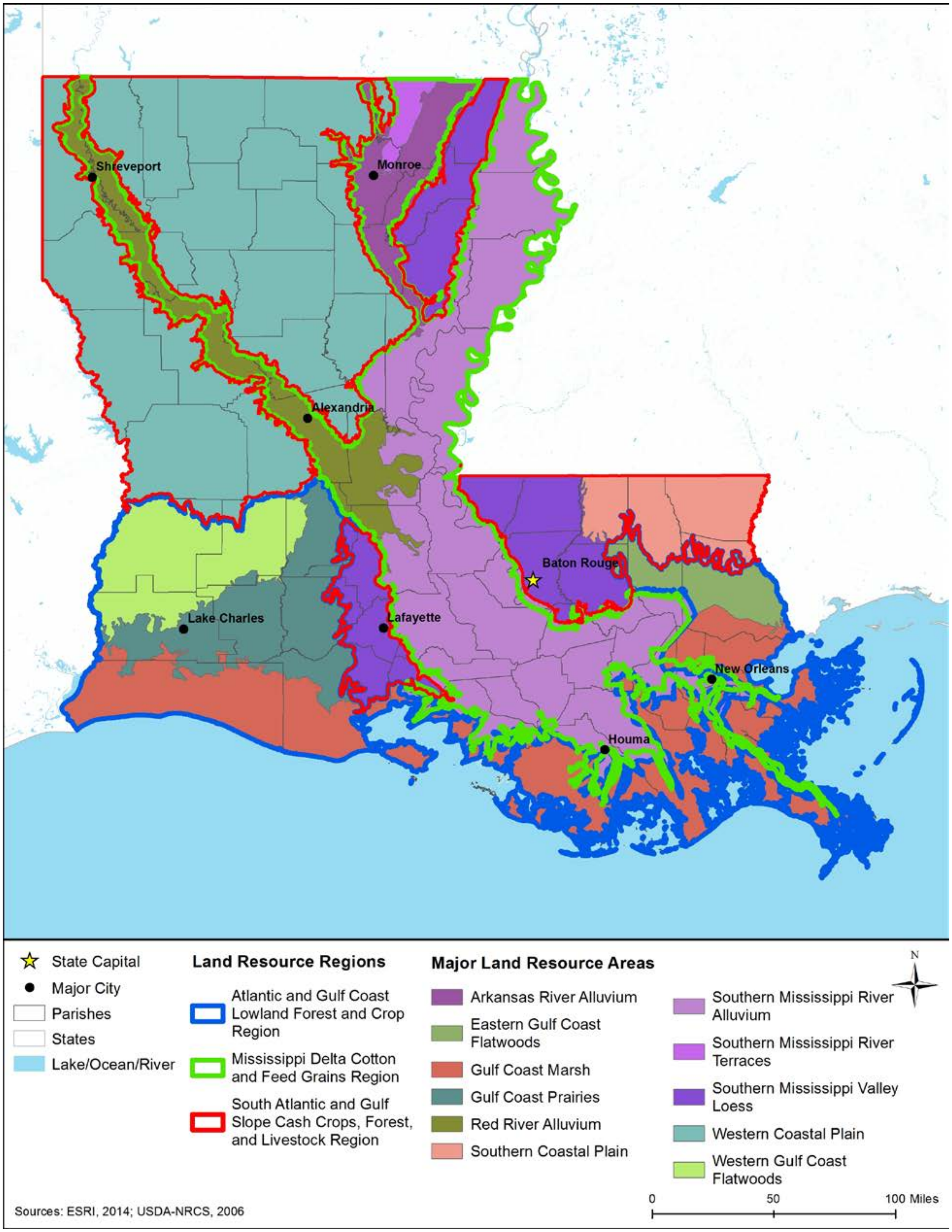

Figure 8.1.2-1: Locations of Major Land Resource Areas in Louisiana

Table 8.1.2-2: Characteristics of Major Land Resource Areas in Louisiana

MLRA Name	Region of State	Soil Characteristics
Arkansas River Alluvium	Northern Louisiana	Alfisols,[a] Entisols,[b] Inceptisols,[c] and Vertisols[d] are the dominant soil orders. These clayey or loamy soils[e] typically range from poorly drained to well drained, and are very deep.
Eastern Gulf Coast Flatwoods	Southeastern Louisiana	Alfisols, Entisols, Histosols,[f] Spodosols,[g] and Ultisols[h] are the dominant soil orders. These sandy, mucky, or loamy soils typically range from somewhat poorly drained to very poorly drained, and are deep or very deep.
Gulf Coast Marsh	Southern Louisiana	Entisols and Histosols are the dominant soil orders. These clayey and very poorly drained soils are typically very deep.
Gulf Coast Prairies	Southwestern Louisiana	Alfisols, Mollisols,[i] and Vertisols are the dominant soil orders. These loamy or clayey soils are very deep and range from very poorly drained to well drained.
Red River Alluvium	Northern Louisiana	Alfisols, Entisols, Inceptisols, and Vertisols are the dominant soil orders. These clayey or loamy soils typically range from poorly drained to moderately well drained, and are very deep.
Southern Coastal Plain	Southeastern Louisiana	Entisols, Inceptisols, and Ultisols are the dominant soil orders. These loamy soils range from poorly drained to somewhat excessively drained, and are typically very deep.
Southern Mississippi River Alluvium	Eastern Louisiana	Alfisols, Entisols, Inceptisols, and Vertisols are the dominant soil orders. These generally clayey or loamy soils range from poorly drained to somewhat poorly drained, and are very deep.
Southern Mississippi River Terraces	Northern Louisiana	Alfisols are the dominant soil order. These silty soils are typically moderately well drained to well drained, and are very deep.
Southern Mississippi Valley Loess	Central and Eastern Louisiana	Alfisols, Entisols, Inceptisols, and Ultisols are the dominant soil orders. These deep or very deep soils range from well drained to poorly drained and are loamy or silty.
Western Coastal Plain	Northern Louisiana	Alfisols and Ultisols are the dominant soil orders. These clayey or loamy soils typically range from poorly drained to well drained, and are very deep.
Western Gulf Coast Flatwoods	Southwestern Louisiana	Alfisols and Ultisols are the dominant soil orders. These typically very deep and loamy or clayey soils range from very poorly drained to moderately well drained.

[a] Alfisols: "Soils found in semiarid to moist areas that are formed from weathering processes that leach clay minerals and other constituents out of the surface layer and into the subsoil. They are productive for most crop, are primarily formed under forest or mixed vegetative cover, and make up nearly 10 percent of the world's ice-free land surface" (NRCS, 2015e).
[b] Entisols: "Soils that show little to no pedogenic horizon development. They occur in areas of recently deposited parent materials or in dunes, steep slopes, or flood plains where erosion or deposition rates are faster than rate of soil development. They make up nearly 16 percent of the world's ice-free land surface" (NRCS, 2015e).
[c] Inceptisols: "Soils found in semiarid to humid environments that exhibit only moderate degrees of soil weathering and development. They have a wide range of characteristics, can occur in a wide variety of climates, and make up nearly 17percent of the world's ice-free land surface" (NRCS, 2015e).
[d] Vertisols: "Vertisols have a high content of expanding clay minerals. They undergo pronounced changes in volume with changes in moisture, and have cracks that open and close periodically, and that show evidence of soil movement. Vertisols transmit water very slowly, have undergone little leaching, and tend to be high in natural fertility. They make up about 2 percent of the world's ice-free land surface" (NRCS, 2015e).
[e] Loamy Soil: "[A soil] that combines [sand, silt, and clay] in relatively equal amounts" (Purdue University Consumer Horticulture, 2006).
[f] Histosols: "Histosols have a high content of organic matter and no permafrost. Most are saturated year round, but a few are freely drained. They form in decomposed plan remains that accumulate in water, forest litter, or moss faster than they decay. Histosols make up about 1 percent of the world's ice-free land surface" (NRCS, 2015e).
[g] Spodosols: "Spodosols formed from weathering processes that strip organic matter combined with aluminum from the surface layer and deposit them in the subsoil. They commonly occur in areas of course-textured deposits under coniferous forests of humid regions, tend to be acid and infertile, and make up about 4 percent of the world's ice-free land surface" (NRCS, 2015e).

[h] Ultisols: "Soils found in humid environments that are formed from fairly intense weathering and leaching processes. This results in a clay-enriched subsoil dominated by minerals. They have nutrients concentrated in the upper few inches and make up 8 percent of the world's ice-free land surface" (NRCS, 2015e).
[i] Mollisols: "Soils that have a dark colored surface horizon relatively high in content of organic matter. They are base rich throughout and quite fertile. Mollisols form under grass in climates that have a moderate to pronounced seasonal moisture deficit" (NRCS, 2015e).
Source: (NRCS, 2006)

8.1.2.4 Soil Suborders

Soil suborders are part of the soil taxonomy (a system of classification used to make and interpret soil surveys). Soil orders are the highest level in the taxonomy; there are 12 soil orders in the world and they are characterized by both observed and inferred properties, such as texture, color, temperature, and moisture regime. Soil suborders are the next level down, and are differentiated within an order by soil moisture and temperature regimes, as well as dominant physical and chemical properties (NRCS, 2015b). The STATSGO2[17] soil database identifies 16 different soil suborders in Louisiana (NRCS, 2015c). Figure 8.1.2-2 depicts the distribution of the soil suborders, and Table 8.1.2-3 provides a summary of the major physical-chemical characteristics of the various soil suborders found.

[17] STATSGO2 is the Digital General Soil Map of the United States that shows general soil association units across the landscape of the nation. Developed by the National Cooperative Soil Survey, STATSGO2 supersedes the State Soil Geographic (STATSGO) dataset.

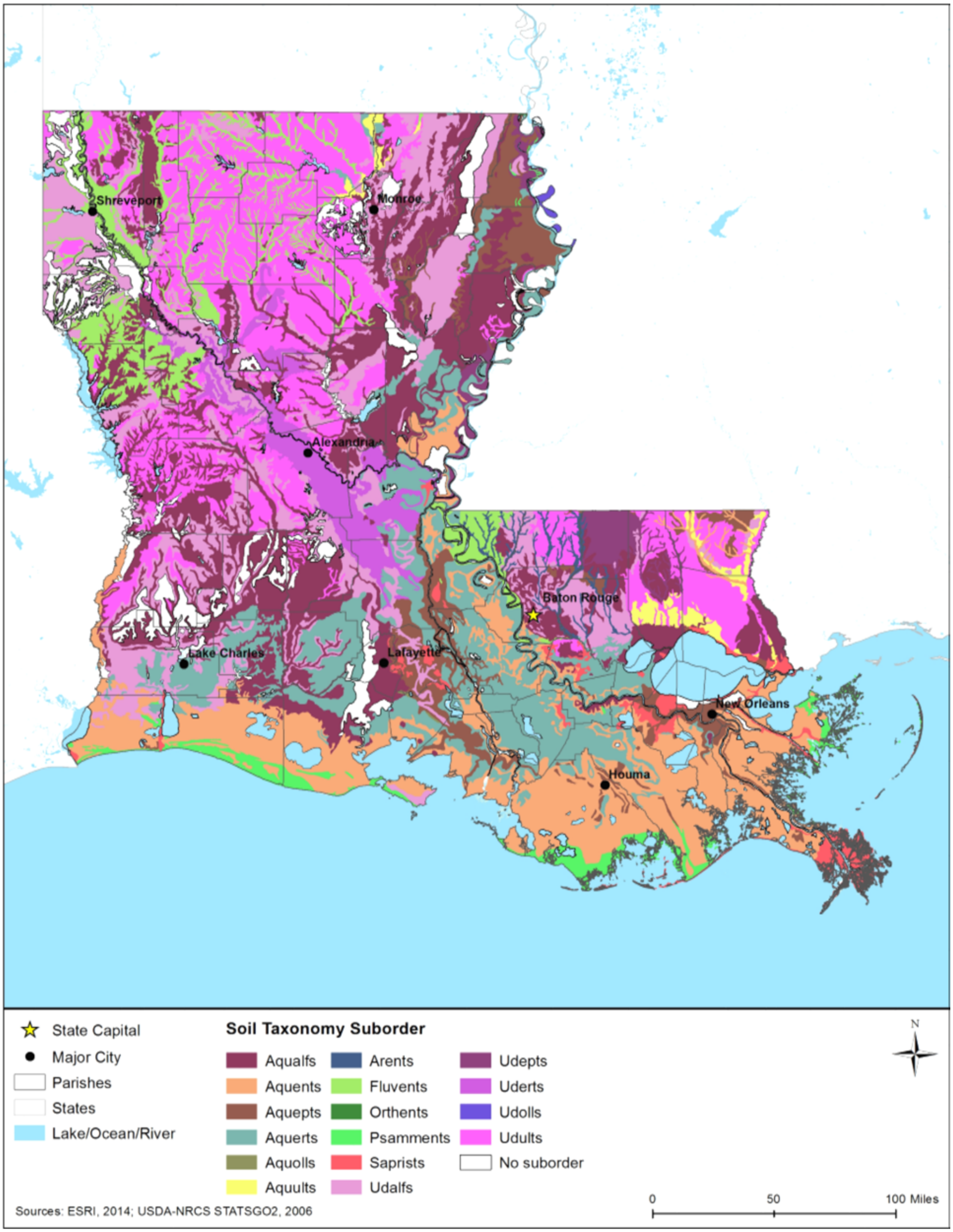

Figure 8.1.2-2: Louisiana Soil Taxonomy Suborders

Table 8.1.2-3: Major Characteristics of Soil Suborders[a] Found in Louisiana, as depicted in Figure 8.1.2-2

Soil Order	Soil Suborder	Ecological Site Description	Soil Texture	Slope (%)	Drainage Class	Hydric Soil[b]	Hydrologic Group	Runoff Potential	Permeability[c]	Erosion Potential	Compaction and Rutting Potential
Alfisols	Aqualfs	Generally have warm and aquic (saturated with water long enough to cause oxygen depletion) conditions. Aqualfs are used as cropland for growing corn, soybeans, and rice, and most have some artificial drainage or other water control. Nearly all Aqualfs have likely supported forest vegetation in the past.	Clay, Loam, Sandy clay loam, Silt loam, Silty clay, Silty clay loam, Very fine sandy loam	0-5	Very poorly drained to poorly drained	No, Yes	C, D	Medium, High	Low, Very Low	Medium to High, depending on slope	High, due to hydric soil and poor drainage conditions
Entisols	Aquents	Widely distributed, with some forming in sandy deposits, and most forming in recent sediments. Aquents support vegetation that tolerates either permanent or periodic wetness, and are mostly used for pasture, cropland, forest, or wildlife habitat.	Clay, Fine sandy loam, Muck, Silt loam, Silty clay loam, Variable	0-5	Very poorly drained to poorly drained	No, Yes	C, D	Medium, High	Low, Very Low	Medium to High, depending on slope	High, due to hydric soil and poor drainage conditions
Inceptisols	Aquepts	Aquepts have poor or very poor natural drainage. If these soils have not been artificially drained, groundwater is at or near the soil surface at some time during normal years (although not usually in all seasons). They are used primarily for pasture, cropland, forest, or wildlife habitat. Many Aquepts have formed under forest vegetation, but they can have almost any kind of vegetation.	Clay, Clay loam, Fine sandy loam, Loam, Mucky clay, Silt loam, Silty clay, Silty clay loam, Stratified very fine sandy loam to clay, Stratified very fine sandy loam to silty clay, Very fine sandy loam	0-3	Very poorly drained to poorly drained	No, Yes	B, C, D	Medium, High	Moderate, Low, Very Low	Medium to High, depending on slope	High, due to hydric soil and poor drainage conditions
Vertisols	Aquerts	Aquerts are wet soils, with prolonged moisture at or near the soil surface. Their natural vegetation includes savanna, grass, and forest. They are used as forest, rangeland, and cropland, although drainage for cropland can be difficult due to poor drainage.	Clay, Silty clay, Silty clay loam	0-3	Poorly drained	Yes	D	High	Very Low	High	High, due to hydric soil and poor drainage conditions
Mollisols	Aquolls	Aquolls support grass, sedge, and forb vegetation, as well as some forest vegetation. However, most have been artificially drained and utilized as cropland.	Very fine sandy loam	0-1	Somewhat poorly drained	No	D	High	Very Low	High	Low
Ultisols	Aquults	Aquults are found in wet areas where groundwater is very close to the surface during part of each year, usually in winter and spring. Their slopes are gentle, with many soils formerly and currently supporting forest vegetation.	Fine sandy loam, Silt loam	0-2	Poorly drained	Yes	D	High	Very Low	High	High, due to hydric soil and poor drainage conditions
Entisols	Arents	Arents are predominantly used for pasture, crops, wildlife habitat, and urban land. Since they have been subject to various means of mixing, they lack diagnostic horizons.	Variable	1-5	NA[d]	No	C	Medium	Low	Medium	Low
Entisols	Fluvents	Fluvents are mostly freely drained soils that form in recently deposited sediments on flood plains, fans, and deltas located along rivers and small streams. Unless protected by dams or levees, these soils frequently flood. Fluvents are normally utilized as rangeland, forest, pasture, or wildlife habitat, with some also used for cropland.	Fine sandy loam, Loamy sand, Sandy loam, Silt, Silt loam, Stratified loamy fine sand to fine sandy loam, Stratified loamy sand to fine sandy loam, Stratified loamy very fine sand to silt loam, Very fine sandy loam	0-5	Moderately well drained to excessively drained	No, Yes	A, B, C	Low, Medium	High, Moderate, Low	Low to Medium, depending on slope	High, due to hydric soil and poor drainage conditions

Soil Order	Soil Suborder	Ecological Site Description	Soil Texture	Slope (%)	Drainage Class	Hydric Soil[b]	Hydrologic Group	Runoff Potential	Permeability[c]	Erosion Potential	Compaction and Rutting Potential
Entisols	Orthents	Orthents are commonly found on recent erosional surfaces and are used primarily as rangeland, pasture, or wildlife habitat.	Variable	0-15	NA	No	NA	-	-	-	-
Entisols	Psamments	Psamments are sandy in all layers. In some arid and semi-arid climates, they are among the most productive rangeland soils, and are primarily used as rangeland, pasture, or wildlife habitat. Those Psamments that are nearly bare are subject to wind erosion and drifting, and do provide good support for wheeled vehicles.	Fine sand, Loamy fine sand, Loamy sand Sand	0-3	Somewhat poorly drained to excessively drained	No	A	Low	High	Low	Low
Histosols	Saprists	Saprists have organic materials are well decomposed, and many support natural vegetation and are used as woodland, rangeland, or wildlife habitat. Some Saprists, particularly those with a mesic or warmer temperature regime, have been cleared, drained, and used as cropland.	Clay, Muck	0-1	Very poorly drained	Yes	D	High	Very Low	High	High, due to hydric soil and poor drainage conditions
Alfisols	Udalfs	Udalfs have an udic (humid or subhumid climate) moisture regime, and are believed to have supported forest vegetation at some time during development.	Clay, Clay loam, Fine sandy loam, Loam, Loamy fine sand, Loamy sand, Sandy clay, Sandy clay loam, Silt loam, Silty clay, Silty clay loam, Stratified fine sandy loam to channery silty clay loam, Very fine sandy loam	0-30	Somewhat poorly drained to somewhat excessively drained	No	A, B, C, D	Low, Medium, High	High, Moderate, Low, Very Low	Low to High, depending on slope	Low
Inceptisols	Udepts	Udepts have an udic or perudic (saturated with water long enough to cause oxygen depletion) moisture regime, and are mainly freely drained. Most of these soils currently support or formerly supported forest vegetation, with mostly coniferous forest in the Northwest and mixed or hardwood forest in the East. Some also support shrub or grass vegetation, and in addition to being used as forest, some have been cleared and are used as cropland or pasture.	Fine sandy loam, Silt loam, Silty clay loam, Very fine sandy loam	0-3	Somewhat poorly drained to well drained	No, Yes	B, C	Medium	Moderate, Low	Medium	High, due to hydric soil and poor drainage conditions
Vertisols	Uderts	Uderts are found in humid areas, and primarily used as cropland, forest, or pasture. They have low permeability, and water usually must be drained from the surface of cropland.	Clay, Loam, Silt loam, Silty clay	0-15	Poorly drained to moderately well drained	No, Yes	D	High	Very Low	High	High, due to hydric soil and poor drainage conditions
Mollisols	Udolls	Udolls are found in humid climates. They are more or less freely drained, and have historically supported tall grass prairie. They are used as pasture or rangeland, and as cropland in areas with little slope.	Silt loam, Silty clay	0-2	Somewhat poorly drained	No, Yes	C	Medium	Low	Medium	High, due to hydric soil and poor drainage conditions

Soil Order	Soil Suborder	Ecological Site Description	Soil Texture	Slope (%)	Drainage Class	Hydric Soil[b]	Hydrologic Group	Runoff Potential	Permeability[c]	Erosion Potential	Compaction and Rutting Potential
Ultisols	Udults	Udults are more or less freely drained, relatively humus poor, and have an udic moisture regime. Most of these soils currently support or formerly supported mixed forest vegetation, and many have been cleared and used as cropland (mostly with the use of soil amendments).	Clay, Clay loam, Fine sandy loam, Gravelly clay, Gravelly fine sandy loam, Gravelly sandy clay, Loam, Loamy fine sand, Loamy sand, Sandy clay loam, Sandy loam, Silt loam, Silty clay, Silty clay loam, Stratified fine sandy loam to clay, Stratified sandy loam to sandy clay loam, Very fine sandy loam	0-60	Somewhat poorly drained to somewhat excessively drained	No	A, B, C	Low, Medium	High, Moderate, Low	Low to Medium, depending on slope	Low

[a] Soil suborders constitute a broad range of soil types. Within each suborder, the range of soil types may have a range of properties across the state, which result in multiple values being displayed in the table for that suborder.
[b] Hydric Soil: "A soil that formed under conditions of saturation, flooding or ponding long enough during the growing season to develop anaerobic conditions in the upper part." (NRCS, 2015f) Soil suborders constitute a broad range of soil types. Within each soil suborder, some specific soil types are hydric while others are not.
[c] Based on Runoff Potential, described in Section 8.1.2.5.
[d] The dataset from NRCS is missing the attributes to populate this information.
Source: (NRCS, 2015c) (NRCS, 1999)

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8.1.2.5 Runoff Potential

The National Resources Conservation Service (NRCS) uses four Hydrologic Soil Groups (A, B, C, and D) that are based on a soil's runoff potential.[18] Group A generally has the smaller runoff potential, whereas Group D generally has the greatest (Purdue University, 2015). Table 8.1.2-3 provides a summary of the runoff potential for each soil suborder in Louisiana.

Group A. Sand, loamy sand or sandy loam soils. This group of soils has "low runoff potential and high infiltration rates[19] even when thoroughly wetted. They consist chiefly of deep, well to excessively drained sands or gravels and have a high rate of water transmission" (Purdue University, 2015). Fluvents, Psamments, Udalfs, and Udults fall into this category in Louisiana.

Group B. Silt loam or loam soils. This group of soils has a "moderate infiltration rate when thoroughly wetted and consists chiefly or moderately deep to deep, moderately well to well drained soils with moderately fine to moderately coarse textures" (Purdue University, 2015). This group has medium runoff potential. Aquepts, Fluvents, Udalfs, Udepts, and Udults fall into this category in Louisiana.

Group C. Sandy clay loam soils. This group of soils has "low infiltration rates when thoroughly wetted and consist chiefly of soils with a layer that impedes downward movement of water and soils with moderately fine to fine structure" (Purdue University, 2015). This group has medium runoff potential. Aqualfs, Aquents, Aquepts, Arents, Fluvents, Udalfs, Udepts, Udolls, and Udults fall into this category in Louisiana.

Group D. Clay loam, silty clay loam, sandy clay, silty clay, or clay soils. This group of soils "has the highest runoff potential. They have very low infiltration rates when thoroughly wetted and consist chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with a claypan or clay layer at or near the surface and shallow soils over nearly impervious material" (Purdue University, 2015). Aqualfs, Aquents, Aquepts, Aquerts, Aquolls, Aquults, Saprists, Udalfs, and Uderts fall into this category in Louisiana.

8.1.2.6 Soil Erosion

"Soil erosion involves the breakdown, detachment, transport, and redistribution of soil particles by forces of water, wind, or gravity" (NRCS, 2015d). Water-induced erosion can transport soil into streams, rivers, and lakes, degrading water quality and aquatic habitat. When topsoil is eroded, organic material is depleted, creating loss of nutrients available for plant growth. Soil particles displaced by wind can cause human health problems and reduced visibility, creating a

[18] Classifying soils is highly generalized and it is challenging to differentiate orders as soil properties can change with distance or physical properties. The soil suborders are at a high level, therefore soil groups may be found in multiple hydrologic groups within a state, as composition, topography, etc. varies in different areas.

[19] Infiltration Rate: "The rate at which a soil under specified conditions absorbs falling rain, melting snow, or surface water expressed in depth of water per unit time" (FEMA, 2010).

public safety hazard (NRCS, 1996a). Table 8.1.2-3 provides a summary of the erosion potential for each soil suborder in Louisiana. Soils with medium to high erosion potential in Louisiana include those in the Aqualfs, Aquents, Aquepts, Aquerts, Aquolls, Aquults, Arents, Fluvents, Saprists, Udalfs, Udepts, Uderts, Udolls, and Udults suborders, which are found throughout most of the state (Figure 8.1.2-2).

8.1.2.7 Soil Compaction and Rutting

Soil compaction and rutting occurs when soil layers are compressed by machinery or animals, which decreases both open spaces in the soil, as well as water infiltration rates (NRCS, 1996b). Moist soils with high soil water content are most susceptible to compaction and rutting, as they lack the strength to resist deformation caused by pressure. When rutting occurs, channels form and result in downslope erosion (USFWS, 2009). Other characteristics that factor into compaction and rutting risk include soil composition (i.e., low organic soil is at increased risk of compaction), amount of pressure exerted on the soil, and repeatability (i.e., the number of times the pressure is exerted on the soil). Machinery and vehicles that have axle loads greater than 10 tons can cause soil compaction of greater than 12 inches depth (NRCS, 1996b), (NRCS, 2003).

Loam, sandy loam, and sandy clay loam soils are most susceptible to compaction and rutting; silt, silty clay, silt loam, silty clay loam, and clay soils are more resistant to compaction and rutting (NRCS, 1996b). Table 8.1.2-3 provides a summary of the compaction and rutting potential for each soil suborder in Louisiana. Soils with the highest potential for compaction and rutting in Louisiana include those in the Aqualfs, Aquents, Aquepts, Aquerts, Aquults, Arents, Fluvents, Saprists, Udepts, Uderts, and Udolls suborders, which are found throughout most of the state (Figure 8.1.2-2).

8.1.3 Geology

8.1.3.1 Definition of the Resource

The U.S. Geological Survey (USGS) is the primary government organization responsible for the nation’s geological resources. USGS defines geology as an interdisciplinary science with a focus on the following aspects of earth sciences: geologic hazards and disasters, climate variability and change, energy and mineral resources, ecosystem and human health, and ground-water availability. Several of these elements are discussed in other sections of this PEIS, including Section 8.1.4, Water Resources, Section 8.1.15, Section 8.1.14, Climate Change, and Human Health and Safety.

This section covers the six aspects of geology most relevant to the Proposed Action and Alternatives:

- Section 8.1.3.3, Environmental Setting: Physiographic Regions[20]and Provinces;[21]
- Section 8.1.3.4, Surface Geology;

[20] Physiographic regions: Areas of the United States that share commonalities based on topography, geography, and geology (Fenneman, 1916).
[21] Physiographic provinces: Subsets within physiographic regions (Fenneman, 1916).

- Section 8.1.3.5, Bedrock Geology;[22]
- Section 8.1.3.6, Paleontological Resources;[23]
- Section 8.1.3.7, Fossil Fuel and Mineral Resources; and
- Section 8.1.3.8, Geologic Hazards.[24]

8.1.3.2 Specific Regulatory Considerations

The Proposed Action must meet the requirements of National Environmental Policy Act (NEPA) and other applicable laws and regulations. A list of applicable state laws and regulations is included in Table 8.1.3-1.

Table 8.1.3-1: Relevant Louisiana Geology Laws and Regulations

State Law/Regulation	Regulatory Agency	Applicability
Uniform Construction Code (Louisiana Administrative Code [LAC] 55:VI.301)	Louisiana Department of Public Safety	Check state seismic guidelines in building code.

8.1.3.3 Environmental Setting: Physiographic Regions and Provinces

The concept of physiographic regions was created in 1916 by geologist Nevin Fenneman as a way to describe areas of the United States based on common landforms (i.e., not climate or vegetation). Physiographic regions are areas of distinctive topography, geography, and geology. Important physiographic differences between adjacent areas are generally due to differences in the nature or structure of the underlying rocks. There are eight distinct physiographic regions in the continental United States: 1) Atlantic Plain, 2) Appalachian Highlands, 3) Interior Plains, 4) Interior Highlands, 5) Laurentian Upland, 6) Rocky Mountain System, 7) Intermontane Plateaus, and 8) Pacific Mountain System. Regions are further sub-divided into physiographic provinces based on differences observed on a more local scale (Fenneman, 1916).

Louisiana has one major physiographic region: Atlantic Plain (Coastal Plain Province) (USGS, 2003b). The location of this region is shown in Figure 8.1.3-1 and its general characteristics are summarized in the following subsections.

[22] Bedrock: Solid rock beneath the soil and superficial rock (USGS, 2015g).
[23] Paleontology: "Study of life in past geologic time based on fossil plants and animals" (USGS, 2015h).
[24] Geologic Hazards: Any geological or hydrological process that poses a threat to people and/or their property, which includes but is not limited to volcanic eruptions, earthquakes, landslides, sinkholes, mudflows, flooding, and shoreline movements (NPS, 2013).

Figure 8.1.3-1: Physiographic Regions and Provinces of Louisiana

8.1.3.4 Surface Geology

Surficial geology is characterized by materials such as till,[25] sand and gravel, or clays that overlie bedrock. The surface terrain, which can include bedrock outcrops, provides information on the rock compositions and structural characteristics of the underlying geology. Because surface materials are exposed, they are subject to physical and chemical changes due to weathering from precipitation (rain and snow), wind and other weather events, and human-caused interference. Depending on the structural characteristics and chemical compositions of the surface materials, heavy precipitation can cause slope failures,[26] subsidence,[27] and erosion (Thompson, 2015).

Most of the surficial materials in Louisiana are from Quaternary (2.6 million years ago [MYA] to present) floodplain deposits from Louisiana's various rivers.[28] "Holocene [(11,700 years to present)] deposits, including alluvium[29] of the Mississippi, Red, Ouachita, and other rivers and smaller tributaries, and coastal marsh deposits, occupy about 55 [percent] of the surface… Approximately 20 [percent] of the state's surface is occupied by Pleistocene [(2.6 MYA to 11,700 years ago)] terraces; the deposits associated with them also consist of sand, gravel, and mud." In northern Louisiana, glacial outwash[30] and loess[31] deposits are present in the Mississippi River Valley as remnants of recent glaciations further to the north. (Louisiana Geological Survey, 2008)

Figure 8.1.3-2 depicts a generalized illustration of the surface geology for Louisiana.

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[25] Till: "An unsorted and unstratified accumulation of glacial sediment, deposited directly by glacier ice. Till is a heterogeneous mixture of different sized material deposited by moving ice (lodgement till) or by the melting in-place of stagnant ice (ablation till). After deposition, some tills are reworked by water" (USGS, 2013c).
[26] Slope failure, also referred to as mass wasting, is the downslope movement of rock debris and soil in response to gravitational stresses (Idaho State University 2000).
[27] Subsidence: "Gradual settling or sudden sinking of the Earth's surface owing to subsurface movement of earth materials" (USGS, 2000).
[28] For consistency, this PEIS uses the University of California Berkeley Geologic Time Scale for all of the FirstNet PEIS state documents. Time scales differ among universities and researchers; FirstNet utilized a consistent time scale throughout, which may differ slightly from other sources. (University of California Museum of Paleontology, 2011)
[29] Alluvium: "Sand, gravel, and silt deposited by rivers and streams in a valley bottom" (USGS, 2015i).
[30] Outwash: "Glacial outwash is the deposit of sand, silt, and gravel formed below a glacier by meltwater streams and rivers. An outwash plain is an extensive, relatively flat area of such deposits" (USGS, 2015i).
[31] Loess: "A wind-blown deposit of sediment made mostly of silt-sized grains" (USGS, 2015i).

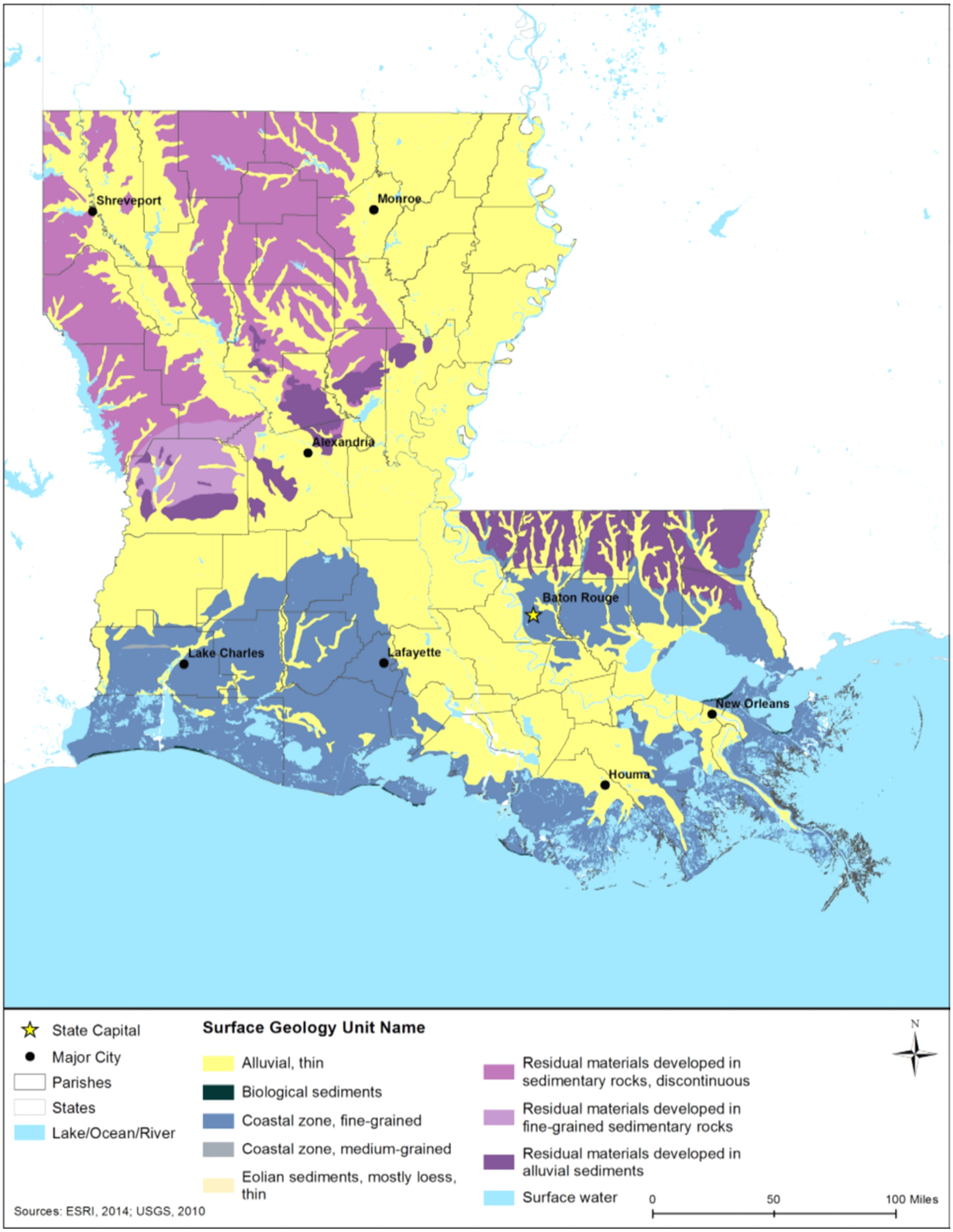

Figure 8.1.3-2: Generalized Surface Geology for Louisiana

8.1.3.5 Bedrock Geology

Bedrock geology analysis, and "the study of distribution, position, shape, and internal structure of rocks" (USGS, 2015b) reveals important information about a region's surface and subsurface characteristics (i.e., three-dimensional geometry), including dip (slope of the formation),[32] rock composition, and regional tectonism.[33] These structural aspects of bedrock geology are often indicative of regional stability, as it relates to geologic hazards such as landslides, subsidence, earthquakes, and erosion (New Hampshire Department of Environmental Services, 2014).

Sedimentary rocks that date from the Cenozoic Era underlie Louisiana (66 MYA to present). The oldest rocks in Louisiana are in the northwestern portion of the state and include the Wilcox and Claiborne Groups that date to the Paleocene/Eocene (66 to 34 MYA) and Eocene Periods, respectively. "The Wilcox and Claiborne units exposed at the surface consist primarily of clastics deposited in deltaic and shallow marine environments." The exposed geology becomes progressively younger moving toward the south. The Catahoula Formation in central Louisiana is composed of Oligocene (34 to 23 MYA) sandstone[34] units. As noted in Section 8.1.3.4, "Quaternary [(2.6 MYA to present)] aged sediment laid down during the Pleistocene [(2.6 MYA to 11,700 years ago)] and Holocene [(11,700 years to present)] account for most of the surface exposures in [southern] Louisiana. The Pleistocene sediments are associated with terrace and outwash deposits and consist primarily of sand, gravel, and mud. The Holocene sediments are alluvium deposits associated with the major river systems and tributaries or coastal marsh deposits consisting chiefly of mud and organic material." (BLM, 2008)

Figure 8.1.3-3 displays the generalized bedrock geology for Louisiana.

[32] Dip: "A measure of the angle between the flat horizon and the slope of a sedimentary layer, fault plane, metamorphic foliation, or other geologic structure" (NPS, 2000).
[33] Tectonism: "Structure forces affecting the deformation, uplift, and movement of the earth's crust" (USGS, 2015j).
[34] Sandstone: "Sedimentary rock made mostly of sand-sized grains" (USGS, 2015i).

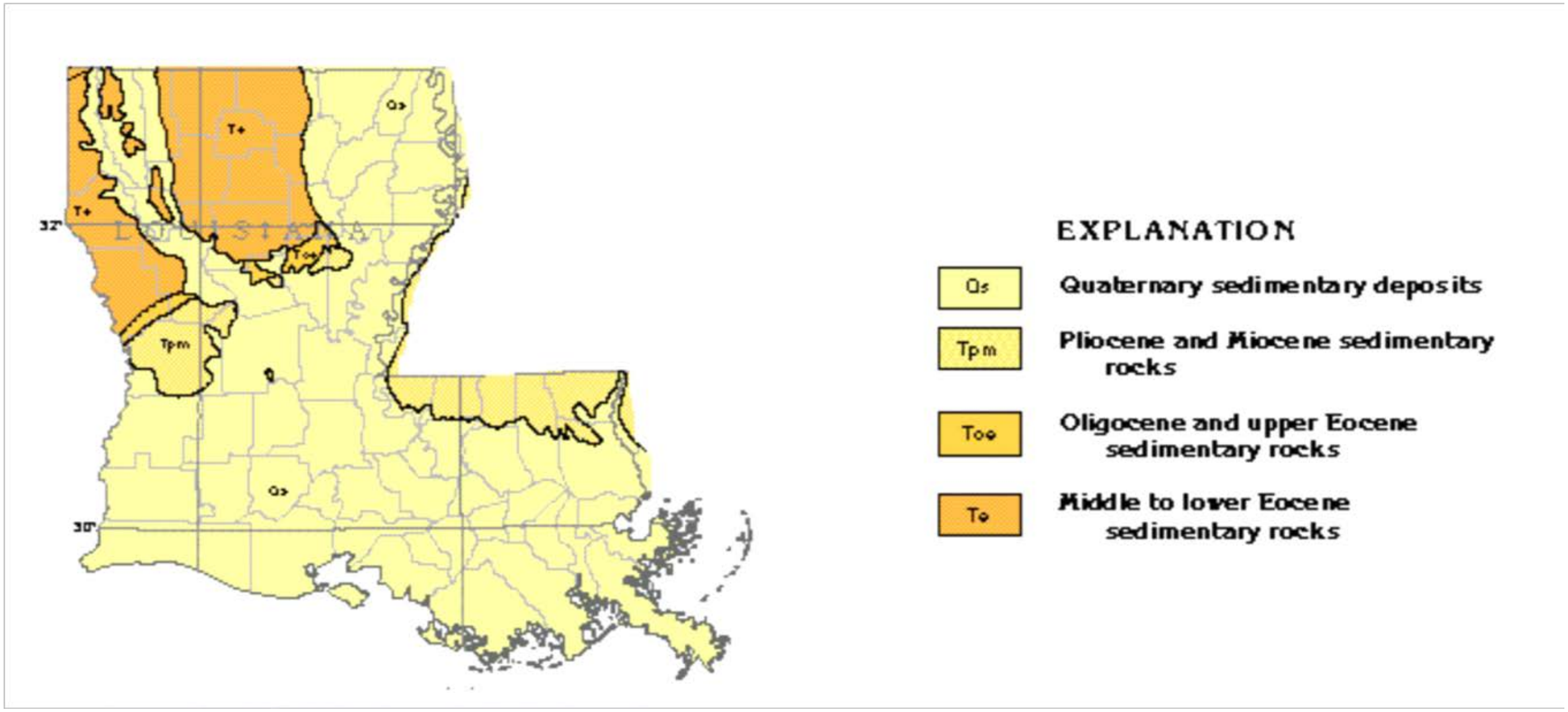

Figure 8.1.3-3: Generalized Bedrock Geology for Louisiana

Source: (USGS, 1998)

8.1.3.6 Paleontological Resources

Carboniferous (359 to 299 MYA) gravels in Louisiana have been found to contain mollusk, crinoid,[35] brachiopod,[36] and trilobite[37] fossils. Shallow seas dominated Louisiana through the Mesozoic Era (251 to 66 MYA). Marine deposits have been found from the Cretaceous Period (146 to 66 MYA) after being pushed up by salt domes. These deposits have yielded shark teeth. The Tertiary Period (66 to 2.6 MYA) also was dominated by shallow seas that formed into river, lake, delta, and nearshore marine deposits, resulting in the preservation of brachiopods and other marine organisms. Mastodon and spruce pollen fossils indicate a cooler climate during parts of the Quaternary Period (2.6 MYA to present) (The Paleontology Portal, 2015).

8.1.3.7 Fossil Fuel and Mineral Resources

Oil and Gas

In 2013, Louisiana produced 71,815 thousand barrels of crude oil. As of 2014, Louisiana ranked ninth nationwide in total crude oil production (EIA, 2014). "The bulk of producing reservoirs in the northern region ranges from Jurassic [(200 to 146 MYA)] to Paleogene [66 to 23 MYA)] strata is generally older than that in the southern onshore region where Neogene [(23 to 2.6 MYA)] formations are predominant" (USDOI, 2008a).

In 2014, Louisiana produced 1,980,287 million cubic feet of natural gas, accounting for 7.2 percent of total nationwide production. Louisiana is ranked 4th nationwide in natural gas production. The most productive natural gas reservoir in Louisiana is the Haynesville Shale in the northwestern portion of the state (EIA, 2014).

Minerals

In 2010 and 2011, Louisiana led all states in salt production. Other minerals produced in the state are crushed stone, common clay and shale, gypsum, phosphate, sulfur, aluminum, industrial sand, perlite, shell, steel, and titanium pigment (USGS, 2015c).

In 2013, Louisiana produced 2,810 thousand short tons of coal. This level of production accounted for 0.3 percent of total nationwide production, and ranked 18th among coal producing states (EIA, 2014).

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[35] Crinoid: "The common name for any echinoderm of the class Crinoidea, including sea lilies, feather stars, etc. Crinoids are common fossils in the Paleozoic and persist to the present. Many species have stalks and radiating arms and feed on particles in the water column" (Smithsonian Institution, 2016).

[36] Brachiopod: "Any member of a phylum of marine invertebrate animals called Brachiopoda. Brachiopods are sessile, bivalved organisms, but are more closely related to the colonial Bryozoa than the bivalved mollusks. Brachiopod diversity peaked in the Paleozoic, but some species survive" (Smithsonian Institution, 2016).

[37] Trilobite: "Any member of Trilobita, an extinct class of marine arthropods. Trilobites are known from the Cambrian to the Permian. They had segmented, oval-shaped bodies and were the first animals to have complex eyes (similar to the compound eyes in modern insects)" (Smithsonian Institution, 2016).

8.1.3.8 Geologic Hazards

The three major geologic hazards of concern in Louisiana are earthquakes, landslides, and subsidence. Volcanoes do not occur in Louisiana and therefore do not present a hazard to the state (USGS, 2015d). The subsections below summarize current geologic hazards in Louisiana.

Earthquakes

Between 1973 and March 2012, there were four earthquakes of a magnitude 2.5 or greater on the Richter scale in Louisiana (USGS, 2014a). Earthquakes are the result of large masses of rock moving against each other along fractures called faults. Earthquakes occur when landmasses on opposite sides of a fault suddenly slip past each other; the grinding motion of each landmass sends out shock waves. The vibrations travel through the Earth and, if they are strong enough, they can damage manmade structures on the surface. Earthquakes can produce secondary flooding impacts resulting from dam failure or from tsunamis (USGS, 2012a).

The shaking due to earthquakes can be significant many miles from its point of origin depending on the type of earthquake and the type of rock and soils beneath a given location. Crustal earthquakes, the most common, typically occur at depths of 6 to 12 miles; these earthquakes typically do not reach magnitudes higher than 6.0 on the Richter scale.[38] Subduction zone earthquakes occur where Earth's tectonic plates collide. "When these plates collide, one plate slides (subducts) beneath the other, where it is reabsorbed into the mantle of the earth" (USGS, 2014b). Convergence boundaries between two tectonic plates can result in earthquakes with magnitudes that exceed 8.0 on the Richter scale (Oregon Department of Geology, 2015). Louisiana is far from any convergence boundaries (Geology.com, 2015).

Figure 8.1.3-5 depicts the seismic risk throughout Louisiana; the box surrounding the range of colors shows the seismic hazards in the state. The map indicates levels of horizontal shaking (measured in Peak Ground Acceleration) that have a 2 percent chance of being exceeded in a 50-year period. Units on the map are measured in terms of acceleration due to gravity (% g). Most pre-1965 buildings are likely to experience damage with exceedances of 10 % g. Post-1985 buildings (in California) have experienced only minor damage with shaking of 60 % g. (USGS, 2010)

Northeastern Louisiana is at the greatest risk of experiencing an earthquake event, generally due to the New Madrid seismic zone (which includes portions of Illinois, Missouri, Kentucky, Tennessee, and Arkansas). "This is primarily due to the combination of proximity of the seismic zone to the state, frequency of recorded seismic events, and great magnitude of some of the historic seismic events." Impacts from the 1812 New Madrid earthquakes were felt as far south as New Orleans (Louisiana Geological Survey, 2001).

[38] The Richter scale is a numerical scale for expressing the magnitude of an earthquake on the basis of seismograph oscillations. The more destructive earthquakes typically have magnitudes between about 5.5 and 8.9; the scale is logarithmic and a difference of one represents an approximate thirtyfold difference in magnitude. (USGS, 2014f)

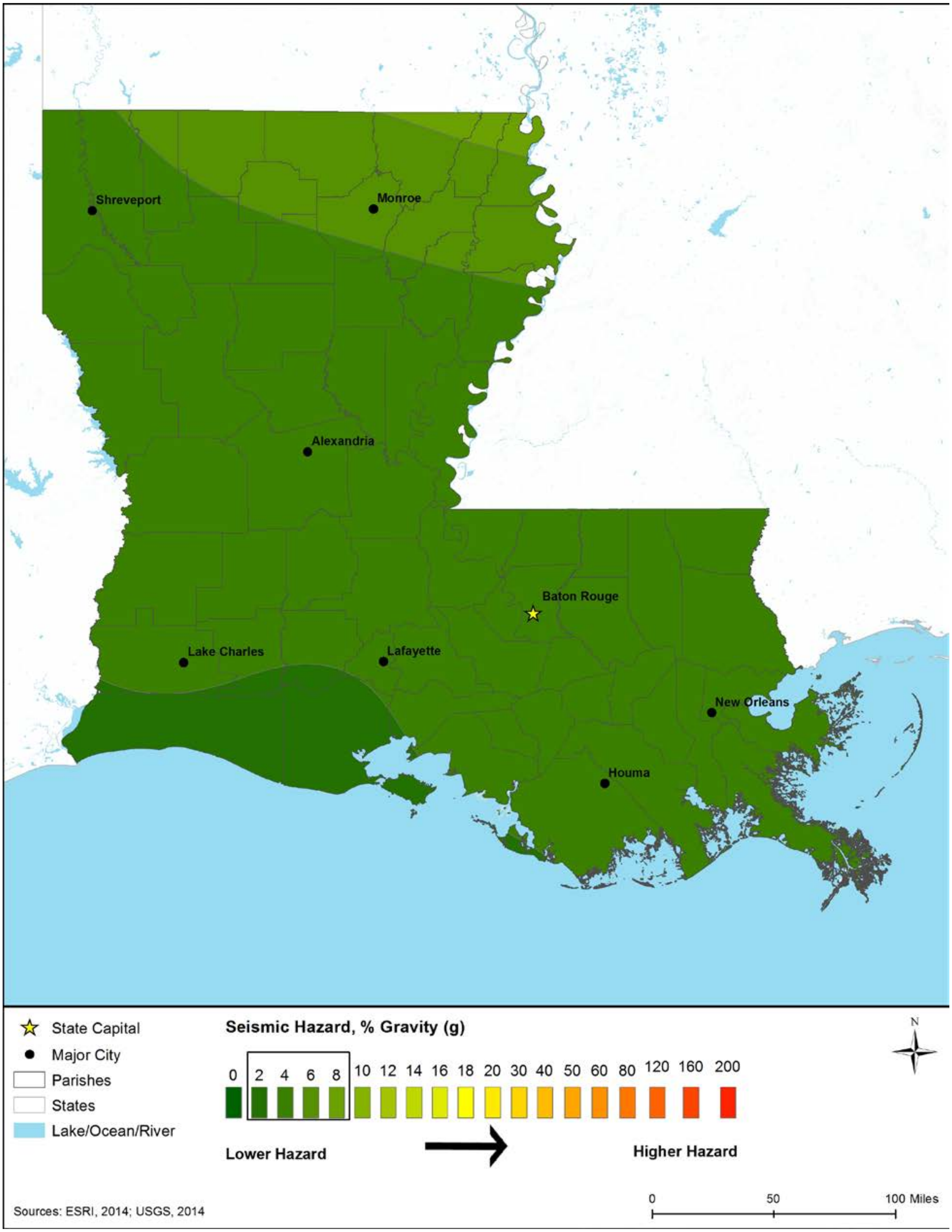

Figure 8.1.3-5: Louisiana 2014 Seismic Hazard Map

The largest earthquake ever recorded in Louisiana occurred near the town of Napoleonville[39] in 1930 and measured magnitude 4.2 on the Richter scale (USGS, 2012b). Energy from this earthquake was detected in a location as distant as Washington, DC. While a series of normal faults[40] exists in southern Louisiana, these are associated with "gradual creep as opposed to the sudden breaking of rock associated with earthquakes. No detected earthquakes have definitely been attributed to any of the specific mapped fault systems" (Louisiana Geological Survey, 2001).

Landslides

Portions of Louisiana along the Mississippi River are susceptible to landslides (Radbruch-Hall, et al., 1982). "The term 'landslide' describes many types of downhill earth movements, ranging from rapidly moving catastrophic rock avalanches and debris flows in mountainous regions to more slowly moving earth slides and other ground failures" (USGS, 2003a). Geologists use the term "mass movement" to describe a great variety of processes such as rock fall, creep, slump, mudflow, earth flow, debris flow, and debris avalanche regardless of the time scale (USGS, 2003a).

Landslides can be triggered by a single severe storm or earthquake, causing widespread damage in a short period. Most landslide events are triggered by water infiltration that decomposes and loosens rock and soil, lubricates frictional surfaces, adds weight to an incipient landslide, and imparts buoyancy to the individual particles. Intense rainfall, freeze/thaw cycles, earthquakes, volcanic eruptions, and human alterations to the natural landscape can trigger mass land movements. Large landslides can dam rivers or streams, and cause both upstream and downstream flooding (USGS, 2003a).

Within Louisiana, landslides are common along the Mississippi River north of Baton Rouge. This area "is more susceptible to failure than the lower delta area because fine-grained deposits in the upper valley are underlain by coarse, easily eroded sand at depths to which the river can scour; this scour causes slumps and earth flows on exposed banks and in deposits below the river level" (Radbruch-Hall, et al., 1982). Figure 8.1.3-6 displays landslide susceptibility throughout Louisiana.

[39] Napoleonville is in southeastern Louisiana about 50 miles west of New Orleans.
[40] Normal Fault: "A fault that drops rock on one side of the fault down relative to the other side" (USGS, 2015i).

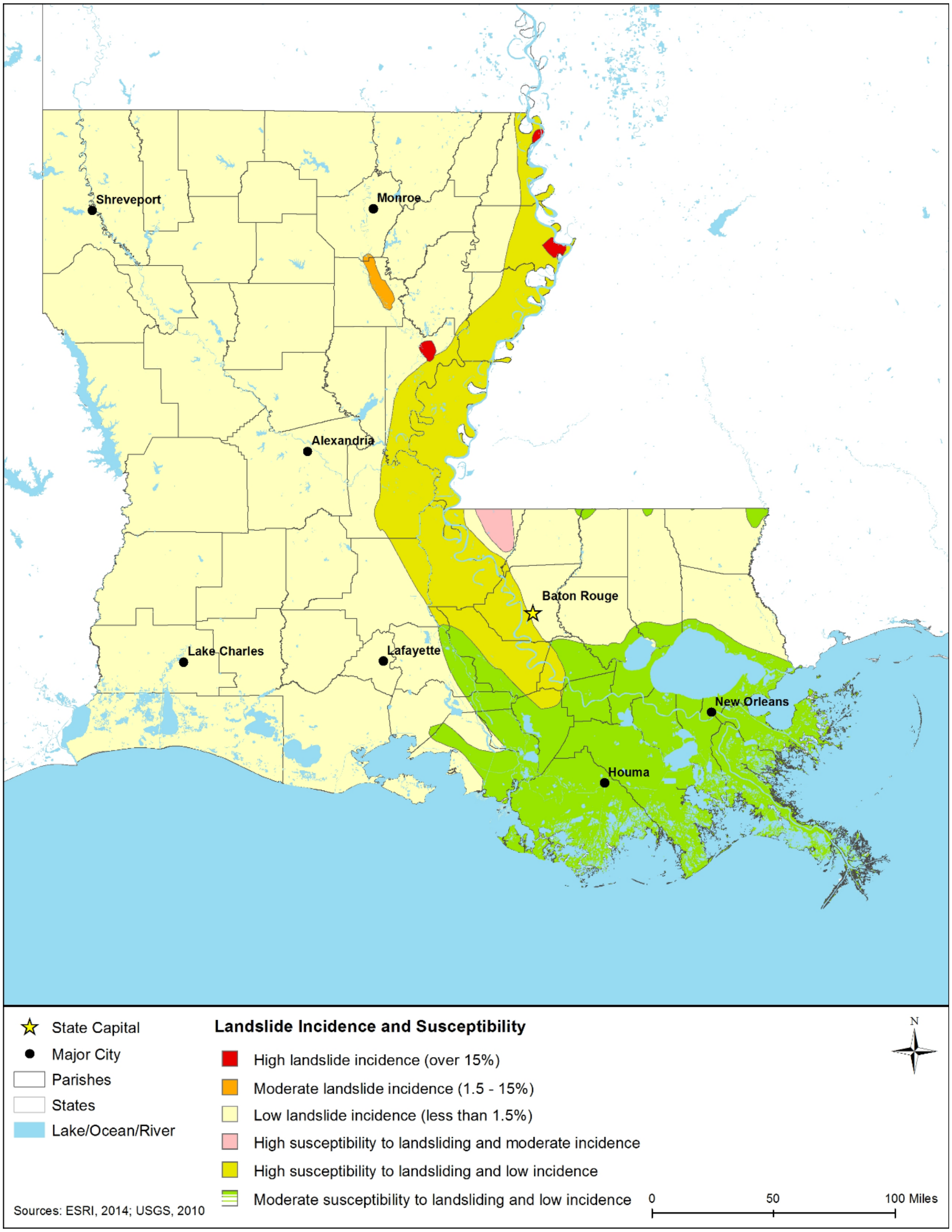

Figure 8.1.3-6: Louisiana Landslide Incidence and Susceptibility Hazard Map[41]

[41] Susceptibility hazards not indicated in Figure 8.1.3-6 where same or lower than incidence. Susceptibility to landslides is defined as the probable degree of response of areal rocks and soils to natural or artificial cutting or loading of slopes, or to anomalously high precipitation. High, moderate, and low susceptibility are delimited by the same percentages used in classifying the incidence of landslides. Some generalization was necessary at this scale, and several small areas of high incidence and susceptibility were slightly exaggerated. (USGS, 2014g)

Land Subsidence

Land subsidence is a "gradual settling or sudden sinking of the Earth's surface owing to subsurface movement of earth materials" (USGS, 2000). Within Louisiana, land subsidence is a serious geologic hazard that threatens to inundate much of the land along the Mississippi River delta (Burkett, Zilkowski, & Hart, 2001). Nationwide, the primary causes of land subsidence are attributed to aquifer system compaction, drainage of organic soils, underground mining, sinkholes, and thawing permafrost. More than 80 percent of subsidence in the United States is a consequence of over-withdrawal of groundwater. In many aquifers, which are subsurface soil layers through which groundwater moves, water is pumped from pore spaces between sand and gravel grains. If an aquifer is confined by layers of silt or clay, which do not transport groundwater, the lowered water pressure in the sand and gravel causes slow drainage of water from the clay and silt beds. The reduced water pressure compromises support for the clay and silt beds, causing them to collapse on one another. The effects of this compression are seen in the permanent lowering of the land surface elevation (USGS, 2000).

Land subsidence can result in altered stream elevations and slopes; detrimental effects to infrastructure and buildings; and collapse of wells due to compaction of aquifer sediments. Subsided areas can become mo8re susceptible to inundation, both during storm events and non-events. Lowered terrain is more susceptible to inundation during high tides. Additionally, land subsidence can affect vegetation and land use (USGS, 2013a).

In Louisiana, land subsidence is a problem within the Mississippi River delta, which includes the city of New Orleans and areas further to the south within the state. Southern Louisiana may be subsiding at rates that range from 0.1 to 13 millimeters per year (FEMA, 1997). More than 5,000 square kilometers have been inundated since the 1930s (USGS, 2014c). "Subsidence of the land surface in the New Orleans region is also attributed to the drainage and oxidation of organic soils, aquifer-system compaction related to ground-water withdrawals, natural compaction and dewatering of surficial sediments, and tectonic activity." It is possible that New Orleans could be up to 4.0 meters (or more) below sea level by the end of this century (Burkett, Zilkowski, & Hart, 2001).

Levees created to prevent flooding in New Orleans have exacerbated the subsidence problem in southern Louisiana "by halting the depositional processes that naturally maintained the altitude of the land surface in southeast Louisiana above sea level." The sediment load delivered to the Mississippi River floodplain has been diminished by nearly 50 percent due to creation of diversion channels along the Mississippi River. (Burkett, Zilkowski, & Hart, 2001)

Bayou Corne Sinkhole Formation (2012)

In recent years, human activity related to mineral extraction has caused land subsidence in Louisiana. In August 2012, a sinkhole formed near the town of Bayou Corne (about 60 miles east of Louisiana) due to “the collapse of a sidewall of an underground storage cavity connected to a nearby well… Onsite investigation revealed the storage cavity, located more than 3,000 feet (914 meters) underground, had been mined closer to the edge of the subterranean Napoleonville salt dome than thought” (NASA: Jet Propulsion Laboratory -- California Institute of Technology, 2014). Formation of the sinkhole may have been aided by subsidence and ongoing dissolution of the Napoleonville Salt Dome (Governor's Office of Homeland Security and Emergency Preparedness, 2012). Today, the Bayou Corne sinkhole covers an area of more than 25 acres (NASA: Jet Propulsion Laboratory -- California Institute of Technology, 2014).

Aerial Image of the Bayou Corne Sinkhole

Source: (NASA: Jet Propulsion Laboratory -- California Institute of Technology, 2014)

8.1.4 Water Resources

8.1.4.1 Definition of the Resource

Water resources are defined as all surface waterbodies and groundwater systems including streams, rivers, lakes, canals, ditches, estuarine waters, floodplains, aquifers, and other aquatic habitats (wetlands are discussed separately in Section 8.1.5). These resources can be grouped into watersheds that are defined as areas of land whose flowing water resources (including runoff from rainfall) drain to a common outlet such as a river or ocean. The value and use of water resources are influenced by the quantity and quality of water available for use and the demand for available water. Water resources are used for drinking, irrigation, industry, recreation, and as habitat for wildlife. Some water resources that are particularly pristine, sensitive, or of great economic value enjoy special protections under federal and state laws. An adequate supply of water is essential for human health, economic wellbeing, and ecological health. (USGS, 2014d)

8.1.4.2 Specific Regulatory Considerations

Federal laws relevant to protecting the quality and use of water resources are summarized in Section 1.8, Overview of Relevant Federal Laws and Executive Orders, and Appendix C, Environmental Laws and Regulations. Table 8.1.4-1 summarizes the major Louisiana laws and permitting requirements relevant to the state's water resources.

Table 8.1.4-1: Relevant Louisiana Water Resources Laws and Regulations

State Law/Regulation	Regulatory Agency	Applicability
CWA Section 404 Nationwide Permits (NWPs), Louisiana regional requirements	U.S. Army Corps of Engineers (USACE) New Orleans District	Regional conditions apply to activities authorized by USACE NWPs in Louisiana.
CWA Section 401 Water Quality Certification	DEQ	In accordance with Section 401 of the CWA, activities that may result in a discharge to waters of the U.S. require a Water Quality Certification from DEQ indicating that the proposed activity will not violate water quality standards.
LPDES Program	DEQ	Regulates the discharge of pollutants in stormwater discharges associated with small and large construction activities that disturb one or more acres.
Louisiana Coastal Resources Program	Louisiana Department of Natural Resources (DNR), Office of Coastal Management	Regulates activities within the state's defined coastal zone boundary.
Surface Water Management Act of 2010, La. R.S. 30:961 et seq.,	Louisiana DNR	Directs the Louisiana DNR to coordinate the management, preservation, conservation and protection of the state's water resources; gives authority for the DNR to enter into cooperative agreements with water users for the withdrawal of surface water from the state's water bodies.
Surface Water Management Act of 2010, La. R.S. 30:961 et seq., Act 556	Louisiana DNR	The Act limits the options for compensation to the state for running surface water withdrawn from waterbodies designated by LDWF to be negatively impacted by invasive aquatic vegetation.

8.1.4.3 Environmental Setting: Surface Water

Surface water resources are lakes, ponds, rivers, and streams, as well as estuarine[42] and coastal waters. Louisiana contains over "66,294 miles of rivers and streams, 1,078,031 acres (1,684 square miles) of lakes and reservoirs, and 4,899,840 acres (7,656 square miles) of estuaries" (LDWF, 2005a). These surface waters supply drinking water; provide aquatic habitat; and support recreation, tourism, agriculture, fishing, and manufacturing across the state (Southern Regional Water Program, 2015).

Watersheds

Watersheds, or drainage areas, consist of surface water and all underlying groundwater, and encompass an area of land that drains streams and rainfall to a common outlet (e.g., reservoir, bay). Louisiana's waters (lakes, rivers, and streams) are divided into 12 major watersheds, or drainage basins (Figure 8.1.4-1). Additional Louisiana watershed information and maps are available at www.deq.louisiana.gov/portal/PROGRAMS/Whatisinyourwater.aspx. (DEQ, 2015e)

Red River Basin is in the northwestern corner of the state. The Ouachita River Basin borders the basin on the east. This basin occupies a majority of the northern half of the state and contains a major reservoir, Bayou D'Arbonne Lake. Major rivers within the basin drain south into the Mississippi River. In southeastern Louisiana, Lake Pontchartrain River Basin borders the Mississippi River to the east and includes Lake Maurepas, Lake Pontchartrain, and the cities of Baton Rouge and New Orleans. The Mississippi River Basin extends along the northeastern border of Louisiana. The major waterbodies within the remaining basins flow south and empty into the Mississippi River and/or the Gulf of Mexico. (DEQ, 2015e)

Freshwater

As shown in Figure 8.1.4-1, there are 21 major rivers in Louisiana: Mississippi River, Red River, Ouachita River, Atchafalaya River, Sabine River, Amite River, Bayou Bartholomew, Bayou Macon, Bayou Teche, Black Lake Bayou, Black River, Boeuf River, Bogue Chitto, Calcasieu River, Dugdemona River, Little River, Mermentau River, Pearl River, Tangipahoa River, Tensas River and Whiskey Chitto. The northeastern border of Louisiana is formed by the Mississippi River. The Red River enters northwestern Louisiana from Arkansas and flows to Shreveport, where it "turns southeastward and flows for approximately 160 miles to its junction with the Atchafalaya River" and continues to the Mississippi River (LDWF, 2005a). In south-central Louisiana, the Atchafalaya River is fed by the Mississippi and Red Rivers and flows southward to the Gulf of Mexico.

Louisiana has 15 major lakes and reservoirs: Lake Pontchartrain, Lake Maurepas, Toledo Bend Reservoir, Grand Lake, White Lake, Calcasieu Lake, Catahoula Lake, Bayou D'Arbonne Lake, Lac des Allemands, Lake Bistineau, Lake Maurepas, Lake Salvador, Sabine Lake, Toledo Bend Reservoir, and White Lake. Within Louisiana, there are approximately 488 lakes, ponds, and

[42] Estuarine: related to an estuary, or a "partially enclosed body of water where fresh water from rivers and streams mixes with salt water from the ocean. It is an area of transition from land to sea." (USEPA, 2015a)

manmade reservoirs, which "account for nearly 1.5 million surface acres of water." Lake Pontchartrain is the largest lake in Louisiana "with a surface acreage that covers 621 square miles and totals 397,000 acres." Toledo Bend Reservoir is in western Louisiana along the Texas border and is the "largest manmade body of water in the South and fifth largest in surface acres in the United States. The reservoir covers 186,000 acres and has a controlled storage capacity of 4,477,000 acre-feet (1.4 trillion gallons)." The lake was created to provide hydropower[43] generation, drinking water, and recreation. Many of the states lakes are "small natural oxbows, which are remnants of rivers after they have altered their course." (LDWF, 2005a)

Estuarine and Coastal Waters

Estuaries (including bays and tidal rivers) are bodies of water that provide transition zones between fresh river water and saline ocean water. Barrier islands, sand bars, and other landmasses protect estuaries, including those in Louisiana, from ocean waves and storms. Louisiana's estuarine environments support a variety of habitats, including tidal wetlands, freshwater wetlands, and sandy beaches, and are a critical part of the lifecycle of many different plant and animal species (USEPA, 2012a).

Louisiana's coastal and marine habitats are found along the Gulf of Mexico, consisting of enclosed estuaries and open bays. Estuaries along the southeastern coast are dependent on sediment and nutrients provided by the Mississippi and Atchafalaya Rivers, which results in delta formations, creating a dynamic landscape. These coastal habitats provide very productive estuaries for the fishing industry. The U.S. Environmental Protection Agency (USEPA), DNR and other state agencies, and local municipalities have developed management plans to address areas of concern and to develop protection and restoration strategies for coastal habitats. Information on Louisiana's estuaries is available on the DNR, Office of Coastal Management site (http://dnr.louisiana.gov/index.cfm?md=pagebuilder&tmp=home&pid=85&ngid=5).

Louisiana has one major estuary in the southeastern portion of the state (Figure 8.1.4-1). The Barataria-Terrebonne Estuary System lies between the Mississippi and Atchafalaya Rivers in the southeastern corner of the state, originating at the foot of the Mississippi River basin and extending to the Gulf of Mexico. This system covers "4.2 million acres of levees, forests, swamps, marshes, islands, bays, and bayous" (LSU, 2015). The estuary serves as important habitat for migratory birds, shrimp, blue crab, and a variety of fish species. In 1990, the USEPA's National Estuary Program (NEP) recognized the Barataria-Terrebonne estuary complex as an Estuary of National Significance. The Barataria-Terrebonne NEP Comprehensive Conservation and Management Plan (CCMP) identified areas of concern and management actions to address point and non-point source pollution, habitat loss and degradation, and water quality.

[43] Hydropower: "electrical energy produced by falling or flowing water" (USEPA, 2004).

Figure 8.1.4-1: Major Louisiana Watersheds and Surface Waterbodies

8.1.4.4 Sensitive or Protected Waterbodies

Wild and Scenic Rivers

A portion of the Saline Bayou River (Figure 8.1.4-1) is designated as a National Wild and Scenic River in Louisiana. The designated portion is 19 miles long and between the Kisatchie National Forest and Saline Lake. The river supports recreational activities, including boating, fishing, and camping, and provides important habitat for wildlife, including wood ducks and pileated woodpeckers. (NWSRS, 2015)

In addition to federally designated Wild and Scenic Rivers, the Louisiana Scenic Rivers Act was established to "preserve, protect, develop, reclaim, and enhance the wilderness qualities, scenic beauties, and ecological regime" of rivers and streams or segments included within the Louisiana Natural and Scenic Rivers and Historic and Scenic Rivers System. Statewide, there are 59 river segments, totaling more than 3,000 miles, designated as Natural and Scenic Rivers; Louisiana Appendix A, Table A-1, identifies each of these rivers. (LDWF, 2015a)

8.1.4.5 Impaired Waterbodies

Several elements, including temperature, dissolved oxygen, suspended sediment, nutrients, metals, oils, observations of aquatic wildlife communities, and sampling of fish tissue, are used to evaluate water quality. Under Section 303(d) of the Clean Water Act, states are required to assess water quality and report a listing of impaired waters,[44] the causes of impairment, and probable sources. Table 8.1.4-2 summarizes the water quality of Louisiana's assessed major waterbodies by category, percent impaired, designated use,[45] cause, and probable sources.

Figure 8.1.4-2 shows the Section 303(d) waters in Louisiana as of 2012.

As shown in Table 8.1.4-2, various sources affect Louisiana's waterbodies, causing impairments. For example, the presence of mercury or organic chemicals has led to fish consumption advisories in waterbodies throughout the state. Almost all of the assessed lakes, reservoirs, and ponds are impaired due to pollutants, such as mercury, nuisance exotic species, and sediments. Designated uses of the impaired waters include agriculture, drinking water supply, fish and aquatic life, and recreation. (USEPA, 2012b)

[44] Impaired waters: waterways that do not meet state water quality standards. Under the CWA, Section 303(d), states, territories, and authorized tribes are required to develop prioritized lists of impaired waters (USEPA, 2015a).

[45] Designated Use: an appropriate intended use by humans and/or aquatic life for a waterbody. Designated uses may include recreation, shellfishing, or drinking water supply (USEPA, 2015a).

Table 8.1.4-2: Section 303(d) Impaired Waters of Louisiana, 2012

Water Type[a]	Amount of Waters Assessed[b] (Percent)	Amount Impaired (Percent)	Designated Uses of Impaired Waters	Top Causes of Impairment	Top Probable Sources for Impairment
Rivers and Streams	14.0%	73.0%	Drinking water, aquatic life, habitat/hydrology, oyster propagation, and, primary and secondary contact recreation	Organic enrichment, mercury, turbidity, nutrients, and pathogens[c]	Atmospheric deposition,[d] agriculture, wildlife, and municipal point source discharges
Lakes, Reservoirs, and Ponds	62.0%	94.0%	Fish and wildlife propagation, drinking water, and primary and secondary contact recreation	Mercury, nuisance exotic species, turbidity, sediment, organic enrichment, and pesticides	Atmospheric deposition, wildlife, agriculture, and hydromodification [e]
Estuaries and Bays	65.0%	84.0%	Fish, oyster and wildlife propagation, and primary and secondary contact recreation	Fish consumption, foam/oil slicks, mercury, pathogens, and organic enrichment	Spills/dumping, atmospheric deposition, and municipal point source discharges/sewage

[a] Some waters may be considered for more than one water type.
[b] Louisiana has not assessed all waterbodies within the state.
[c] Pathogen: a bacterium, virus, or other microorganism that can cause disease (USEPA, 2015a).
[d] Atmospheric deposition: the process by which airborne pollutants settle onto to the earth's surface and pollutants travel from the air into the water through rain and snow ("wet deposition"), falling particles ("dry deposition"), and absorption of the gas form of the pollutants into the water (USEPA, 2015a).
[e] Hydromodification: "changes in channel form associated with alterations in flow and sediment due to past or proposed future land-use alteration" (Stein, et al., 2012).
Source: (USEPA, 2012b)

Dissolved oxygen, mercury contamination, sediment/silt, pathogens, and nutrients are the leading causes of impairment in Louisiana rivers and lakes. Other frequent pollutants include toxic substances, such as pesticides and metals. Low dissolved oxygen occurs from high nutrient and sediment loading in waterbodies typically a result of sewage, fertilizers, and high plant detritus typically found in swampy areas. Atmospheric deposition of mercury is derived from coal-fired power plants, both nationally and internationally. (DEQ, 2012)

In April 2010 the explosion of the Deepwater Horizon drilling rig, approximately 50 miles off the coast in the Gulf of Mexico, triggered a catastrophic oil spill, leaking over an estimated 4.9 million gallons of oil (Louisiana Coastal Wetlands Conservation and Restoration Task Force, 2012). The resulting oil spill and caused fish, crab, shrimp, and shellfish closures affected a large portion of the Louisiana coastline. Cleanup activities are still ongoing and the impacts of the spill are still being investigated by DEQ and other agencies (DEQ, 2012). More information on Louisiana's Deepwater Horizon response can be found at https://www.restorethegulf.gov/.

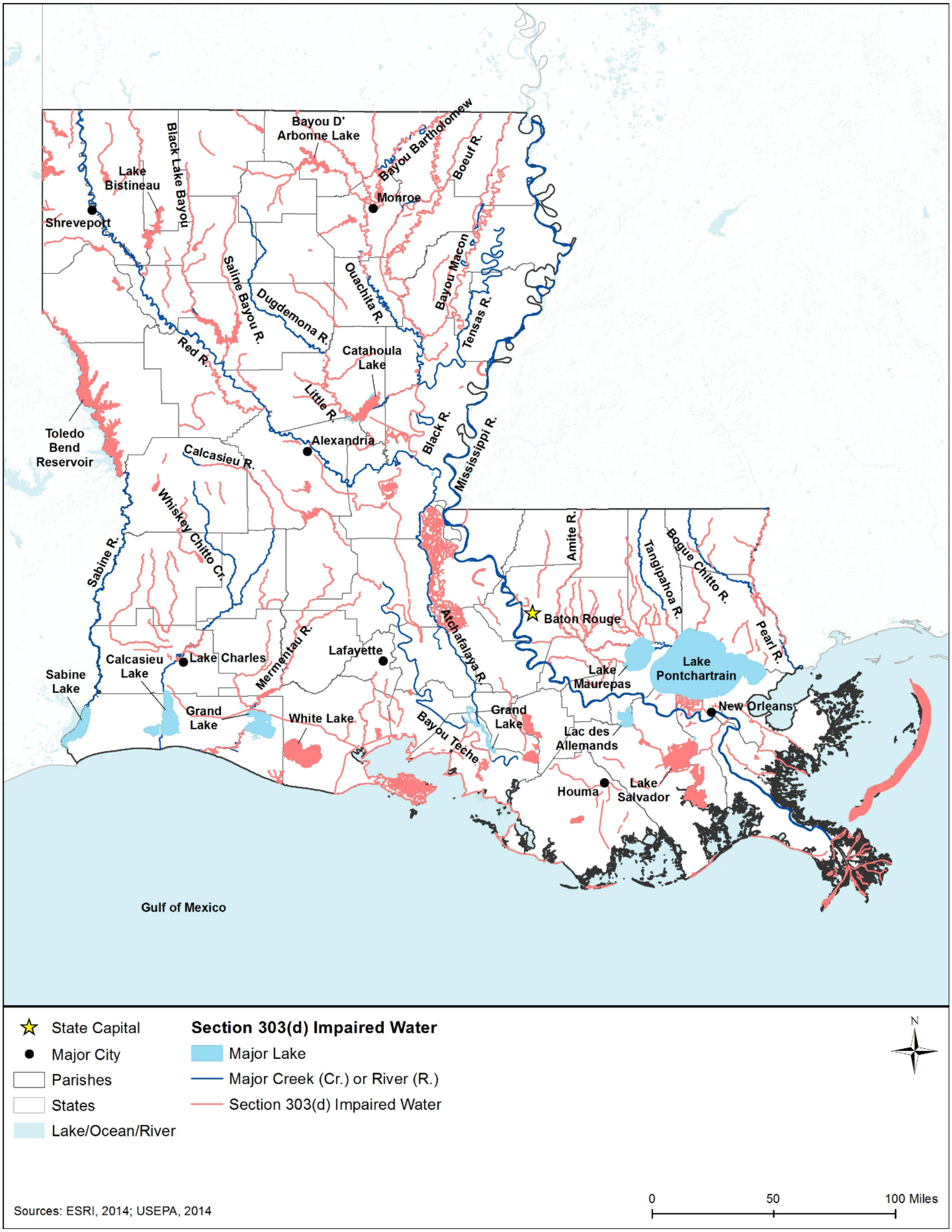

Figure 8.1.4-2: Section 303(d) Impaired Waters of Louisiana, 2012

8.1.4.6 Floodplains

The Federal Emergency Management Agency (FEMA) defines a floodplain or flood-prone area as "any land area susceptible to being inundated by water from any source" (44 Code of Federal Regulations [CFR][46] 59.1) (FEMA, 2000). Through FEMA's flood hazard mapping program, the agency identifies flood hazards and risks associated with the 100-year flood, which is defined as "a flood that has a 1 percent chance of occurring in any given year," to allow communities to prepare and protect against flood events (FEMA, 2013).

Floodplains provide suitable and sometimes unique habitat for a wide variety of plants and animals, and are typically more biologically diverse than upland areas due to the combination of both terrestrial and aquatic ecosystems. Vegetation along stream banks provides shade, which helps to regulate water temperature for aquatic species. During flood events, sediment and debris settle out and collect on the floodplain, enriching the soil with additional nutrients. Pollutants from floodwater runoff are also filtered by floodplain vegetation and soils; thereby improving water quality. Furthermore, floodplains protect natural and built infrastructure by providing floodwater storage, erosion control, water quality maintenance, and groundwater recharge. Historically, floodplains have been favorable locations for agriculture, aquaculture, and forest production due to the relatively flat topography and nearby water supply. Floodplains can also offer recreational activities, such as boating, swimming, and fishing, as well as hiking and camping (FEMA, 2014a).

There are two primary types of floodplains in Louisiana.

- **Riverine floodplains** occur along rivers, streams, or lakes where overbank flooding may occur, inundating adjacent land areas. Flatter floodplains, including those in Louisiana, may remain inundated for days or weeks, covered by slow-moving and shallow water (FEMA, 2014b).
- **Coastal floodplains** in Louisiana border the Gulf of Mexico coastline. Coastal flooding can occur when strong wind and storms, usually hurricanes, increase water levels on the adjacent shorelines (FEMA, 2013). In addition, a storm surge event can cause floodwaters to exceed normal tide levels, as was the case during Hurricane Katrina.

Flooding is the leading cause for disaster declaration by the President in the United States, and results in significant damage throughout the state annually (NOAA, 2015a). There are several causes of flooding in Louisiana, often resulting in loss of life and damage to property, infrastructure, agriculture, and the environment. These include flash flooding, tropical storms, debris jams, and dam/levee failures (NOAA, 2015b). Although some areas, such as floodplains, are more prone to flooding than others, no area in the state is exempt from flood hazards. Since 1953, Louisiana has had 30 major disaster declarations that resulted in severe flooding; 4 of which have occurred since 2009 (FEMA, 2015a). The most recent disaster declaration occurred August 14, 2016; the designation covered 22 parishes (FEMA, 2016).

[46] To search for and locate CFR records, see the Electronic Code of Federal Regulations (e-CFR): www.ecfr.gov.

Louisiana is highly susceptible to flood events due to the state's geographic location along the Gulf Coast and with areas below sea level. This area is frequently impacted by weather systems as they make their way through the Gulf of Mexico. The most recent catastrophic flood event occurred in August and September 2005 resulting from Hurricane Katrina, which made landfall near Grand Isle, Louisiana. Widespread flooding caused over $25 billion worth of damage in Louisiana and impacted almost the entire city of New Orleans. (NOAA, 2015b)

Hurricane Katrina

In 2005, Hurricane Katrina traveled through six states in the southeast, including Louisiana, causing billions of dollars in damage, particularly in Louisiana and Mississippi coastal communities. On August 29, 2005, its storm surge hit Louisiana's coast producing rainfall totals of 8 to 15 inches, immobilizing residents; flooding streets, bridges and other infrastructure; and eliminating power resources in the region. The size and strength of Hurricane Katrina created an immense tidal surge, that when combined with the tide (about 1 foot) and 11-foot waves on top of the storm surge, resulted in a High Water Mark of 34.1 feet above mean sea level in Biloxi, Mississippi. (NOAA, 2015b)

Source: (NOAA, 2015)

Local communities often have floodplain management or zoning ordinances that restrict development within the floodplain. FEMA provides floodplain management assistance, including mapping of 100-year floodplain limits, to approximately 312 communities in Louisiana through the National Flood Insurance Program (NFIP) (FEMA, 2014c). Established to reduce the economic and social cost of flood damage by subsidizing payments, the NFIP encourages communities "to adopt and enforce floodplain management regulations and to implement broader floodplain management programs" and allows property owners in participating communities to purchase insurance protection against losses from flooding (FEMA, 2015b). As an incentive, communities can voluntarily participate in the NFIP Community Rating System (CRS), which is a program that rewards communities by reducing flood insurance premiums in exchange for doing more than the minimum NFIP requirements for floodplain management. As of May 2014, Louisiana had 46 communities participating in the CRS (FEMA, 2014d).[47]

8.1.4.7 Groundwater

Groundwater systems are sources of water that result from precipitation infiltrating the ground surface, and includes underground water that occupies pore spaces between sand, clay, or rock particles. An aquifer is a permeable geological formation that stores or transmits water to wells and springs. Groundwater is contained in either confined (bound by clays or nonporous bedrock) or unconfined (no layer to restrict the vertical movement of groundwater) aquifers. (USGS,

[47] A list of the 46 CRS communities can be found in the most recent FEMA CRS report dated May 1, 2014 (FEMA, 2014d) and additional program information is available from FEMA's NFIP CRS website (www.fema.gov/national-flood-insurance-program-community-rating-system).

1999) When the water table reaches the ground surface, groundwater will reappear as either streams, surface bodies of water, or wetlands. This exchange between surface water and groundwater is an important feature of the hydrologic (water) cycle.

Louisiana's principal aquifers consist of sands, silts, and clays with some gravel. Approximately two-thirds of residents draw drinking water from Louisiana's groundwater resources (DEQ, 2015f). Generally, the water quality of Louisiana's aquifers is suitable for drinking and daily water needs. Statewide, the most serious threats to groundwater quality include leaking storage tanks, inadequate or failing onsite septic systems, discharge from hazardous waste landfills and industrial contamination, and saltwater intrusion (saltwater moving into freshwater aquifers), and urban runoff (DEQ, 2012).

Table 8.1.4-3 provides details on aquifer characteristics in the state; Figure 8.1.4-3 shows Louisiana's principal and sole source aquifers.

Table 8.1.4-3: Description of Louisiana's Principal Aquifers

Aquifer Type and Name	Location in State	Groundwater Quality
Coastal Plain aquifer systems in semi consolidated sand, silt and clay Coastal Lowlands aquifer system	Extends through northern and southern Louisiana divided by the sole source aquifer in the central part of the state	Small concentration of dissolved solids but salinity increases as it moves toward the coast. In addition, as the water approaches the coastline, it becomes more mineralized. Water is used primarily for public supply purposes.
Coastal Plain aquifer systems in semi consolidated sand, silt and clay Mississippi Embayment aquifer system	Extends through northern and southern Louisiana divided by the sole source aquifer in the central part of the state	Generally, the water is suitable for most uses. In the north, contains low amount of dissolved solids. Water concentration is of moderate salinity closer to the coast. Main use is for domestic and commercial use.
Mississippi River Valley alluvial aquifer Gravel, coarse sand, silt and clay	Very northeastern corner of Louisiana	Majority of water is calcium bicarbonate type with lower level of dissolved solids. Quality of water is generally suitable for most uses though primary use is industrial and agricultural.

Source: (Moody, Carr, Chase, & Paulson, 1986) (Renken, 1998)

Sole Source Aquifers

The USEPA defines sole source aquifers (SSAs) as "an aquifer that supplies at least 50 percent of the drinking water consumed in the area overlying the aquifer" and are areas with no other drinking water sources (USEPA, 2015j). Louisiana has two designated SSA within the state, which encompasses over 17,000 square miles (as shown in Figure 8.1.4-3) (DEQ, 2015g). The Southern Hills SSA is in the southeastern portion of the state and extends into Mississippi. The Chicot SSA is found in the southwestern portion of the state. Designating a groundwater resource as an SSA helps to protect the drinking water supply in that area and requires reviews for all federally funded proposed projects to ensure that the water source is not jeopardized (USEPA, 2015j).

Figure 8.1.4-3: Principal and Sole Source Aquifers of Louisiana

8.1.5 Wetlands

8.1.5.1. Definition of the Resource

The CWA defines wetlands as "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas" (40 CFR 230.3(t), 1993).

The USEPA estimates that "more than one-third of the United States' threatened and endangered species live only in wetlands, and nearly half of such species use wetlands at some point in their lives" (USEPA, 1995). In addition to providing habitat for many plants and animals, wetlands also provide benefits to human communities. Wetlands store water during flood events, improve water quality by filtering polluted runoff, help control erosion by slowing water velocity and filtering sediments, serve as points of groundwater recharge, and help maintain base flow in streams and rivers. Additionally, wetlands provide recreation opportunities for people, such as hiking, bird watching, and photography. (USEPA, 1995)

8.1.5.2. Specific Regulatory Considerations

Appendix C, Environmental Laws and Regulations, describes the pertinent federal laws protecting wetlands in detail. Table 8.1.5-1 summarizes the major Louisiana state laws and permitting requirements relevant to the state's wetlands.

Table 8.1.5-1: Relevant Louisiana Wetlands Laws and Regulations

State Law/Regulation	Regulatory Agency	Applicability
CWA Section 404 NWPs, Louisiana regional requirements	USACE Louisville District	Regional conditions apply to activities authorized by USACE NWPs in Louisiana.
Louisiana Coastal Resources Program	DNR, Office of Coastal Management	Regulates activities within wetlands and the state's defined coastal zone boundary.
LPDES Program	DEQ	Regulates the discharge of pollutants in stormwater discharges associated with small and large construction activities that disturb one or more acres.
CWA Section 401 Water Quality Certification	DEQ	In accordance with Section 401 of the CWA, activities that may result in a discharge to waters of the U.S. require a Water Quality Certification from DEQ indicating that the proposed activity will not violate water quality standards.

8.1.5.3. Environmental Setting: Wetland Types and Functions

The U.S. Fish and Wildlife Service's (USFWS) National Wetlands Inventory (NWI) mapping adopted a national Wetlands Classification Standard (WCS) that classifies wetlands according to shared environmental factors, such as vegetation, soils, and hydrology, as defined by (Cowardin, Carter, Golet, & LaRoe, 1979). The Wetlands Classification System includes five major wetland Systems: Marine, Estuarine, Riverine, Lacustrine, and Palustrine. Louisiana includes all five of these Systems, as detailed in Table 8.1.5-2. The first four of these include both wetlands and deepwater habitats but the Palustrine includes only wetland habitats. (USFWS, 2015a)

- "The Marine System consists of the open ocean overlying the continental shelf and its associated high-energy coastline. Marine habitats are exposed to the waves and currents of the open ocean and the Water Regimes are determined primarily by the ebb and flow of oceanic tides. Salinities exceed 30 parts per thousand (ppt), with little or no dilution except outside the mouths of estuaries." Where wave energy is low, mangroves or mudflats may be present.
- "The Estuarine System consists of deepwater tidal habitats and adjacent tidal habitats that are usually semi-enclosed by land but have open, partly obstructed, or sporadic access to the open ocean and the ocean water is at least occasionally diluted by freshwater runoff from the land."
- "Riverine System includes all wetlands and deepwater habitats contained within a channel with two exceptions (1) wetlands dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens, and (2) habitats with water containing ocean-derived salts in excess of 0.5 ppt."
- Lacustrine System includes inland waterbodies that are situated in topographic depressions, lack emergent trees and shrubs, have less than 30 percent vegetation cover, and occupy greater than 20 acres. Includes lakes, larger ponds, sloughs, lochs, bayous, etc.
- "Palustrine includes all nontidal wetlands dominated by trees, shrubs, persistent emergents, or emergent mosses or lichens, and all such wetlands that occur in tidal areas where salinity due to ocean-derived salts is below 0.5 percent." The system is characterized based on the type and duration of flooding, water chemistry, vegetation, or substrate characteristics (soil types) (Cowardin, Carter, Golet, & LaRoe, 1979) (FGDC, 2013).

As of 2007, Louisiana wetlands accounted for approximately 15 percent of the freshwater wetlands and 40 percent of the salt marshes that remain in the continental United States (DEQ, 2004). In Louisiana, palustrine (freshwater) wetlands found on river and lake floodplains across the state (mostly on the eastern half of the state), are the main type of wetlands, as shown in Figure 8.1.5-2. Riverine and lacustrine wetlands, as defined in Table 8.1.5-2, include approximately four percent of the wetlands in the state. Therefore, they are not discussed in this PEIS.

Table 8.1.5-2 uses 2014 NWI data to characterize and map Louisiana wetlands on a broad-scale.[48] The data is not intended for site-specific analyses and is not a substitute for field-level

[48] The wetland acreages were obtained from the USFWS (2014) National Wetlands Inventory. Data from this inventory was downloaded by state at https://www.fws.gov/wetlands/. The wetlands data contains a wetlands classification code, which are a series of letter and number codes, adapted to the national wetland classification system in order to map from (e.g., PFO). Each of these codes corresponds to a larger wetland type; those wetland areas are rolled up under that wetlands type. The codes and associated acres that correspond to the deepwater habitats (e.g., those beginning with M1, E1, L1) were removed. The wetlands acres were derived from the geospatial datafile, by creating a pivot table to capture the sum of all acres under a particular wetland type. The maps reflect/show the wetland types/classifications and overarching codes; the symbolization used in the map is standard to these wetland types/codes, per the USFWS and Federal Geographic Data Committee.

wetland surveys, delineations, or jurisdictional determinations, which may be conducted, as appropriate, at the site-specific level once those locations are known. As shown in Figure 8.1.5-2, western and northern Louisiana respectively, are predominately palustrine wetlands, while estuarine/marine wetlands are found in the southern portion of the state along the Gulf Coast. The map codes and colorings in Table 8.1.5-2 correspond to the wetland types in the figures.

Table 8.1.5-2: Louisiana Wetland Types, Descriptions, Location, and Amount, 2014

Wetland Type	Map Code and Color	Description[a]	Occurrence	Amount (acres)[b]
Palustrine forested wetland	PFO	PFO wetlands contain woody vegetation that are at least 20 feet tall. Floodplain forests and hardwood swamps are examples of PFO wetlands.	Throughout the state, often on forested lowlands within the state	5,178,467
Palustrine scrub-shrub wetland	PSS	Woody vegetation less than 20 feet tall dominates PSS wetlands. Thickets and shrub swamps are examples of PSS wetlands.	Throughout the state, often on river and lake floodplains	
Palustrine emergent wetlands	PEM	PEM wetlands have erect, rooted, green-stemmed, annual, water-loving plants, excluding mosses and lichens, present for most of the growing season in most years. PEM wetlands include freshwater marshes, wet meadows, fens,[c] prairie potholes, and sloughs.[d]	Southern part of the state along the Gulf Coast	1,020,052
Palustrine unconsolidated bottom	PUB	PUB and PAB wetlands are commonly known as freshwater ponds, and includes all wetlands with at least 25% cover of particles smaller than stones and a vegetative cover less than 30%.	Southern part of the state, primarily around the Mississippi River delta	118,506
Palustrine aquatic bed	PAB	PAB wetlands include wetlands vegetated by plants growing mainly on or below the water surface line.		
Other Palustrine wetland	Misc. Types	Farmed wetland, saline seep[49], and other miscellaneous wetlands are included in this group.	Throughout the state	2,268
Riverine wetland	R	Riverine systems include rivers, creeks, and streams. They are contained in natural or artificial channels periodically or continuously containing flowing water.	Throughout the state	158,738

[49] Saline seep is an area where saline groundwater discharges at the soil surface. These wetland types are characterized by saline soils and salt tolerant plants. (City of Lincoln, 2015)

Wetland Type	Map Code and Color	Description[a]	Occurrence	Amount (acres)[b]
Lacustrine wetland	L2	Lacustrine systems are lakes or shallow reservoir basins generally consisting of ponded waters in depressions or dammed river channels, with sparse or lacking persistent emergent vegetation, but including any areas with abundant submerged or floating-leaved aquatic vegetation. These wetlands are less than 8.2 feet deep.	Southern and western part of the state and along Catahoula Lake	145,862
Estuarine and Marine intertidal wetland	E2/M2	These intertidal wetlands include the areas between the highest tide level and the lowest tide level. Semidiurnal tides (two high tides and two low tides per day) periodically expose and flood the substrate. Wetland examples include vegetated and non-vegetated brackish (mix of fresh and saltwater), and saltwater marshes, shrubs, beaches, sandbars, or flats.	Southern part of the state along the Gulf Coast	1,693,190
			TOTAL	**8,317,083**

[a] The wetlands descriptions are based on information from the Federal Geographic Data Committee (FGDC)'s Classification of Wetland and Deepwater Habitats of the United States. Based on Cowardin, et.al, 1979, some data has been revised based on the latest scientific advances. The USFWS uses these standards as the minimum guidelines for wetlands mapping efforts (FGDC, 2013).
[b] All acreages are rounded to the nearest whole number. The maps are prepared from the analysis of high altitude imagery. A margin of error is inherent in the use of imagery. The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted (USFWS, 2015b).
[c] Fens are nutrient-rich, grass- and sedge-dominated emergent wetlands that are recharged from groundwater and have continuous running water. (Edinger, et al., 2014)
[d] Slough: "Swamp or shallow lake system, usually a backwater to a larger body of water" (NOAA, 2014c).
Sources: (Cowardin, Carter, Golet, & LaRoe, 1979) (USFWS, 2015a) (FGDC, 2013)

Palustrine Wetlands

In Louisiana, palustrine wetlands include the majority of vegetated freshwater wetlands (forested wetlands, freshwater marshes, swamps, and ponds). Palustrine forested wetlands (PFO) are found throughout the state and are the most common type of palustrine wetlands within Louisiana. Common types of PFO in Louisiana include cypress swamps, hardwood swamps, and bayhead swamps. Palustrine scrub-shrub wetlands (PSS) occur throughout Louisiana, usually found in previously disturbed areas. Palustrine emergent wetlands (PEM) (or freshwater marshes) found in Louisiana include wet prairies[50], flatwoods ponds, floodplain marshes, and bogs[51]. Louisiana marshes occur in shallow water along the northern boundary of coastal marshes, and along coastal bays, and support diverse plant and animal species. Common marsh plants in Louisiana include maidencane (*Panicum hemitomon*), sedges (*Eleocharis* spp.), wire

[50] Wet prairies are dominated by short grass/sedge vegetation and are inundated (or saturated by surface or groundwater) for no more than a few months per year. (USFWS, 2014f)
[51] Bogs are acidic wetlands that form thick organic (peat) deposits up to 50 feet deep or more. They have little groundwater influence and are recharged through precipitation. (APA, 2013)

grass (*Spartina patens*), pickerelweed (*Pontederia cordata*), and duck weed *(Lemna minor*). PEM are common in the southern part of the state and along the coastline. (LDWF, 2009)

Palustrine wetlands also include the shallow water zones of lakes, rivers, and ponds and aquatic beds formed by water lilies and other floating-leaved or free-floating plants. These are the easiest wetlands to recognize and occur throughout the state. (LDWF, 2009)

Based on the USFWS NWI 2014 analysis, there are currently approximately 6.3 million acres of palustrine (freshwater) wetlands in the state. Of those, PFO/PSS wetlands are the dominant wetland type (82 percent), followed by PEM wetlands (16 percent), PUB/PAB (ponds) (2 percent), and other palustrine wetlands (less than 1 percent) (USFWS, 2014a). Main threats to palustrine wetlands in Louisiana include agricultural conversion and urbanization.

Estuarine and Marine Wetlands

In Louisiana, estuarine, or tidal fringe wetlands, can be vegetated (salt marshes) or unvegetated (mud and sand flats), and are found between the open saltwater of the bays or the Gulf of Mexico and the uplands of the coastal plain and barrier islands. These wetlands are found along Louisiana's shoreline, as shown in Figure 8.1.5-2. Salt marshes are the primary coastal habitat along the Gulf of Mexico (Fluery, 2000).

Figure 8.1.5-1: Louisiana salt marsh
Source: (NOAA, 2011)

"Approximately 30 percent of coastal marshes and 45 percent of all intertidal coastal marshes of the lower 48 States are located in Louisiana." However since the 1930's more than 1,883 square miles of Louisiana's coast has been lost, which makes up more than 80 percent of the Nation's annual coastal wetland loss. (Louisiana Coastal Wetlands Conservation and Restoration Task Force, 2012)

Coastal development and urban expansion has historically caused great losses to estuarine wetlands in Louisiana. Although these ecosystems are now protected by state and local regulations, such as the Louisiana Coastal Area Program and the 2012 Louisiana Comprehensive Master Plan for a Sustainable Coast, habitat loss still occurs due to natural processes and adverse human influences (e.g., changes in upstream hydrology, inputs of excess sediments and nutrients). (USGS, 2015e)

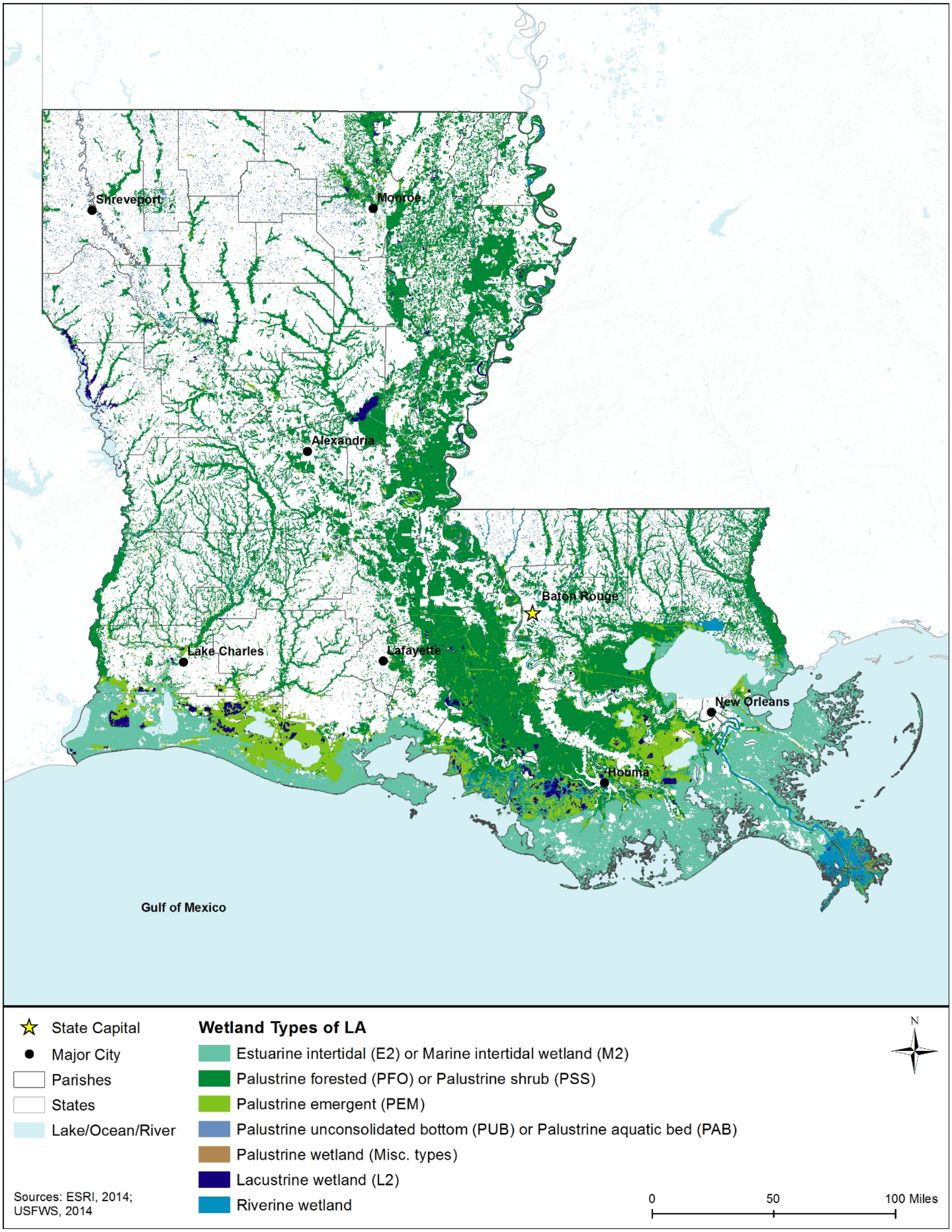

Figure 8.1.5-2: Wetlands by Type, in Louisiana, 2014

8.1.5.4. Wetlands of Special Concern or Value

In addition to protections under state's regulations and national CWA, Louisiana considers certain wetland communities, specifically estuarine wetlands along the Gulf coast, as areas of special value due to their global or regional scarcity, local/national importance, or habitat they support.

Protected Wetland Areas

Louisiana's coastal zone provides substantial economic value to the state, and the nation, through a variety of products such as food, fiber, lumber, and energy resources. Abundant reserves of crude oil and natural gas occur in south Louisiana and off the coast in the Gulf of Mexico. Commercial fisheries are also dependent on the valuable coastal wetlands that provide habitat for shellfish and a variety of fish species. Because of the ongoing significant coastal wetland losses in Louisiana, Congress established the Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA) in 1990. CWPPRA was enacted "to identify, prepare, and fund construction of coastal wetlands restoration projects. Since its inception, 204 coastal restoration or protection projects have been authorized, benefiting over 97,401 acres in Louisiana (USGS, 2015f).

Due to the economic and ecological importance of this region, the loss of Louisiana coastal wetlands, which are high quality, is "considered a matter of national concern" (Louisiana Coastal Wetlands Conservation and Restoration Task Force, 2012). Wetland loss is attributed to a combination of natural and human factors including storms, subsidence, dredging of waterways, and disruption of the natural deposition of river-borne sediment from the Mississippi River. In addition to construction and development, land subsidence, and sea level rise contributes to estuarine wetland loss. "These challenges were further compounded in 2010 by the Deepwater Horizon oil spill, which released more than 4.9 million barrels of oil into the Gulf affecting thousands of miles of shoreline, bayous, and bays" (Louisiana Coastal Wetlands Conservation and Restoration Task Force, 2012). The resulting oil spill and caused fish, crab, shrimp, and shellfish closures affected a large portion of the Louisiana coastline. Cleanup activities are still ongoing and the impacts of the spill are still being investigated by DEQ and other agencies (DEQ, 2012).

Other Important Wetland Sites in Louisiana

- Wildlife Management Areas are designated for outdoor recreation; these public lands include approximately 1.6 million acres, including wetlands (LDWF, 2014a).
- Other wetlands protected under easements or agreements by national and local nonprofit natural resource conservation groups such as state land trusts, The Nature Conservancy, Orleans Audubon Society, Coastal Land Trust, Coastal Plain Conservancy, Ducks Unlimited, and the Land Trust for Southeastern Louisiana (LDWF, 2014a). According to the National Conservation Easement Database, a national electronic repository of government and privately held conservation easements (http://conservationeasement.us/), the U.S. Natural Resource Conservation Service holds more than 292,000 acres in conservation easements in Louisiana (NCED, 2015).

8.1.6 Biological Resources

8.1.6.1 Definition of the Resource

This section describes the biological resources for the state of Louisiana. Biological resources include terrestrial[52] vegetation, wildlife, fisheries and aquatic[53] habitats, and threatened[54] and endangered[55] species, and communities and species of conservation concern. Wildlife habitat and associated biological ecosystems are also important components of biological resources. Because of the topograp8.1.6.hic variation within the state and its location along the Gulf of Mexico, the state of Louisiana supports biological resources ranging from marine[56] and estuarine habitat[57] settings along the coast and in the Mississippi Delta to deciduous[58] and coniferous[59] forests in the "piney woods" of northeastern Louisiana and the upland regions of the state. Each of these topics is discussed in more detail below.

8.1.6.2 Specific Regulatory Considerations

The federal laws relevant to the protection and management of biological resources in Louisiana are summarized in Section 1.8, Overview of Relevant Federal Laws and Executive Orders, and Appendix C, Environmental Laws and Regulations. Table 8.1.6-1 summarizes the major state laws relevant to the Louisiana's biological resources.

Table 8.1.6-1: Relevant Louisiana Biological Resources Laws and Regulations

State Law/Regulation	Regulatory Agency	Applicability
LRS Title 56 §1-2037: Wildlife and Fisheries	Louisiana Wildlife and Fisheries Commission	Laws and regulations related to inland fisheries, wildlife management, the natural heritage and endangered species program, and hunting; Grants general jurisdiction over animal species in the wild; Creates the Aquatic Plant Control Fund and authorizes control of aquatic noxious plants.
LRS Title 3 §1652-1791: Agriculture and Forestry	Louisiana Department of Agriculture and Forestry	Gives jurisdiction over farm-raised animals and animals raised in captivity, forestry, and plants; Declares Chinese tallow tree (*Sapium sebiferum*) a noxious plant harmful to growth and development of other plants and pasture and authorizes its destruction within the state; Regulates terrestrial plants that the agency designates as noxious weeds.

[52] Terrestrial: "Pertaining to the land" (USEPA, 2015b).
[53] Aquatic: "Pertaining to water" (USEPA, 2015s).
[54] Threatened species are "any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range" (16 U.S.C. §1532(20)).
[55] Endangered species are "any species which is in danger of extinction throughout all or a significant portion of its range" (16 U.S.C. §1532(6)).
[56] Marine: "Any marine environment, from pond to ocean, in which plants and animals interact with the chemical and physical features of the environment" (USEPA, 2015s).
[57] Estuarine habitat: "An estuary is the area where a river or stream connects to the open sea or ocean, estuarine includes the estuary and its associated habitats such as seagrasses and shellfish beds" (USEPA, 2015q).
[58] Deciduous: "Trees such as oaks and maples that lose their leaves during part of the year" (USEPA, 2015q).
[59] Coniferous: "Cone-bearing trees, mostly evergreens that have needle-shaped or scale-like leaves. They produce wood known commercially as softwood" (USEPA, 2015q).

State Law/Regulation	Regulatory Agency	Applicability
LRS Title 56, Chapter 8 §1901: Threatened and Endangered Species Conservation	Louisiana Department of Wildlife and Fisheries (LDWF)	Regulates the possession of plant and animal species listed as endangered,[a] threatened[b] of special concern or listed under the ESA; Outlines how the state may determine by regulation whether species of wildlife are listed as endangered or threatened; Provides for conservation of species listed under this rule; Regulates the possession, take, transfer, and sale of listed spices, including exceptions.
LRS Title 43, Chapter 7: Natural Resources	Department of Conservation of the State of Louisiana, Office of Coastal Management	Makes the Office of Coastal Management responsible for the maintenance and protection of the state's coastal wetlands through regulation of uses in the Louisiana coastal zone.
LRS Title 56 § 281: Coastwide Nutria Control Program	LDWF	Provides authorization to engage trappers and coastal landowners in cooperative agreements for cost-sharing programs as an economic incentive to control overpopulated nutria.
LRS Title 56 §1830. Louisiana Natural Heritage Program	LDWF	Creates the Louisiana Natural Heritage Program to administer the provisions of law and rules and regulations regarding the Louisiana Natural Areas Registry, the Threatened and Endangered Species Conservation program, and other programs, duties, and functions in accordance with the law.

[a] Endangered species are "any species which is in danger of extinction throughout all or a significant portion of its range" (16 U.S.C §1532(6)).
[b] Threatened species are "any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range" (16 U.S.C §1532(20)).

8.1.6.3 Terrestrial Vegetation

The distribution of flora within Louisiana is a function of the characteristic geology,[60] soils, climate, and water of a given geographic area and correlates to distinct areas identified as ecoregions.[61] Ecoregions are broadly defined areas that share similar characteristics, such as climate,[62] geology, soils, and other environmental conditions, and represent ecosystems contained within a region. The boundaries of an ecoregion are not fixed, but rather depict a general area with similar ecosystem types, functions, and qualities (National Wildlife Federation, 2015) (USDA, 2015a) (World Wildlife Fund, 2015).

Ecoregion boundaries often coincide with physiographic[63] regions of a state. The ecoregions mapped by the USEPA are the most commonly referenced, although individual states and

[60] USGS defines geology as an interdisciplinary science with a focus on the following aspects of earth sciences: geologic hazards and disasters, climate variability and change, energy and mineral resources, ecosystem and human health, and ground-water availability.
[61] Ecoregion: "A relatively homogeneous ecological area defined by similarity of climate, landform, soil, potential natural vegetation, hydrology, or other ecologically relevant variables" (USEPA, 2015q).
[62] Climate: "Climate in a narrow sense is usually defined as the "average weather," or more rigorously, as the statistical description in terms of the mean and variability of relevant quantities over a period of time ranging from months to thousands of years. The classical period is 3 decades, as defined by the World Meteorological Organization (WMO)" (USEPA, 2016c).
[63] Physiographic: "The natural, physical form of the landscape" (USEPA, 2015q).

organizations have also defined ecoregions that may differ slightly from those designated by the USEPA. The USEPA divides North America into 15 broad Level I ecoregions. These Level I ecoregions are further divided into 50 Level II ecoregions. These Level II ecoregions are further divided into 182 smaller Level III ecoregions. This section presents a discussion of biological resources for Louisiana at USEPA Level III ecoregion (USEPA, 2016a).

As shown in Figure 8.1.6-1, the USEPA divides Louisiana into six Level III ecoregions: Mississippi Alluvial Plain, Mississippi Valley Loess Plains, South Central Plains, Southeastern Plains, Southern Coastal Plain, and Western Gulf Coastal Plain (USEPA, 2016b).

The Mississippi Alluvial Plain encompasses the eastern inland portion of the state along the Mississippi River down to the river delta along the southeastern portion of the state along the coast, including New Orleans. The Western Gulf Coast Plain is composed of the remainder of the coastal area in the western portion of the state and is bordered to the north by the South Central Plains, which include Shreveport and Alexandria. The Mississippi Valley Loess Plains encompass the central part of the state near Baton Rouge, and the Southern Coastal Plain is composed of a thin area east of the Loess Plains. The Southeastern Plains are in the extreme northeastern portion of Louisiana. (USEPA, 2016j)

These six ecoregions support a variety of different plant communities that closely track the geography of the area, greatly influenced by the Gulf of Mexico and the Mississippi River. Louisiana contains barrier islands and coastal lowlands, large river floodplains, rolling and hilly coastal plains with evergreen and deciduous forests, and a variety of aquatic habitats. Bottomland hardwoods and cypress communities are associated with the Red River, which is a tributary to the Mississippi River and cuts across the state of Louisiana from northwest to southeast, and the Mississippi River. These two rivers mark the general area of the Mississippi Alluvial Plain. The southern part of the state along the coast is marshlands, and the eastern part of the state above the marsh area is prairie (Western Gulf Coastal Plains). Longleaf pine forests are present in the west central part of the state (South Central Plains) as well as in the northeastern corner of the state, where they overlap with the Southeastern Plains ecoregion. Shortleaf pine hardwood vegetation regions are present in the northeastern part of the state and in the area west of the Mississippi River in the northern portion of the state, overlapping with the Mississippi Valley Loess Plain. Flatwoods are present in the southern part of the South Central Plains and continue through the Southern Coastal Plains in the west-central and east-central parts of Louisiana. Upland hardwoods occur throughout the higher elevation areas of the Mississippi Alluvial Plain (USEPA, 2016d). Table 8.1.6-2 provides a summary of the general abiotic[64] characteristics, vegetative communities, and the typical vegetation found within each of the six Louisiana ecoregions, divided into five geographic regions.

[64] Abiotic: "Characterized by absence of life; abiotic materials include non-living environmental media (e.g., water, soils, sediments); abiotic characteristics include such factors as light, temperature, pH, humidity, and other physical and chemical influences" (USEPA, 2016h).

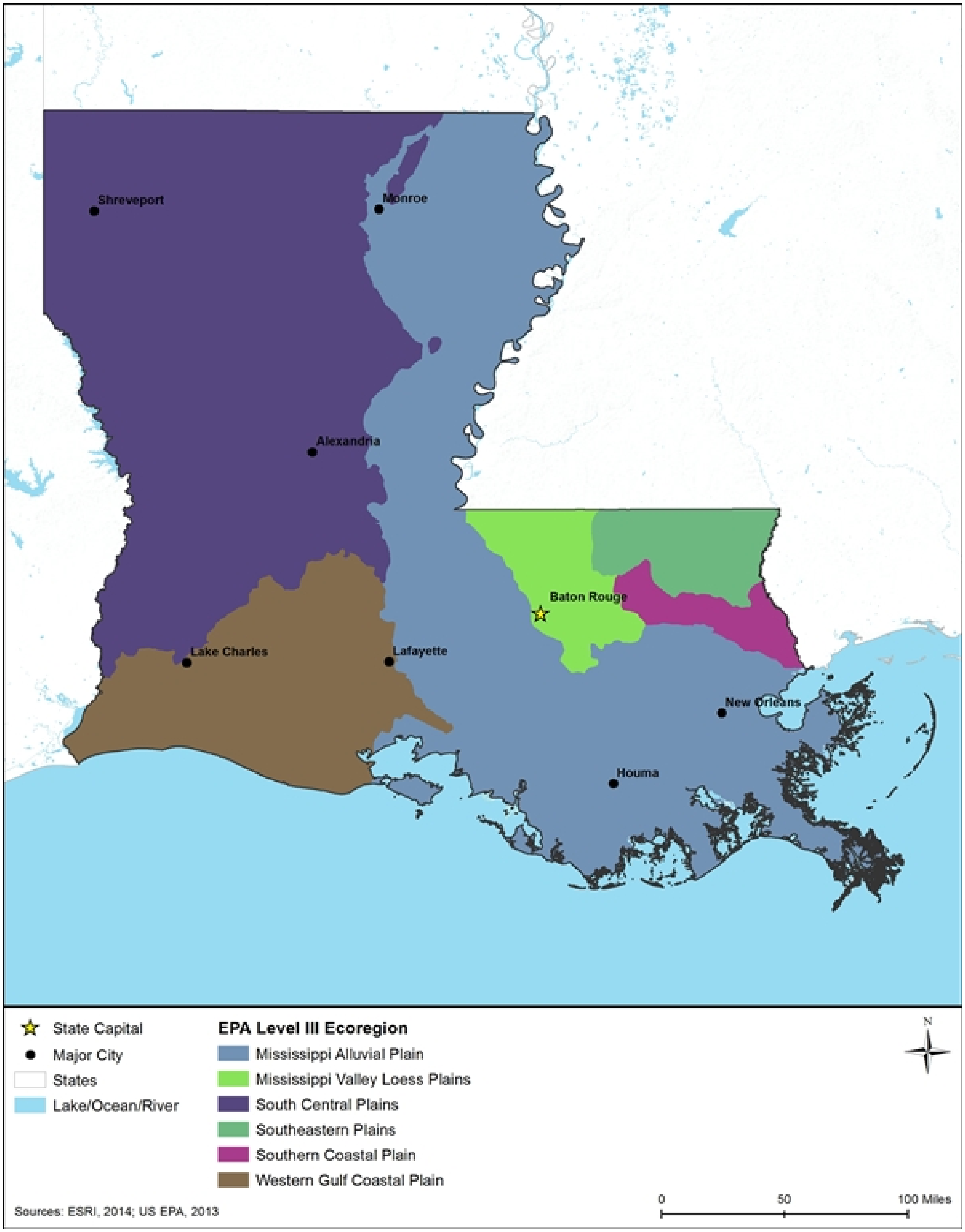

Figure 8.1.6-1: USEPA Level III Ecoregions in Louisiana

Table 8.1.6-2: USEPA Level III Ecoregions of Louisiana

Ecoregion Number	Ecoregion Name	Abiotic Characterization	General Vegetative Communities	Typical Vegetation
Geographic Regions: North and Central Louisiana				
73	Mississippi Alluvial Plain	This riverine ecoregion is composed of a flat, broad floodplain with "river terraces, swales, and levees providing the main elements of relief"; poorly drained soils with hot summers and mild winters.	Bottomland deciduous forests. Much of the land is cultivated for crops	• **Hardwoods –** overcup oak (*Quercus lyrata*), water hickory oaks (*Carya aquatica*), green ash (*Fraxinus pennsylvanica*), hackberry (*Celtis laevigata*), American elm (*Ulmus americana*), cottonwood (*Populus deltoides*) • **Shrubs –** swamp dogwood (*Cornus foemina var. foemina*), hawthorn (*Crataegus* spp.), red mulberry (*Morus rubra*)
35	South Central Plains	Area of mostly irregular plains known as the "piney woods," this is the western edge of the coniferous forest belt. Historically blanketed by a mix of coniferous and hardwood forests, it has been largely converted to tree plantations.	Pine and hardwood forests; cultivated for crops and loblolly and shortleaf pines	• **Hardwoods –** Water oak (*Quercus nigra*), laurel oak (*Q. laurifolia*), sweetbay (*Magnolia virginiana)*, red maple (Acer rubrum) (red maple), sweetgum (*Liquidambar styraciflua*), black gum (*Nyssa sylvatica*), willow (*Salix* spp.) • **Conifer Trees –** loblolly pine (*Pinus tadea*); shortleaf pine, slash pine (*Pinus elliottii*), longleaf pine (*Pinus palustris*) • **Shrubs –** wild azalea (*Rhododendron oblongifolium*) • **Forbs/Grasses** – sunbonnet (*Chaptalia tomentosa),* broomsedges (*Andropogon* spp.), panic grasses (*Panicum* spp.)
Geographic Region: Acadiana and Greater New Orleans (South Louisiana)				
75	Western Gulf Coastal Plain	Area with relatively flat coastal plain topography and mainly grassland potential natural vegetation. A large percentage of this area is in cropland and urbanization and industrialization are also prominent.	Grasslands with pine flatwood forests or savannas inland; cultivated for crops	• **Hardwoods –** Water oak (*Quercus nigra*), laurel oak (*Q. laurifolia*), red maple (Acer rubrum) (red maple), sweetgum (*Liquidambar styraciflua*), black gum (*Nyssa sylvatica*)

Ecoregion Number	Ecoregion Name	Abiotic Characterization	General Vegetative Communities	Typical Vegetation
				• **Conifer Trees –** longleaf pine (*Pinus palustris*), loblolly pine (*Pinus tadea*) • **Shrubs –** Wax myrtles (*Morella* spp), swamp cyrilla (*Cyrilla racemiflora*), dwarf palmetto (*Sabal minor*) • **Forbs/Grasses** – brownseed paspalum (*Paspalum plicatulum*), little bluestem, (*Schizachyrium scoparium*), slender bluestem (*S. tenerum*), big bluestem (*Andropogon gerardii*), St. John's-worts (*Hypericum* spp), blazing-stars (*Liatris* spp), blackberries (*Rubus* spp.), sunbonnet (*Chaptalia tomentosa*), broomsedges (*Andropogon* spp), panic grasses (*Panicum* spp.)
73	Mississippi Alluvial Plains	The low-elevation portion of the Mississippi Alluvial Plains, composed of the Mississippi Delta.	Delta coastal marshes, swamps, and barrier islands	• **Hardwoods –** willow (*Salix* spp), sweetgum, southern magnolia, oaks, cypress, tupelo • **Shrubs –** red maple; wax-myrtle; red bay • **Herbaceous –** coast cockspur grass (*Echinochloa walteri)*, broadleaf bulltongue (*Sagittaria latifolia*), delta arrowhead (*S. platyphylla*), variable flatsedge (*Cyperus difformis*), Mexican spangletop (*Leptochloa uninervia*), dwarf spikerush (*Eleocharis parvula*), coastal water hyssop (*Bacopa monnieri*)
Geographic Region: Florida Parishes				
65	Southeastern Plains	These plains are irregular and a mixture of forest, cropland, pasture, and woodland vegetation; soils are younger and streams low gradient with sandy bottoms.	Oak-hickory-pine and Southern mixed forest with patches of prairie	• **Hardwoods** –overcup oak (*Quercus lyrata*), water oak (*Q. nigra*), delta post oak (*Q. similis*), cedar elm (*Ulmus crassifolia*) • **Conifer Trees –** longleaf pine (*Pinus palustris*); slash pine (*Pinus elliottii*) baldcypress (*Taxodium distichum*), pondcypress (*T. ascendens*)

Ecoregion Number	Ecoregion Name	Abiotic Characterization	General Vegetative Communities	Typical Vegetation
				• **Shrubs** – litterleaf gallberry (*Ilex glabra*)
75	Southern Coastal Plains	A heterogeneous region composed of flat plains with many swamps, marshes and lakes, barrier islands, coastal lagoons, and swampy lowlands along the Gulf of Mexico; low elevation with wet soils.	Once covered by a variety of forest communities that included trees of longleaf pine, slash pine, pond pine, beech, sweetgum, southern magnolia, white oak, and laurel oak, land cover in the region is now mostly slash and loblolly pine with oak-gum-cypress forest in some low lying areas	• **Hardwoods –** sweetbay (*Magnolia virginiana*), black gum (*Nyssa sylvatica*), red maple (*Acer rubrum*), water oak (*Quercus nigra*) • **Conifer Trees –** longleaf pine (*Pinus palustris*); slash pine (*Pinus elliottii*) baldcypress (*Taxodium distichum*), pondcypress (*T. ascendens*) • **Shrubs –** summer sweet (*Clethra alnifolia*), blueberry (*Vaccinium* spp.), huckleberries (*Gaylussacia* spp.*)*
74	Mississippi Valley Loess Plains	"Irregular plains, with some gently rolling hills, and dissected hills, ridges, and bluffs near the Mississippi River." Thick loess is one of the distinguishing characteristics. "The Bluff Hills in the western portion contain soils that are very deep, steep, silty, and erosive. Flatter topography is found to the east" and streams tend to have less gradient and siltier substrates.	Oak-Hickory and Oak-Hickory Pine	• **Hardwoods** – southern red oak (*Quercus falcate*), post oak (*Q. stellate*), blackjack oak (*Q. marilandica*), black oak (*Q. velutina*), white oak (*Q. alba*), mockernut hickory (*Carya tomentosa*), black hickory (*C. texana*), bitternut hickory (*C. cordiformis*), winged elm (*Ulmus alata*) • **Conifer Trees –** longleaf pine (*Pinus palustris*); shortleaf pine (*Pinus echinata*) • **Shrubs** – blackberry; deciduous holly (*Ilex opaca*)

Sources: (USEPA, 2016d) (CEC, 2011)

Communities of Concern

Natural communities are groups of plant and animal species that occur in association with one another in certain landscapes and environments. The Louisiana Natural Heritage Program (LNHP), part of the Louisiana Department of Wildlife and Fisheries, manages a statewide inventory that includes lists of the types of natural communities known to occur, or that have historically occurred, in the state (LDWF, 2015b). Louisiana has 66 community types within its six ecoregions, according to LNHP's current natural community classification (LDWF, 2015c). Some community types are widespread across the state and while others are localized or restricted. The historical occurrences are important for assessing previously undocumented occurrences or re-occurrences of previously documented species.

Louisiana contains several vegetative communities of concern that include rare natural plant communities, plant communities with vulnerability or sensitivity to disturbance, and communities that provide habitat for both rare plant and wildlife species. The ranking system for these communities gives an indication of the relative rarity, sensitivity, uniqueness, or vulnerability of these areas to potential disturbances generated by the proposed project. This ranking system also provides an indication as to the level of potential impact a particular community could experience from an action. (LDWF, 2015c)

Each natural community is assigned a rank based on its rarity and threat, as well as the species element ranking developed for the Natural Heritage system by The Nature Conservancy and maintained by NatureServe.[65] As with most state heritage programs, LNHP's ranking system assesses rarity using a state rank (S1, S2, S3, S4, S5) assigned by the state. The state rank indicates rarity within Louisiana. Typically, this rank is based on the range of the community, the number of occurrences, the viability of the occurrences, and the vulnerability of the community. As new data become available, ranks are revised as necessary to reflect the most current information. (NatureServe, 2015)

LHNP considers natural community types ranked S1, S2, and S3 to be critically imperiled, imperiled, and rare, respectively. Community types ranked S4 and S5 have many occurrences and are considered secure. Natural community types assigned a rank of S1 include critically imperiled species because of extreme rarity, where the species consist of five or fewer occurrences, or very few remaining individuals, acres, or miles of stream. Communities with an S1 rank may also be especially vulnerable to extirpation in Louisiana for other reasons (LDWF, 2015c) (LNHP, 2009) (NatureServe, 2015).

There are 28 vegetative communities that are ranked as S1 communities[66] in Louisiana; these communities represent the rarest habitat in the state and are in palustrine and terrestrial areas (LDWF, 2015b). The palustrine areas occur in coastal zones along the southern edge of the state and 10 S1 communities are included in this group. There are 18 S1 communities in terrestrial

[65] NatureServe is a non-profit organization that provides high-quality scientific expertise for conservation projects with over 1,000 conservation professionals from the U.S., Canada, and Latin America (www.natureserve.org).
[66] S1 – "Critically imperiled in Louisiana because of extreme rarity (5 or fewer known extant populations) or because of some factor(s) making it especially vulnerable to extirpation" (Louisiana Department of Wildlife & Fisheries 2009) (LDWF, 2009).

areas, and they occur throughout Louisiana. Louisiana Appendix B, Table B-1, S1-Ranked Terrestrial Communities in Louisiana, provides a description of the communities of conservation concern in Louisiana along with their state rank, distribution, and the associated USEPA Level III ecoregions. Louisiana Appendix B, Table B-2, S1-Ranked Palustrine Communities in Louisiana, identifies the S1-Ranked Palustrine Communities in Louisiana.

Nuisance and Invasive Plants

There are a large number of undesirable plant species that are considered nuisance and invasive plants. Noxious weeds[67] are typically non-native species that have been introduced into an ecosystem inadvertently; however, on occasion, a native species can be considered a noxious weed. Noxious weeds greatly affect agricultural areas, forest management, natural, and other open areas (Government Publishing Office, 2011). The U.S. government has designated certain plant species as noxious weeds in accordance with the Plant Protection Act of 2000 (7 U.S.C. 7701 et seq.). As of September 30, 2014, 112 federally recognized noxious weed species have been catalogued in the United States (88 terrestrial, 19 aquatic, and 5 parasitic (USDA, 2015b).

Louisiana's humid subtropical climate puts it at high risk for invasive species introductions and serves to increase the potential for those introductions to lead to established populations. Economic and environmental damage area caused by non-native species that become invasive, and they can have a large detrimental impact on Species of Greatest Conservation Need (SGCN) (LDWF, 2015n). Invasive species control in Louisiana has historically focused on aquatic species, although with the updated Wildlife Action Plan, that is changing. Title 56 (La. R.S. § 56:10.1) creates the Aquatic Plant Control Fund, which is utilized by the LDWF Office of Fisheries to control aquatic plants and collaborate the Louisiana State University on research and public education through their Agricultural Center. (USDA, 2016)

In the 2004 Louisiana Legislative Session, a bill was passed to create the Louisiana Aquatic Invasive Species Council (LAISC) and places LDWF as the lead agency. There is a large involvement in invasive species management in Louisiana from the higher education community, with The Invasive Species Initiative at the Center for Bioenvironmental Research (CBR) at Tulane and Xavier Universities providing resources. (Tulane University, 2006) There is a state-listed noxious weed, the Chinese tallow tree (*Sapium sebiferum*) (LDWF, 2016c).

Louisiana's invasive species list includes all invasive species, from those that are known to occur in Louisiana that have or are likely to have impacts on SGCN or their habitats to those that have the potential to invade within the next 10 years. The list is divided into four tiers, with the first tier (Tier I) being those species that are present and causing severe or widespread negative impacts on wildlife or natural communities (most problematic), and the fourth tier being those species known to have occurred in the past or with the potential to invade in the future (least

[67] Noxious weeds: "any living stage (e.g., seeds and reproductive parts) of any parasitic or other plant of a kind, or subdivision of a kind, which is of foreign origin, is new to or not widely prevalent in the United States., and can directly or indirectly injure crops, other useful plants, livestock, or poultry or other interests of agriculture, including irrigation, or navigation or the fish and wildlife resources of the U.S. or the public health" (Federal Noxious Weed Act of 1974).

problematic) (LDWF, 2015n). The invasive species list shown below in Table 8.1.6-3 only deals with the Tier I invasive plant species.

Table 8.1.6-3: Louisiana Invasive Plant Species List

Common Name	Scientific Name
Coral Ardisia	*Ardisia crenata*
Camphor Tree	*Cinnamomum camphora*
Elephant Ear	*Colocasia esculenta*
Bermuda Grass	*Cynodon dactylon*
Japanese Twin-Sorus Fern	*Deparia petersenii*
Air Yam	*Dioscorea alata & D. bulbifera*
Brazilian Waterweed	*Egeria densa*
Water Hyacinth	*Eichhornia crassipes*
Chinese Parasol Tree	*Firmiana simplex*
Hydrilla or Waterthyme	*Hydrilla verticillata*
Cogon Grass	*Imperata cylindrica*
Yellow Flag Iris	*Iris pseudacorus*
Chinese Privet	*Ligustrum sinense*
Japanese Climbing Fern	*Lygodium japonicum*
Torpedo Grass	*Panicum repens*
Holmwood Grass	*Paspalum modestum (=P. hydrophyllum)*
Vasey Grass	*Paspalum urvillei*
Trifoliate Orange	*Poncirus trifoliata*
Kudzu	*Pueraria montana*
McCartney Rose	*Rosa bracteata*
Cherokee Rose	*Rosa laevigata*
Common Salvinia (Water Spangles)	*Salvinia minima*
Giant Salvinia	*Salvinia molesta*
Smut Grass	*Sporobolus indicus*
Chinese Tallow Tree	*Triadica sebifera*
Tungoil Tree	*Vernicia fordii*

Source: (LDWF 2015d)

8.1.6.4 Terrestrial Wildlife

This section discusses the terrestrial wildlife species in Louisiana, divided among mammals, birds, reptiles and amphibians, and invertebrates. Terrestrial wildlife is defined as animals that live predominantly on land. Terrestrial wildlife includes common big game species, small game animals and furbearers,[68] nongame animals, game birds, and waterfowl. A discussion of non-native or invasive wildlife species is also included.

The LDWF implements the state's Wildlife Action Plan (WAP). The 2005 Comprehensive Wildlife Conservation Strategy (CWCS) was updated as scheduled in 2015, and a Draft Louisiana WAP is now available (LDWF, 2015n) (LDWF, 2005b). The Louisiana WAP is a comprehensive document that helps guide the LDWF in management actions for Louisiana's fish and wildlife species with special emphasis on SGCN and their associated habitats. Among the changes made to the updated 2015 draft document are additions, changes, and removals from the SGCN list, the expansion of an invasive species section, and the addition of a climate change section (LDWF, 2015n).

There are 342 animal SGCN identified in the 2015 Louisiana WAP (compared to 240 SGCN in the 2005 WAP). To manage the threats and conservation actions, the Louisiana Natural Heritage Program tracks 68 community types in the six ecoregions mentioned above (LNHP, 2009). In general, the state WAP habitats are broader than the more fine-grained S1 communities described above and aim to capture several ecological associations (LDWF, 2015n).

Louisiana contains a wide range of terrestrial wildlife species. Of the native species known in the state, there are 70 mammals, 64 mollusks, at least 148 freshwater fish species, an unknown number of saltwater fishes, 134 amphibians and reptiles, five marine turtles, 160 year-round birds and over 244 migrants birds, 34 crawfish, and an undefined number for the total terrestrial non-crustacean arthropods.[69] (LDWF, 2015e)

Mammals

There are 70 mammal species present in Louisiana[70] with highly diverse habitat preferences and ecology (LDWF, 2015n). Mammal species commonly found throughout Louisiana include the Virginia possum (*Dedelphis virginiana*); nine-banded armadillo (*Dasypus novemcinctus*); several types of voles and shrews, such as the eastern vole (*Scalopus aquaticus*) and the least shrew (*Cryptotis parva*). Many types of Chiroptera (bats) are also found in Louisiana, including the Mexican free-tailed bat (*Tadarida brasiliensis*) and the Rafinesque's big-eared bat (*Corynorhinus rafinesquii*). Many kinds of Rodentia can be found in Louisiana, from the American beaver (*Castor canadensis*) to the eastern gray squirrel (*Sciurus carolinensis*). The swamp rabbit (*Sylivagus aquaticus*) and the eastern cottontail (*Sylivagus floridana*). Carnivora is represented by many species, including the bobcat *(Lynx rufus)*, mink (*Mustela vison*), and ringtail (*Bassariscus astutus*). Mammal species also include the white-tailed deer (*Odocoileus virginianus*) (LDWF, 2015n).

The following 12 furbearing mammals may be legally hunted in the state during appropriate seasons: beaver, bobcat, coyote (*Canis latrans*), gray fox (*Urocyon cinereoargenteus*), mink, muskrat (*Ondatra zibethicus*), nutria (*Myocastor coypus*), opossums (*Didelphimorphia*), river

[68] Furbearer is the name given to mammals that traditionally have been hunted and trapped primarily for fur.
[69] Arthropods: "Any member of the phylum Arthropoda, which are characterized by jointed appendages, an exoskeleton, and segmented body parts. Arthropods are the most diverse group of animals on Earth and include insects, crustaceans, arachnids, myriapods, and onychophorans as well as extinct forms like trilobites" (Smithsonian Institution, 2016).
[70] Marine mammals are described in further detail in Section 8.1.6.5, Fisheries and Aquatic Habitats.

otter (*Lontra Canadensis*), red fox (*Vulpes vulpes*), raccoon (*Procyon lotor*) and skunk (*Mephitis mephitis*) (LDWF, 2015d). The state also allows the hunting of turkey (*Meleagris gallopavo*), migratory birds, deer and outlaw quadrupeds, such as feral hogs (*Sus scrofa*), and during specific seasons (LDWF, 2015f).

Of the 70 mammal species present in Louisiana, one terrestrial mammal is federally listed and are considered SGCN. The Louisiana Black bear (*Ursus americanus luteolus*) was removed on March 10, 2016 from the lists of threatened and endangered wildlife under the ESA due to recovery (USFWS, 2016a). Section 8.1.6.6, Threatened and Endangered Species and Species of Conservation Concern, identifies protected mammal species.

Two mammal species have been removed from the SGCN list because they are no longer believed to be found in the state of Louisiana. These species include the red wolf (*Canis rufus*) and Florida Panther (*Puma concolor*). (LDWF, 2016d) (LDWF, 2016e)

Birds

The number of native bird species documented in Louisiana is estimated to be 160 year-round residents (Wiedenfeld & Swan, 2000). In addition, there are more than 300 species known to either migrate through or winter in the state, but this can vary according to the timing of the data collection effort, changes in bird taxonomy[71], and the reporting organization's method for categorizing occurrence and determining native versus non-native status (LDWF, 2015n). This section begins with a summary of native bird species found in Louisiana. The many diverse ecological communities of Louisiana (i.e., coastal areas, backwater swamps, rivers valleys, lakes, prairies, woodlands, etc.) support a large variety of bird species.

There are 89 bird species of concern list, and 50 of them are considered critically imperiled, imperiled, or rare and local (LNHP, 2015). Several threatened and endangered birds are found in Louisiana, and five of them are believed to be extirpated. Section 8.1.6.6, Threatened and Endangered Species and Species of Conservation Concern, lists and briefly describes these protected species.

Among bird species known to occur in Louisiana, there are the strongly represented duck, geese, swan and songbird groups. Plovers, oystercatchers, stilts, avocets, sandpipers and allies, gulls, terns, skimmers, jaegers, and murrelets are also well-represented. Other species found in Louisiana include the following: quail and wild turkey; loons; grebes; flamingos; albatrosses; shearwaters and petrels; tropic birds; storks, frigatebirds, boobies, ganets, cormorants and anhingas; pelicans, bitterns, herons, egrets, night-herons, ibises, and spoonbills; vultures, ospreys, kites, eagles, harriers and hawks; rails, gallinules, coots, and cranes; pigeons, doves, and ground-doves; cuckoos, roadrunners, and anis; barn owls and true owls; goatsuckers; swifts and hummingbirds; kingfishers; woodpeckers; caracaras and falcons; and parakeets. Many of these species reflect the state's coastal location and a high percentage of migratory species (LDWF, 2012a).

[71] Taxonomy: "A formal representation of relationships between items in a hierarchical structure" (USEPA, 2013c).

Louisiana is at the southernmost edge of the Mississippi Flyway, which spans from the breeding grounds in Canada and the northern United States to the Gulf of Mexico and South American wintering locations. Over 325 species of birds utilize this flyway during their annual migrations northward in the spring and southward in the fall. Audubon staff have worked with Baton Rouge Audubon Society, Orleans Audubon Society and the Louisiana Bird Resource Center to identify and map 23 Important Bird Areas (IBAs) in Louisiana (Louisiana Audubon Society, 2015).

Bald eagles (*Haliaeetus leucocephalus*) and golden eagles (*Aquila chrysaetos*) are protected under the Bald and Golden Eagle Protection Act. Bald eagles are generally found nesting in the southern, coastal portions of Louisiana, though less successful nests along river valleys in central and northern Louisiana have also been documented (LDWF, 2012b). Golden eagles are known only to occur in the northern portion of the Mississippi River, near the border with Mississippi (LDWF, 2010).

In Louisiana, 630,000 acres, or 986 square miles, of habitat encompass critical breeding, wintering, and stopover habitat for birds of conservation concern such as the endangered piping plover (*Charadrius melodus*) and red-cockaded woodpecker (*Leuconotopicus borealis*), the near-threatened Bachman's sparrow (*Aimophila aestivalis*) and Henslow's sparrow (*Ammodramus henslowii*), American woodcock (*Scolopax minor*), northern bobwhite (*Colinus virginianus*), and congregatory northern pintail (*Anas acuta*), ring-necked duck (*Aythya collaris*), canvasback (*Aythya valisineria*), royal tern (*Thalasseus maximus*), sandwich tern (*Thalasseus sandvicensis*), and significant populations of Prothonotary (*Protonotaria citrea*), Yellow-throated (*Setophaga dominica*), and Northern Parula Warblers (*Setophaga americana*). The selected sites in Louisiana represent a range of habitats that include upland pine savannahs, forested wetlands, barrier islands, and bald cypress-tupelo swamps. Louisiana encompasses parts of four Bird Conservation Regions, and has an atypically intact landscape, with large contiguous areas of habitat.

A total of 15 IBAs (National Audubon Society, 2015a), covering approximately 630,000 acres, have been identified in Louisiana as important locations for birds requiring land conservation (National Audubon Society, 2015a) (Figure 8.1.6-2). The establishment of IBAs assists in achieving local conservation priorities, by identifying and protecting important habitat for native bird populations during breeding,[72] migratory stops, feeding, and over-wintering areas. A variety of habitats are designated as IBAs, including forests, prairies, river valleys and wetlands/marshes, and coastal species. Louisiana has large, contiguous areas of bird habitat, although some IBAs are in developed areas. The majority of the IBAs are in the southern portion of the state, along waterways, although there are IBAs inland as well (National Audubon Society, 2015b).

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[72] Breeding areas: "The area utilized by an organism during the reproductive phase of its lifecycle and during the time that young are reared" (USEPA, 2015q).

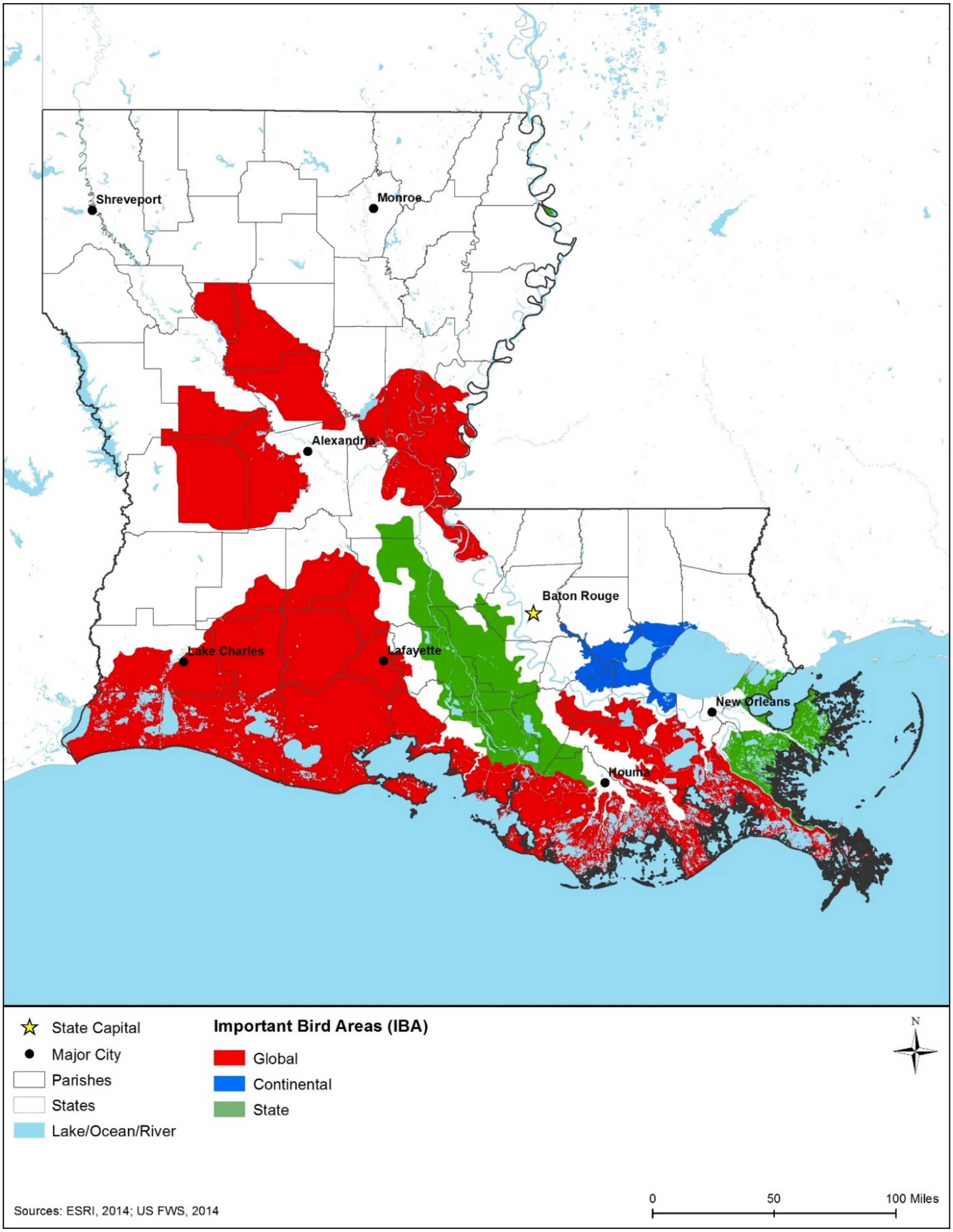

Figure 8.1.6-2: Important Bird Areas in Louisiana

Reptiles and Amphibians

A total of 140 reptile and amphibian species, such as sea turtles, snakes, and salamanders, occur in Louisiana, but it is unique in that it has no endemic reptiles or amphibians for being a high-diversity state. The greatest diversity is in the Florida Parishes east of the Mississippi river, and Tammany Parish alone has 102 species. The second most diverse area is in the uplands of central Louisiana, with the poorest diversity occurring in the coastal marshes and Mississippi floodplain (LDWF, 2005b). Thirty-four species of reptiles and 16 amphibians are considered by the Louisiana Department of Fish and Wildlife (LDWF, 2015n) (LDWF, 2005b). The dusky gopher frog (*Lithobates sevosus*) and ornate chorus frog (*Pseudacris ornate*) are considered extirpated in Louisiana.

A number of other threatened and endangered reptiles and amphibians are found in Louisiana. Section 8.1.6.6, Threatened and Endangered Species and Species of Conservation Concern, lists and briefly describes these protected species.

Invertebrates

Louisiana contains a large number of invertebrate species, including insects, spiders, and snails. These invertebrates provide an abundant food source for mammals, birds, reptiles, amphibians, and other invertebrates. Fifty-seven insects, one spider, and one scorpion are included as SGCN. This group is the most poorly known of Louisiana's fauna, and are in need of baseline data (LDWF, 2015n). The Tier I SGCN in the insect and arachnid group include the yellow brachycercus mayfly (*Brachycercus flavus*), pitcher plant spiketail (*Cordulegaster sarracenia*), Texas Emerald (*Somatochlora margarita*), Louisiana needlefly (*Leuctra szczytkoi*), Comanche harvester ant (*Pogonomyrmex comanche*), schoolhouse springs net-spinning caddisfly (*Diplectrona rossi*), spring-loving psiloneuran caddisfly (*Agarodes libalis*), bay skipper (*Euphyes bayensis*), and Louisiana eyed silkmoth (*Automeris louisiana*).

A number of threatened and endangered invertebrates occur in Louisiana. Section 8.1.6.6, Threatened and Endangered Species and Species of Conservation Concern, identifies these protected species.

Invasive Wildlife Species

The LDWF and other conservation organizations work to control the spread of invasive wildlife species in critical habitats and natural communities. There are two mammal species identified as invasive in Louisiana: the nutria rat (*Myocastor coypus*) and feral hogs (*Sus scrofa*). Both of these were deliberately introduced and cause extensive ecological damage. Other invasive invertebrate species are extensively established, and are listed with other invasive terrestrial wildlife species below (Table 8.1.6-4). Aquatic invasive species are described in more detail in Section 8.1.6.5, Fisheries and Aquatic Habitats.

Table 8.1.6-4: Louisiana Invasive Terrestrial Animal Species List

Common Name	Scientific Name
Channeled Apple Snail	*Pomacea canaliculata*
Argentine Ant	*Linepithema humile*
Red Imported Fire Ant	*Solenopsis invicta*
European Starling	*Sturnus vulgaris*
House Sparrow	*Passer domesticus*
Norway Rat	*Rattus norvegicus*
Black Rat	*Rattus*
Nutria	*Myocastor coypus*
Feral/Domestic Cat	*Felis catus*
Feral Hog	*Sus scrofa*

8.1.6.5 Fisheries and Aquatic Habitats

This section discusses the aquatic wildlife species in Louisiana, including freshwater fish, saltwater fish, invertebrates, marine mammals, and sea turtles. A summary of non-native and invasive aquatic species is also presented in this section. Louisiana's coastline encompasses includes open ocean, estuaries, bays, inlets, and other coastal features that provide habitat for a multitude of fisheries and aquatic wildlife, resulting in a very high diversity of species and a robust commercial and recreational fishing industry.

Freshwater Fish

Louisiana hosts a complex group of aquatic habitats, from small streams and bayous to large river systems, backwater swamps, and coastal areas. Primarily for this reason, it has a very high diversity of freshwater fish (LDWF, 2015n). At least 148 fish species have been recorded from freshwater habitats in Louisiana, and 39 species are considered SGCN.

Numerous families, ranging in size from small minnows to larger species such as sturgeon are found in Louisiana. Examples of carps and minnows found in Louisiana include the Bluehead shiner (*Pteronotropis hubbsi*), Bluenose shiner (*Pteronotropis welaka*), Bluntface shiner (*Cyprinella camura*), Bigeye shiner (*Notropis boops*), Broadstripe topminnow (*Fundulus euryzonus*), Chub shiner (*Notropis potteri*), Flagfin shiner (*Pteronotropis signipinnis*), Golden shiner (*Notemigonus crysoleucas*), Steelcolor shiner (*Cyprinella whipplei*), Silverjaw minnow (*Ericymba buccata*), and Suckermouth minnow (*Phenacobius mirabilis*). (LDWF, 2016b) (LDWF, 2015o)

Catfish that can be found in Louisiana include: the Black bullhead (*Ameiurus melas*), Blue catfish (*Ictalurus furcatus*), Brown bullhead (*Ameiurus nebulosus*), Channel catfish (*Ictalurus punctatus*), Flathead catfish (*Pylodictis olivaris*), Frecklebelly madtom (*Noturus munitus*), Yellow bullhead (*Ameiurus natalis*). (LDWF, 2016b) (LDWF, 2015o)

Several examples of Gar species of Gar within the state include the Alligator gar (*Atractosteus spatula*), Longnose gar (*Lepisosteus osseus*), Shortnose gar (*Lepisosteus platostomus*), and Spotted gar (*Lepisosteus oculatus*). (LDWF, 2016b) (LDWF, 2015o)

Pike fish species, such as the Chain pickerel (*Esox niger*) and Redfin pickerel (*Esox americanus americanus*), can be found in Louisiana (LDWF, 2016b).

Examples of sucker fish species include the Bigmouth buffalo (*Ictiobus cyprinellus*), Black buffalo (*Ictiobus niger*), Creek chubsucker (*Erimyzon oblongus*), River carpsucker (*Carpiodes carpio*), Smallmouth buffalo (*Ictiobus bubalus*), and Spotted sucker (*Minytrema melanops*). (LDWF, 2016b) (LDWF, 2015o)

A variety of sunfish species reside within Louisiana, including the Black crappie (*Pomoxis nigromaculatus*), the Flier (*Centrarchus macropterus*), Green sunfish (*Lepomis cyanellus*), Largemouth bass (*Micropterus salmoides*), Longear sunfish (*Lepomis megalotis*), Orange spotted sunfish (*Lepomis humilis*), Pygmy sunfish (*Elassoma*), Redbreast sunfish (*Lepomis auritus*), Redear sunfish (*Lepomis microlophus*), Striped bass (*Morone saxatilis*), Warmouth bass (*Lepomis gulosus*), White bass (*Morone chrysops*), and White crappie (*Pomoxis annularis*). (LDWF, 2016b) (LDWF, 2015o)

Within Louisiana, examples of perch include the Bigscale logperch (*Percina macrolepida*), Channel darter (*Percina copelandi*), Crystal darter (*Crystallaria asprella*), Freckled darter (*Percina lenticula*), Gulf logperch (*Percina suttkusi*), Pearl darter (*Percina aurora*), Rainbow darter (*Etheostoma caeruleum*), and Western sand darter (*Ammocrypta clara*). (LDWF, 2016b) (LDWF, 2015o)

Inland fishes of SGCN includes the bluehead shiner (*Pteronotropis hubbsi*), flagfin shiner (*Pteronotropis signipinnis*), bluenose shiner (*Pteronotropis welaka*), southeastern blue sucker (*Cycleptus meridionalis*), broadstripe topminnow (*Fundulus euryzonus*), and gumbo darter (*Etheostoma thompsoni*).

Popular inland sportfish in Louisiana include striped bass or hybrid striped bass (*Morone saxatilis*), white bass (*Morone chrysops*), and yellow bass (*Morone mississippiensis*). Bowfin (Amia calva), buffalo fish (*Ictiobus* spp), blue catfish (*Ictalurus furcatus*), channel catfish (*Ictalurus punctatus*), flathead catfish (*Pylodictis olivaris*), crappie (*Pomoxis* spp), freshwater drum (*Aplodinotus grunniens*), paddlefish (*Polyodon spathula*), and shad (*Dorosoma* spp). Pallid sturgeon (*Scaphirhynchus albus*) are a formerly popular sportfish, but they are a federally listed species (LDWF, 2015p).

A management plan for the pallid sturgeon (USFWS, 2014b) has been developed and the pearl darter (*Percina aurora*) has a historical range within the state but is now considered extirpated (Suttkus, Thompson, & Bart, 1994). A number of threatened and endangered freshwater fish are found in Louisiana. Section 8.1.6.6, Threatened and Endangered Species and Species of Conservation Concern, identifies these protected species.

Saltwater Fish

Louisiana has extremely productive coastal areas and about 95 percent of its commercial and recreational fishes are associated with estuarine habitats for some portion of their lifecycle. The range of habitats associated with saltwater environments is widely varied, from coastal marshlands to estuaries to open-ocean environments (LDWF, 2015n). Non-commercial saltwater fish and invertebrates are not as well known, and more baseline data are needed.

Many saltwater fish species are known for their recreational and commercial fishing value. Commonly caught species in the marine waters off the coast of Louisiana include cobia (*Rachycentron canadum*), black drum (*Pogonias cromis*), red drum (*Sciaenops ocellatus*), southern flounder (*Paralichthys lethostigma*) , king mackerel (*Scomberomorus cavalla*), Spanish mackerel (*Scomberomorini*), striped mullet (*Mugil cephalus*), spotted seatrout (*Cynoscion nebulosus*), blue marlin (*Makaira nigricans*), white marlin (*Kajikia albidus*), sailfish (*Istiophorus albicans*), Atlantic sharpnose shark (*Rhizoprionodon terraenovae*), bonnethead shark (*Sphyrna tiburo*), swordfish (*Xiphias gladius*), Bluefin tuna (*Thunnus thynnus*), bigeye tuna (*Thunnus obesus*), yellowfin tuna (*Thunnus albacares*), black grouper (*Mycteroperca bonaci*), gag grouper (*Mycteroperca microlepis*), yellowfin grouper (*Mycteroperca venenosa*), red grouper (*Epinephelus morio*), scamp grouper (*Mycteroperca phenax*), snapper (*Lutjanus*), almaco jack (*Seriola rivoliana*), gray triggerfish (*Balistes capriscus*), tilefish (*Malacanthidae*), amberjack (*Carangidae*), hogfish (*Lachnolaimus maximus*), and tripletail (*Lobotes surinamensis*). Crabbing, oyster-harvesting, and shrimping are also activities that occur in saltwaters of Louisiana (LDWF, 2015p).

The gulf sturgeon (*Acipenser oxyrhynchus desotoi*) is a federally listed species for which a recovery plan has been developed (USFWS, 1995). Section 8.1.6.6, Threatened and Endangered Species and Species of Conservation Concern, identifies these protected species.

Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act identifies and protects those fish habitats that are necessary for spawning, breeding, feeding, or growth to maturity. These habitats are termed "Essential Fish Habitat" or EFH. The National Oceanic and Atmospheric Administration (NOAA) provides an online mapping application and website to provide the public a means to obtain illustrative representations of EFH (NOAA, 2015c) (NOAA, 2015d). [73] This tool is used to identify the existing conditions for a project location to identify sensitive resources. A summary of EFH offshore of Louisiana may be found in Louisiana Appendix B, Table B-3.

Under the Magnuson-Stevens Act, the National Marine Fisheries Service also considers a second, more limited habitat designation for each species in addition to EFH. Habitat Areas of

[73] NOAA's Essential Fish Habitat Mapper v 3.0 was used to identify "EFH areas of particular concern" and "EFH areas protected from fishing". As of July 2016, the procedure to use this interactive tool is as follows: 1) Visit http://www.habitat.noaa.gov/protection/efh/habitatmapper.html. 2) Select "EFH Mapper" under Useful Links. 3) After closing the opening tutorial, select the "Region" of interest from the drop-down menu. 4) Select the species under "Essential Fish Habitat" to view the areas in the selected region protected for the various life states (i.e., eggs, larvae, juvenile, adult, or all).

Particular Concern (HAPC) are described as subsets of EFH which are rare, particularly susceptible to human-induced degradation, especially ecologically important, or in an environmentally stressed area. In general, HAPCs include high value intertidal and estuarine habitats, offshore areas of high habitat value or vertical relief, and habitats used for migration, spawning, and rearing of fish and shellfish. HAPCs are not afforded any additional regulatory protection under the Magnuson-Stevens Act; however, federal actions with potential adverse impacts to HAPC will be more carefully scrutinized during the consultation process and will be subject to more stringent EFH conservation recommendations (NOAA, 2010). Table 8.1.6-5 presents a summary of HAPC along or near the Mississippi coast.

Table 8.1.6-5: Habitat Areas of Particular Concern for Louisiana

Species	Description of EFH - HAPC
Specific HAPCs in the Gulf of Mexico	All of the EFH areas are offshore, and none are close to Louisiana waters. EFH includes offshore areas at Florida Middle Grounds, Madison-Swanson Marine Reserve, Tortugas North and South Ecological Reserves, Pulley Ridge, and the individual reefs and banks of the Northwestern Gulf of Mexico: East and West Flower Garden Banks, Stetson Bank, Sonnier Bank, MacNeil, 29 Fathom Bank, Rankin Bright Bank, Geyer Bank, McGrail Bank, Bouma Bank, Rezak Sidner Bank, Alderice Bank, and Jakkula Bank.

Source: (NOAA, 2005) (NOAA, 2009) (NOAA, 2015d)

Invertebrates

There are approximately 300 species of mussels in the United States (Williams et al. 2008) and roughly 24 percent (64) of these species occur in Louisiana (Neves et al. 1997). Of the 64 species of mussels present in Louisiana, 26 species are ranked as imperiled or critically imperiled in the state by the Louisiana Natural Heritage Program (LNHP, 2015). Many of them are federally listed, including rabbitsfoot (*Quadrula cylindrical*) (USFWS, 2013a), pink mucket (*Lampsilis abrupta*) (USFWS 1976), fat pocketbook (*Potamilus capax*) (USFWS, 1989), inflated heelsplitter (*Potamilus inflatus*). (USFWS 1992), and Louisiana pearlshell (*Margaritifera hembeli*), the only mussel species endemic to Louisiana (USFWS 1989b). The Tier I species of greatest conservation need in the freshwater mollusk category include the sandbank pocketbook (*Lampsilis satura*), black sandshell (*Ligumia recta*), Louisiana pearlshell (*Margaritifera hembeli*), southern hickorynut (*Obovaria jacksoniana*), pyramid pigtoe (*Pleurobema rubrum*), and inflated heelsplitter. In addition to 33 freshwater mussels, two snails, one aquatic and one terrestrial, are included on the SGCN list.

Crustaceans found in Louisiana are imperiled because of their small ranges and loss of habitat (LDWF, 2015c). There are over 330 species of crawfish in the United States, and 39 are known to occur in Louisiana (LDWF, 2015g). Twenty of these crawfish species are considered rare and local, imperiled, or critically imperiled by LNHP including at least five endemic or apparently endemic taxa: Teche Painted Crawfish (*Orconectes hathawayi*), Calcasieu Painted Crawfish (*Orconectes hathawayi spp Blacki*), Ouachita Fencing Crawfish (*Faxonella creaseri*), Caddo Chimney Crawfish (*Procambarus machardyi*), and Calcasieu Creek Crawfish (*Procambarus pentastylus*) (LNHP, 2015). The Tier I SGCN in the crustacean category include the Calcasieu painted crawfish (*Orconectes blacki*), Caddo chimney crawfish (*Procambarus machardyi*), and pine hills digger (*Fallicambarus dissitus*).

Mollusks

Five marine mollusks are included due to their dependence on highly restricted habitats within Louisiana. At least three of the five marine mollusk are currently known only from Marine Seagrass Beds at the Chandeleur Islands: the bay scallop (*Argopecten irradians*), sawtooth penshell (*Atrina serrata*), and half-naked penshell (*Atrina seminude*).

Marine Mammals

Louisiana recognizes the protection of five marine mammal species. They include the West Indian manatee (*Trichechus manatus*) and four species of whale. Marine mammals are more commonly abundant in offshore waters. Three of the four whale species included on the 2005 Louisiana WAP's SGCN list have been removed, as they do not regularly occur in state waters, and therefore may not be impacted by conservation actions within Louisiana (LDWF, 2015n).

The West Indian manatee (*Trichechus manatus*) is the only marine mammal that has a recovery plan in place in the state of Louisiana (LDWF, 2005b) (LDWF, 2015n). More detailed information on protected mammal species are presented in Section 8.1.6.6, Threatened and Endangered Species and Species of Conservation Concern.

Sea Turtles

All five marine sea turtles present in Louisiana are federally listed. Kemp's ridley sea turtle (*Lepidochelys kempii*), hawksbill sea turtle (*Eretmochelys imbricata*), and leatherback sea turtle (*Dermochelys coriacea*) are endangered and the loggerhead sea turtle (*Caretta caretta*) and green sea turtle (*Chelonia mydas*) are threatened. For more information on these protected sea turtles, refer to Section 8.1.6.6, Threatened and Endangered Species and Species of Conservation Concern.

Invasive Aquatic Species

Louisiana is well known as an important location for recreational and commercial fishing. Originally, Louisiana focused its attention to invasive species primarily on managing aquatic invasive plant species. For this reason, this area of invasive species management is more developed. The Wildlife and Fisheries Commission regulates 15 aquatic invasive plant species in the state. These species include rooting or anchoring hyacinth (*Eichhornia azurea*), elodea (*Elodea canadensis*), hydrilla (*Hydrilla* spp), African elodea (*Lagarosiphon muscoides* and *Lagarosiphon major*), Eurasian watermilfoil (*Myriophyllum spicatum*), marine naiad (*Najas marina*), torpedograss (*Panicum repens*), pickerelweed (*Pontederia* spp), giant duckweed (*Spirodela oligorrhiza*), waterchestnut (*Trapa* spp), kapok tree (*Melaleuca quinquenvia*), water lettuce (*Pistia stratiotes*), salvinia (*Salvinia* spp), purple loosestrife (*Lythrum salicaria*), and water hyacinth (*Eichhornia crassipes*) (LDWF, 2005c).

Freshwater invasive fish species are also present in Louisiana, and the LDWF has identified six Tier I freshwater fish species considered extensively and locally established. The following species are on that list: Rio Grande cichlid (*Cichlasoma cyanoguttatum*), common carp (*Cyprinus carpio*), grass carp (*Ctenopharyngodon idella*), silver carp (*Hypophthalmichthys molitrix*), bighead carp (*Hypophthalmichthys nobilis*), and black carp (*Mylopharyngodon piceus*) (LDWF, 2015n) (LDWF, 2005c).

Freshwater non-native invertebrates in Louisiana are also of concern, although they are not ranked as Tier I species. They include the zebra mussel (*Dreissena polymorpha*) and the Asian clam (*Corbicula fluminea*) (LDWF, 2015n) (LDWF, 2005c). Both of these species are well-established in the largest rivers of the state, the Mississippi, Red, and Atchafalaya Rivers, but are generally confined to their river drainages, so they are classified as Tier II, or "having moderate negative impacts on wildlife or natural communities in Louisiana, but of limited concern and/or extent" (LDWF, 2015n).

Marine finfish invasive species in Louisiana include 1 species, the lionfish (*Pterois volitans* and *P. miles*) (LDWF, 2015n), which escaped from the aquarium trade and represents one of the fastest finfish marine invasions.

8.1.5.6. Threatened and Endangered Species and Species of Conservation Concern

The USFWS is responsible for administering the Endangered Species Act (ESA) (16 U.S.C. §1531 et seq.) in the state of Louisiana. The USFWS has identified 11 federally endangered and 11 federally threatened species known to occur in Louisiana (USFWS, 2015c). Of these 22 federally listed species, two of them have designated critical habitat[74] (USFWS, 2015d). There is one candidate[75] species identified by USFWS as occurring within the state (USFWS, 2015e). Candidate species are not afforded statutory protection under the ESA. However, the USFWS recommends taking these species into consideration during environmental planning because they could be listed in the future (USFWS, 2014c). The 22 listed and 1 candidate species include 2 mammals, 7 reptiles, 4 birds, 2 fishes, 5 invertebrates, and 3 plants, and are discussed in detail under the following sections. Federal land management agencies maintain lists of species of concern for their landholdings; these lists are not discussed below as they are maintained independently from the ESA. For future site-specific analysis on those lands, consultation with the appropriate land management agency would be required. ESA designated critical habitat in Louisiana is shown in Figure 8.1.6-3.

[74] Critical habitat includes "the specific areas (i) within the geographic area occupied by a species, at the time it is listed, on which are found those physical or biological features (I) essential to conserve the species and (II) that may require special management considerations or protection; and (ii) specific areas outside the geographic area occupied by the species at the time it is listed upon determination that such areas are essential to conserve the species" (16 U.S.C §1532(5)(A)).

[75] Candidate species are plants and animals that the USFWS has "sufficient information on their biological status and threats to propose them as endangered or threatened under the ESA, but for which development of a proposed listing regulation is precluded by other higher priority listing activities" (USFWS, 2014b).

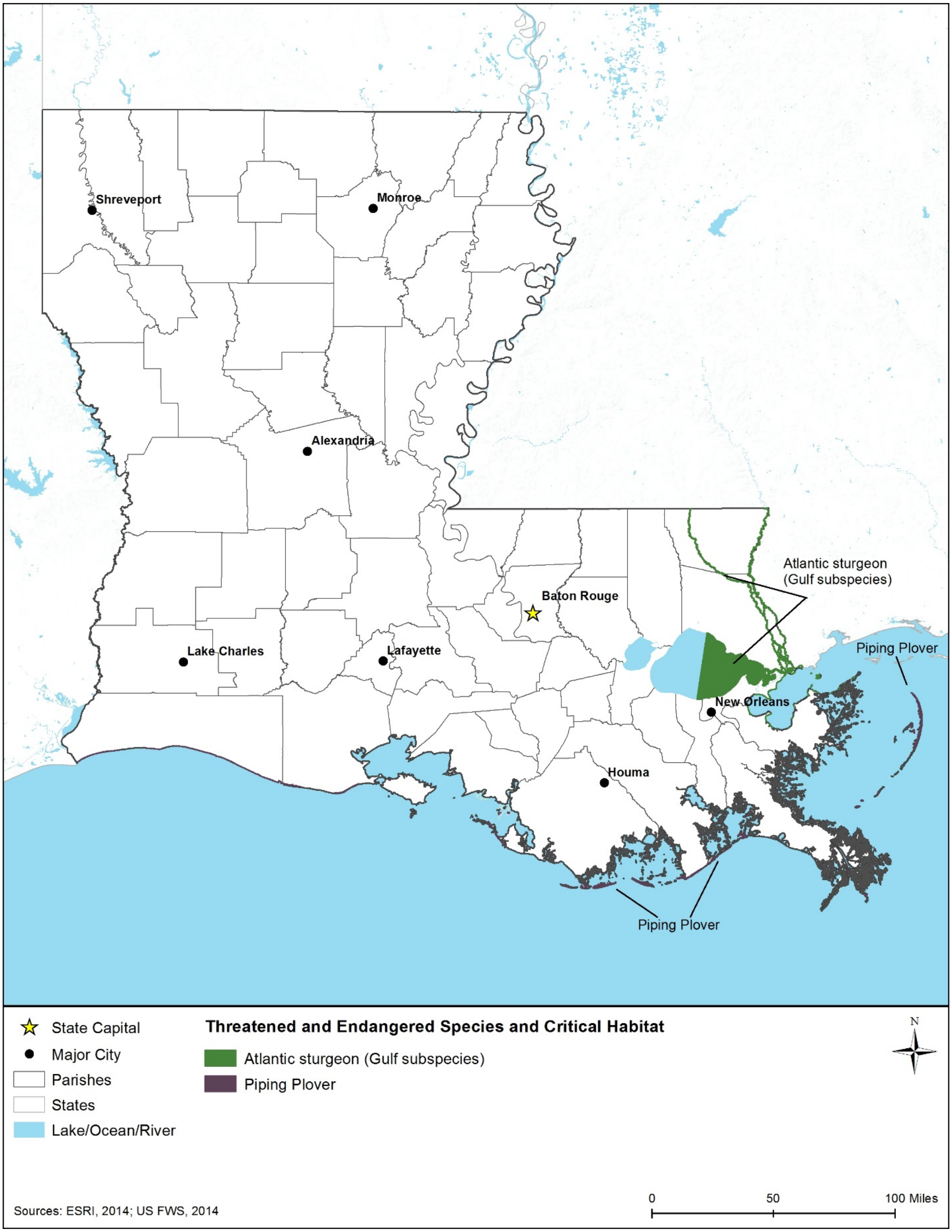

Figure 8.1.6-3: ESA Designated Critical Habitat in Louisiana

Mammals

One endangered and one threatened mammal species are federally listed for Louisiana as summarized in Table 8.1.6-6 (USFWS, 2015c). The Northern long-eared Bat (*Myotis septentrionalis*) occurs in the northern half of Louisiana (USFWS, 2016b) (USFWS, 2016c). The West Indian Manatee (*Trichechus manatus*) occurs along the Gulf of Mexico and southern Louisiana (Wilson, J., 2003) (USFWS, 2016c). Information on the habitat, distribution, and threats to the survival and recovery of each of these species in Louisiana is provided below.

Table 8.1.6-6: Federally Listed Mammal Species of Louisiana

Common Name	Scientific Name	Federal Status [a]	Critical Habitat in Louisiana	Habitat Description
Marine Mammals				
West Indian Manatee	*Trichechus manatus*	E	No	Tropical and subtropical coastal and river waters. Found in 18 parishes along the Gulf of Mexico and southern Louisiana.
Terrestrial Mammals				
Northern Long-eared Bat	*Myotis septentrionalis*	T	No	Hibernates in caves and mines that exhibit constant temperatures, high humidity, and no air currents. In the summer, they roost singly or in colonies beneath bark, or in crevices or cracks of both live and dead trees. Found in 27 parishes in the northern half of Louisiana.

[a] E = Endangered, T = Threatened
Source: (USFWS, 2015c)

Marine Mammals

West Indian manatee Photo Credit: USFWS

West Indian Manatee. The West Indian Manatee averages 9 feet in length and weighs about 1,000 pounds. Manatees have a large, seal-shaped body with flippers and a large tail, and are typically gray in color (USFWS, 2015f). The manatee was listed as endangered in 1967 (32 Federal Register [FR] 4001, March 11, 1967) and was incorporated into the ESA as an endangered species (16 U.S.C. §1531 et seq.). Manatees found in mainland U.S. waters are recognized as a separate subspecies known as the Florida manatee (*Trichechus manatus latirostris*) (USFWS, 2001a). The species is found in the Gulf of Mexico from Texas, Louisiana, Mississippi, Alabama, and Florida; along the Atlantic coast, the species extends from Florida north along Georgia and South Carolina to North Carolina. In Louisiana, the species occurs in 18 parishes along the Gulf of Mexico and in the southern portion of the state (USFWS, 2015f), including Pearl, Pontchartrain, Barataria, Mermentau, Calcasieu, and Sabine river basins (USFWS, 2015g).

West Indian manatees are found in tropical and subtropical coastal and river waters along the southeast U.S. coast, the Caribbean coast of Central and South America, and locally throughout the West Indies. During summer, manatees may be commonly found almost anywhere in Florida with appropriate water depths (3 to 6 feet). "Shallow grass beds with ready access to deep channels are preferred feeding areas in coastal and riverine habitats. Manatees often use secluded canals, creeks, embayments, and lagoons, particularly near the mouths of coastal rivers and sloughs, for feeding, resting, cavorting, mating, and calving" (USFWS, 2001a).

Threats to West Indian manatees include death or serious injury from boat strikes, decreased availability of warm-water refuges for manatees, and intensive coastal development (USFWS, 2001a).

Terrestrial Mammals

Northern Long-eared Bat. The threatened Northern long-eared bat is a medium-sized, brown furred, insectivorous bat with long ears. This bat is medium-sized, reaching a total length of 3 to 3.7 inches, relative to other members of the genus *Myotis*, (USFWS, 2015h). The Northern long-eared bat was listed as endangered in 2013 (78 FR 72058 72059, December 2, 2013) and was relisted as threatened in 2015 (80 FR 17973 18033, April 2, 2015). In the United States, its range includes most of the eastern and north central states. In Louisiana, the Northern long-eared bat is known from 27 parishes in the northern half of the state (USFWS, 2015i).

This species hibernates in caves and mines that exhibit constant temperatures and high humidity, which do not have air currents. In the summer, they roost singly or in colonies beneath bark, or in crevices or cracks of both live and dead trees. Although mating occurs in the fall, fertilization occurs following hibernation, from which pregnant females then migrate to summer areas where they roost in small colonies (USFWS, 2015h).

White Nose Syndrome is the leading cause for the decline of this species. The numbers of northern long-eared bats in hibernacula has decreased by 99 percent in the northeast United States (USFWS, 2015i). Other threats include temperature or air flow impacts to their hibernating habitat, forest management practices that are incompatible with this species' habitat needs, habitat fragmentation, and wind farm operations (USFWS, 2015h).

Reptiles

Three endangered, three threatened, and one candidate reptile species are federally listed for Louisiana as summarized in Table 8.1.6-7. The Hawksbill Sea Turtle (*Eretmochelys imbricate*), Kemp's Ridley Sea Turtle (*Lepidochelys kempii*), Leatherback Sea Turtle (*Dermochelys coriacea*), and Loggerhead Sea Turtle (*Caretta caretta*) occur off the coast of the Gulf of Mexico in Louisiana. The Ringed Map Turtle (*Graptemys oculifera*) and the Western Gopher Tortoise (*Gopherus Polyphemus*) occur in eastern Louisiana. The Louisiana Pine Snake (*Pituophis ruthveni*) has been identified as a candidate species in Louisiana. (USFWS, 2015c) (USFWS, 2016c) (LADEQ, 2010) Information on the habitat, distribution, and threats to the survival and recovery of the listed species in Louisiana is provided below.

Table 8.1.6-7: Federally Listed Reptile Species of Louisiana

Common Name	Scientific Name	Federal Status [a]	Critical Habitat in Louisiana	Habitat Description
Marine Reptiles				
Hawksbill Sea Turtle	*Eretmochelys imbricata*	E	No	Warm, shallow, coastal waters of reefs, lagoons, inlets, and bays with submerged aquatic vegetation. Found in the 9 coastal parishes on the Gulf of Mexico in Louisiana.
Kemp's Ridley Sea Turtle	*Lepidochelys kempii*	E	No	Nearshore habitats characterized by muddy or sandy bottoms where their prey items can be found, in waters rarely greater than 160 feet deep. Found in the 9 coastal parishes on the Gulf of Mexico in Louisiana.
Leatherback Sea Turtle	*Dermochelys coriacea*	E	No	Mostly open oceans but also coastal waters. Found in the 9 coastal parishes on the Gulf of Mexico in Louisiana.
Loggerhead Sea Turtle	*Carettacaretta*	T	No	Open sea environment, but they also occur in inshore area such as salt marshes, creeks, bays, and lagoons. Found in the 9 coastal parishes on the Gulf of Mexico in Louisiana.
Terrestrial Mammals				
Ringed Map Turtle	*Graptemys oculifera*	T	No	River stretches having moderate current, numerous basking logs, and sand beaches for nesting. Found in St. Tammany and Washington parishes, eastern Louisiana.
Western Gopher Tortoise	*Gopherus polyphemus*	T	No	Natural xeric communities, mostly of the longleaf-pine-scrub oak type, located on sand ridges. Found in St. Tammany, Tangipahoa, and Washington parishes, eastern Louisiana.

[a] E = Endangered, T = Threatened
Source: (USFWS, 2015c)

Marine Reptiles

Hawksbill Sea Turtle. The hawksbill sea turtle is one of the smaller sea turtles. It has overlapping plates that are thicker than those of other sea turtles. This protects them from being battered against sharp coral and rocks during storm events. Adults range in size from 30 to 36 inches and weigh up to 300 pounds. Its upper shell is dark brown with faint yellow streaks and a yellow under shell (USFWS, 2015j). The hawksbill sea turtle was listed as endangered in 1970 (35 FR 8491 8498, June 2, 1970). The species is found throughout all of the oceans of the world (USFWS, 2015k) (NOAA, 2014a). Even though in the Atlantic they range from the East Coast of the United States to northern Brazil, they are rarely found offshore of the East Coast states (NOAA, 2015e). In Louisiana, the hawksbill sea turtle is known from the nine coastal parishes on the Gulf of Mexico (USFWS, 2015j).

This species prefers warm, shallow, coastal waters of reefs, lagoons, inlets, and bays with submerged aquatic vegetation. Hawksbill sea turtles are omnivores that feed primarily on sponges, algae, and invertebrates, and are most often associated with the coral reef community. Nesting for these turtles occurs on remote beaches in the Gulf of Mexico and the Caribbean Sea in 2 to 3 year cycles, where females will lay between 140 to 200 eggs (USFWS, 2015k). Current threats to the hawksbill sea turtle include accidental capture in fishing lines, vessel strikes, contaminants, oil spills, disease, habitat loss of coral reef communities, and commercial exploitation. Outside of the United States, a current threat is the harvest of their meat and eggs, which was the historic threat to this species causing their decline (NOAA, 2014a).

Kemp's Ridley Sea Turtle. The Kemp's Ridley sea turtle is considered the smallest sea turtle species and the most endangered. These sea turtles can grow to more than 2 feet long and weigh up to 100 pounds. (NOAA, 2015f) (USFWS, 2015l) The Kemp's Ridley sea turtle was first federally listed in 1970 (35 FR 18319 18322, December 2, 1970) under the Endangered Species Conservation Act and was incorporated into the ESA as an endangered species (16 U.S.C. §1531 et seq.) (USFWS, 2015m). Their range includes the Gulf of Mexico and the U.S. Atlantic seaboard, from New England to Florida. In Louisiana, the Kemp's Ridley sea turtle is known from the nine coastal parishes on the Gulf of Mexico (USFWS, 2015m).

Kemp's Ridley sea turtles prefer nearshore habitats characterized by muddy or sandy bottoms where their prey items can be found, in waters rarely greater than 160 feet deep. They feed mostly on crabs, but also consume jellyfish, fish, and an array of mollusks (NOAA, 2015f). Kemp's Ridley sea turtles gather in large groups in Tamaulipes, Mexico where approximately 95 percent of this species' breeding occurs. Nesting occurs as early as April and into July. Some males migrate yearly between breeding and feeding grounds, whereas other remain near breeding grounds throughout the year. Hatchlings drift with the currents or float with plant material rafts for approximately two years (NOAA, 2015f). Historically, harvesting of the turtles eggs during their nesting was the main cause for the decline of this species while current threats to this species includes the direct harvest of adults and eggs, accidental capture in fishing gear, recreational activities on beaches, and pollution (USFWS, 2015l).

Leatherback Sea Turtle. The leatherback sea turtle is the deepest-diving and most wide-ranging sea turtle found in all of the world's oceans. It is the largest of all sea turtles, reaching 4 to 8 feet long and weighing 500 to 2,000 pounds (USFWS, 2015n). The leatherback sea turtle was listed as endangered in 1970 (35 FR 8491 8498, June 2, 1970) and was incorporated into the ESA as an endangered species (16 U.S.C. §1531 et seq.) (USFWS, 2015o). The leatherback sea turtle is capable of tolerating a wide range of water temperatures, and has the widest global distribution of all reptiles. Regionally, this species is known to occur in the Atlantic, Pacific, and Indian Oceans, as well as in some locations as far as Newfoundland and Argentina. The occurrence in the United States is rare for the Atlantic population, with the most significant location within the east coast being in southeastern Florida (USFWS, 2015n) (NOAA, 2015g). In Louisiana, the leatherback sea turtle is known from the nine coastal parishes on the Gulf of Mexico (USFWS, 2015o).

The preferred habitat for this species is the open ocean, but is also found in coastal waters. The leatherback sea turtle diet consists of jellyfish, salps (a transparent barrel-shaped tunicate[76]), and

[76] Tunicate: "Commonly known as 'sea squirts.' The body of an adult tunicate is quite simple, being essentially a sack with two siphons through which water enters and exits. Water is filtered inside the sack-shaped body." (University of California Museum of Paleontology, 2006)

other soft-bodied animals. (NOAA, 2015g). Individual female leatherback sea turtles nest at 2 to 3 year intervals. Nest-building occurs during the night between the months of March to July. Each female leatherback sea turtle can create up to 11 nests per nesting season (USFWS, 2015n). Current major threats to the species include harvesting eggs, hunting, incidental capture in fishing gear, and consumption of plastics mistaken for jellyfish (NOAA, 2015g).

Loggerhead Sea Turtle. The loggerhead sea turtle is a smaller sea turtle that can grow to an average length of 3 feet and weight of 250 pounds. This species has a reddish-brown carapace and flippers, and is characterized by its large head (USFWS, 2015p). The loggerhead sea turtle was initially listed as threatened throughout its range in 1978 (43 FR 32800 32811, July 28, 1978); by 2011, nine different distinct populations were listed and the northwester Atlantic Ocean population remained listed as threatened (76 FR 58868 58952, September 22, 2011) (USFWS, 2015q).

This turtle is known to occur throughout temperate and tropical regions in the Atlantic, Pacific, and Indian oceans with the most nesting areas in the western Atlantic Ocean. Nesting by the loggerhead sea turtle occurs from Texas to Virginia along the southeastern coast of the United States (USFWS, 2008). In Louisiana, the loggerhead sea turtle is known from the nine coastal parishes on the Gulf of Mexico (USFWS, 2015q), including the Pontchartrain, Mississippi, and Barataria river basins; however, nesting has only been recorded on the Chandeleur Islands (LDWF, 2015h).

The preferred habitat for the loggerhead sea turtle is the open sea environment, but they also occur in inshore area such as salt marshes, creeks, bays, and lagoons. Open beaches are the preferred location for nesting along the coast and coral reefs and rocky places are the preferred feeding areas for the loggerhead sea turtles (NOAA, 2014b). Current threats to the logger head sea turtle include incidental captures in in fishing gear, directed harvesting of eggs, and loss and degradation of habitats (USFWS, 2008) (NOAA, 2014b)

Terrestrial Reptiles

Ringed Map Turtle. The ringed map turtle is a small turtle with each shield of its upper shell having a yellow ring bordered inside and outside with dark olive-brown: its undershell (plastron) is yellow. The head has a large yellow spot behind the eye, two yellow stripes from the orbit backwards, and a characteristic yellow stripe covering the whole lower jaw. Males grow to 4 inches and females to 7 inches in plastron length (USFWS, 2015r). The species was listed as threatened in 1986 (51 FR 45907 45910, December 23, 1986). Ringed map turtles are known from the Pearl and Bogue Chitto Rivers in Mississippi and eastern Louisiana (LDWF, 2006a); in Louisiana, the species is known from St. Tammany and Washington parishes in the eastern portion of the state (USFWS, 2015r).

Preferred habitats include river stretches having moderate current, numerous basking logs, and sand beaches for nesting. The river exposure must be wide enough to allow for sun penetration for several hours. The species nests in unvegetated and short grass areas, with nests generally within 115 feet of the river bank. Nests are built in areas with very fine sand (USFWS, 1988).

Major threats to the ringed map turtle include habitat modification and water quality degradation. Channel and floodplain modifications and reservoir construction have caused population declines. Increased channelization within the watershed, which causes increased runoff and heavy siltation, is also a threat. Sand and gravel dredging also impacts suitable habitat (USFWS, 1988).

Western Gopher Tortoise. The western gopher tortoise (*Gopherus polyphemus*) is dark-brown to grayish-black colored terrestrial turtle that digs deep borrows in dry sandy habitat. Adult tortoises have a shell length between 6 and 15-inches long. Distinctive morphology include, "elephantine hind feet, shovel-like forefeet, and a gular projection beneath the head on the yellowish, hingeless plastron or undershell" (USFWS, 2015s). The species is listed as threatened west of the Mobile and Tombigbee Rivers and is listed as a candidate species east of those rivers (USFWS, 1990a) (USFWS, 2015s). The species was first recommended for review as a protected species in 1982 (47 FR 58454 58460, December 30, 1982), and was federally listed as threatened in the western portion in 1987 (52 FR 25376 25380, July 7, 1987). Western gopher tortoises occur in the Coastal Plain in southern South Carolina, Georgia, Florida, Alabama, Mississippi, and eastern Louisiana. In Louisiana, the species is known from St. Tammany, Tangipahoa, and Washington parishes in the eastern portion of the state (USFWS, 2015s).

Preferred habitats of the western gopher tortoise are sand ridges in longleaf pine savannas. The species is also found "ruderal[77] habitats such as fence rows, pastures, and field edges and power lines." Breeding occurs between February and September (USFWS, 1990a). The major threat to gopher tortoise is habitat destruction, followed by "habitat fragmentation and degradation, predation, inadequacy of regulatory mechanisms, and incompatible use of herbicides in forest management and some silvicultural activities" (USFWS, 2016d)."

Birds

Two endangered and two threatened bird species are federally listed for Louisiana as summarized in Table 8.1.66-8. The Least Tern (*Sterna antillarum*) occurs in northeastern and northwestern Louisiana. The Red-cockaded Woodpecker (*Picoides borealis*) occurs in northwestern and eastern Louisiana. The Piping Plover (*Charadrius melodus*) and the Red Knot (*Calidris canutus rufa*) occur on the coast of Louisiana. (USFWS, 2015c) (USFWS, 2016c) (LDWF, 2012a) Information on the habitat, distribution, and threats to the survival and recovery of each of these species in Louisiana is provided below.

Table 8.1.6-8: Federally Listed Bird Species of Louisiana

Common Name	Scientific Name	Federal Status [a]	Critical Habitat in Louisiana	Habitat Description
Least Tern	*Sterna antillarum*	E	No	Relatively unvegetated sandbars near rivers, reservoirs and other open water habitat. Found along the Mississippi River and Red River in 9

[77] Growing where the natural vegetational cover has been disturbed by humans.

Common Name	Scientific Name	Federal Status [a]	Critical Habitat in Louisiana	Habitat Description
				parishes in northeastern and northwestern Louisiana.
Piping Plover	*Charadrius melodus*	T	Yes; 8 parishes along coastal areas in Louisiana.	Open, sandy beaches and on tidal mudflats and sandflats. Found in 8 parishes in coastal Louisiana.
Red Knot	*Calidris canutus rufa*	T	No	Intertidal marines, estuaries, and bays. Found in 9 parishes in coastal Louisiana.
Red-cockaded Woodpecker	*Picoides borealis*	E	No	Mature pine forests, with the preferred pine species being the longleaf pines (*Pinus palustris*). Found in 24 parishes in northwestern and eastern Louisiana.

[a] E = Endangered, T = Threatened

Source: (USFWS, 2015c)

Least Tern. The least tern is the smallest member of the gull and tern family. The birds are approximately 9 inches in length. Unlike gulls, terns will dive into the water for small fish. The body of least terns is predominately gray and white, with black streaking on the head. Least terns have a forked tail and narrow pointed wings. Least terns less than a year old have less distinctive black streaking on the head and less of a forked tail (USFWS, 2015t). The species was federally listed as endangered in 1985 (50 FR 21784 21792, May 28, 1985). The species is known to breed along the Mississippi River in on sandbars and dike fields and is known from nine parishes in northeastern and northwestern parts of Louisiana (along the Mississippi River and red River) (USFWS, 1990b) (USFWS, 2015t).

Suitable habitat for least terns consists of relatively unvegetated sandbars near rivers, reservoirs and other open water habitat. The primary threat to this species is the destruction and degradation of habitat. Nest disturbance and predation can also be factors. The primary causes of habitat loss historically have been dam construction, recreational activities, and the alteration of flow regimes along major river systems (USFWS, 2013a).

Piping Plover. The piping plover is a small, pale brown-colored shorebird with a short beak and black band across the forehead, measuring approximately 7.25 inches in length. The piping plover was listed as endangered in 1985 for the Great Lakes watershed of both the United States and Canada, and as threatened in the remainder of its range in the United States, which includes the Northern Great Plains, Atlantic and Gulf Coasts, Puerto Rico, and the Virgin Islands (50 FR 50726 50734, December 11, 1985). Piping plovers can be found in eight parishes in coastal Louisiana (USFWS, 2015u). Critical habitat for the piping plover has been designated within eight parishes along coastal areas within Louisiana (refer to Figure 8.1.6-2) (FWS, 2001).

Piping plovers are found on open, sandy beaches and on tidal mudflats and sandflats along both the Atlantic and Gulf coasts (FWS, 2001). Suitable habitat consists of open, sparsely vegetated beaches composed of sand or gravel on islands or shorelines of inland lakes or rivers. They feed on worms, fly larvae, beetles, crustaceans, and other marine macroinvertebrates. Current threats to this species include habitat loss and habitat degradation, human disturbance, pets, predation, flooding from coastal storms, and environmental contaminants (USFWS, 2015v) (USFWS, 2015w).

Red Knot. The red knot is approximately 9 inches in length with a wingspan up to 20 inches, making it among the largest of the small sandpipers (USFWS, 2013b). It was recently federally listed as a threatened species in 2014 (79 FR 73705 73748, December 11, 2014). The red knot migrates annually from its breeding grounds above the Arctic Circle to the tip of South America where it winters. During spring and fall migration, the red knot travels in "non-stop segments of 1,500 miles and more, ending at stop sites called "staging areas." Some have been documented to fly more than 9,300 miles from south to north every spring and return south in autumn (USFWS, 2013b) (USFWS, 2014d). Red knot is known to occur in nine parishes in coastal Louisiana (USFWS, 2015x).

The preferred habitat for the red knot is intertidal marines, estuaries, and bays. Mussel beds are important food sources for the red knot. Red knots eat mussels and other mollusks mostly all year; however, during migration season, red knots eat "juvenile clams and mussels and horseshoe crab eggs (USFWS, 2013b). Current threats to the red knot include sea level rise; coastal development; shoreline stabilization; dredging; reduced food availability at their migration stopovers; and disturbance by humans, dogs, vehicles, and climate change (USFWS, 2014d) (USFWS, 2016e).

Red-cockaded Woodpecker. The red-cockaded woodpecker is a small black and white woodpecker that grows approximately 7 inches with a wingspan of about 15 inches. It is characterized by its black cap and white cheek patches (USFWS, 2015y). The red-cockaded woodpecker was listed as endangered in 1970 under early endangered species legislation (35 FR 16047 16048 October 13, 1970) and was incorporated into the ESA as an endangered species (16 U.S.C. §1531 et seq.). Regionally, this species is known to occur in open pine forests in the southeast from Virginia south to Florida and west to Oklahoma and Texas. It is known from 24 parishes in northwestern and eastern Louisiana (USFWS, 2015z).

The preferred habitat for the red-cockaded woodpecker is mature pine forests, with the preferred pine species being the longleaf pines (*Pinus palustris*). This species forages on pine trunks and branches and flakes away bark in search of insects. Its diet is primarily composed of insects including beetles, ants, spiders, other insect found on pine trees, with occasional wild fruits and pine seeds. Current threats to the red-cockaded woodpecker include lack of suitable habitats (USFWS, 2003a).

Fish

One endangered and one threatened fish species are federally listed for Louisiana as summarized in Table 8.1.6-9. The Atlantic Sturgeon (Gulf subspecies) (*Acipenser oxyrinchus desotoi*) occurs in rivers in southern Louisiana. The Pallid Sturgeon (*Scaphirhynchus albus*) occurs in rivers throughout Louisiana (USFWS, 2015c) (USFWS, 2016c) (USFWS, 2001b). Information on the habitat, distribution, and threats to the survival and recovery of each of these species in Louisiana is provided below.

Table 8.1.6-9: Federally Listed Fish Species of Louisiana

Common Name	Scientific Name	Federal Status[a]	Critical Habitat in Louisiana	Habitat Description
Atlantic Sturgeon (Gulf subspecies)	*Acipenser oxyrinchus desotoi*	T	Yes; portions of the Pearl and Bogue Chitto rivers, the eastern half of Lake Pontchartrain, Lake Catherine, Little Lake, The Rigolets, Lake Borgne, and Pascagoula Bay, Louisiana.	Migrates in the spring from salt water into fresh water rivers to spawn and spend the summer. When they are not migrating, they prefer to rest near the bottom of riverbeds and oceans. Found in 22 parishes in southern Louisiana.
Pallid Sturgeon	*Scaphirhynchus albus*	E	No	Large rivers with strong currents; they can withstand a wide range of turbidity conditions. Found in 31 parishes throughout Louisiana, in the Atchafalaya, Mississippi, and Pontchartrain river basins.

[a] E = Endangered, T = Threatened
Source: (USFWS, 2015c)

Atlantic Sturgeon (Gulf subspecies). The Gulf sturgeon (Gulf subspecies of Atlantic sturgeon) can grow up to 9 feet long and weigh up to 300 pounds (USFWS, 2015aa). A bony fish with a long bladelike snout, this species is light to dark brown with a pale belly in coloring (USFWS, 1995). The Gulf sturgeon was federally listed as threatened in 1991 (56 FR 49653 49658, September 30, 1991) (USFWS, 2015aa). Gulf sturgeons were historically common in rivers from Tampa Bay, Florida to the Mississippi River; currently, they can be found only in a number of large freshwater rivers from the Suwannee River in Florida to the Pearl River in Louisiana (USFWS, 2015aa). It is known to occur in 22 parishes in southern Louisiana (USFWS, 2015aa) in the Pearl, Bogue Chitto, and Tchefuncte Rivers in St. Tammany and Washington parishes, and is likely to be found in any large river in the Lake Pontchartrain drainage (LDWF, 2006b). Critical habitat for the Gulf sturgeon in Louisiana includes portions of the Pearl and Bogue Chitto rivers, the eastern half of Lake Pontchartrain, Lake Catherine, Little Lake, The Rigolets, Lake Borgne, and Pascagoula Bay (USFWS, 2003b).

The Gulf sturgeon migrates in the spring from salt water in freshwater rivers to spawn and spend the summer. Due to strong instincts, individual sturgeons often return to the river they were born in to spawn. When not migrating, Gulf sturgeon prefer to rest near the bottom of riverbeds and oceans. Major threats to the Gulf Sturgeon are barriers (such as dams) to historical spawning habitats, loss of habitat, poor water quality, and overfishing for sturgeon eggs and meat (USFWS, 1995).

Pallid Sturgeon. The pallid sturgeon is one of two species of sturgeon found east of the Continental Divide; it is the larger of the two species, and weighs up to 60 pounds (USFWS, 2014b). It has a flattened, shove-shaped snout, toothless mouth that is under the head, and its body is mostly cartilage rather than bone. It was federally listed as endangered in 1990 (55 FR 36641 36647, September 6, 1990) (USFWS, 2015ab). The pallid sturgeon is found in the Missouri River, Yellowstone River, and some of its larger tributaries in Montana. This species range also includes the Missouri-Mississippi confluence, and the Mississippi River down to New Orleans, Louisiana (USFWS, 2014b). In Louisiana, the species is known from 31 parishes throughout the state (USFWS, 2015ab), within the Atchafalaya, Mississippi, and Pontchartrain river basins (LDWF, 2006c).

Pallid sturgeon **Photo Credit: USFWS**

Pallid sturgeons prefer large rivers with strong currents; they can withstand a wide range of turbidity conditions. The key reason for this species' decline has been habitat fragmentation and alteration from the damming of major rivers and other large tributaries (USFWS, 2014b).

Invertebrates

Two endangered and three threatened invertebrate species are federally listed for Louisiana as summarized in Table 8.1.6-10. The Fat Pocketbook (*Potamilus capax*), Pink Mucket (*Lampsilis abrupta*), and the Rabbitsfoot (*Quadrula cylindrical cylindrical*) occur in northeastern Louisiana. The Alabama Heelsplitter (*Potamilus inflatus*) occurs in southeastern Louisiana. The Louisiana Pearlshell (*Margaritifera hembeli*) occurs in central Louisiana (USFWS, 2015c) (USFWS, 2016c). Information on the habitat, distribution, and threats to the survival and recovery of each of these species in Louisiana is provided below.

Table 8.1.6-10: Federally Listed Invertebrate Species of Louisiana

Common Name	Scientific Name	Federal Status [a]	Critical Habitat in Louisiana	Habitat Description
Alabama Heelsplitter	*Potamilus inflatus*	T	No	A soft, stable substrate in slow to moderate current. Found in the Pearl and Pontchartrain river basins in 6 parishes in southeastern Louisiana.
Fat Pocketbook	*Potamilus capax*	E	No	Streams, tributaries, and channels with sand, mud, or gravel, or substrates. Found in the Mississippi River basin in 4 parishes in northeastern Louisiana.
Louisiana Pearlshell	*Margaritifera hembeli*	T	No	Clear, relatively shallow headwater streams, with moderately swift current and rocky outcroppings. Found in Grant and Rapides parishes, central Louisiana.

Common Name	Scientific Name	Federal Status [a]	Critical Habitat in Louisiana	Habitat Description
Pink Mucket	*Lampsilis abrupta*	E	No	Riffle areas in rivers that exhibit a moderate current and mud or sand substrates. Found in Morehouse Parish, northeastern Louisiana.
Rabbitsfoot	*Quadrula cylindrica cylindrica*	T	No	Shallow area of streams and rivers with sand and gravel along the banks. Found in Morehouse Parish, northeastern Louisiana.

[a] E = Endangered, T = Threatened
Source: (USFWS, 2015c)

Alabama Heelsplitter. The Alabama heelsplitter, or inflated heelsplitter, has an oval, thin shell and grows up to about 5.5 inches in length. The shell is brown to black and young specimens sometimes have green rays. The inner shell is a pink to purple color. The Alabama heelsplitter was federally listed as threatened in 1990 (55 FR 39868 39872, September 28, 1990). This species can be found regionally in rivers throughout Alabama, Louisiana, and Mississippi. In Louisiana, it occurs in the Pearl and Pontchartrain river basins in six parishes in the southeastern part of the state (LDWF, 2006d) (USFWS, 2015ac).

The Alabama heelsplitter inhabits sand, mud, silt, and sandy-gravel substrates. It prefers a soft, stable substrate in slow to moderate current. Threats to the Alabama heelsplitter include habitat destruction due to sand and gravel mining, and channel maintenance (dredge disposal). (USFWS, 1993a)

Fat Pocketbook. The fat pocketbook is a mussel with a globose shell. This species has as smooth shell that is typically yellowish brown and lacks rays (USFWS, 1989). This species was listed as endangered in 1976 (41 FR 24062 24067, June 14, 1976). Regionally, this species is known or believed to occur in Arkansas, Illinois, Indiana, Kentucky, Louisiana, Mississippi, and Missouri. In Louisiana, the fat pocketbook occurs in the Mississippi River basin in four parishes in the northeastern portion of the state (USFWS, 2015ad).

This species is typically found in streams, tributaries, and channels with sand, mud, or gravel, or substrates. Threats to this species include habitat loss and degradation due to water impoundment, channel maintenance, and dredging. The creation of impoundments in the fat pocketbook’s range has inundated habitats and altered water flow. Dredging may lead to the accidental removal of individuals, increased erosion, and reduce habitat stability. (USFWS, 2007)

Louisiana Pearlshell. The Louisiana pearlshell is an oblong freshwater mussel with a round anterior end and a low pointed posterior ridge, approximately 4 inches in length. The epidermis is brown to blackish and the nacre is white to purple with numerous pits. This species was federally listed as threatened in 1988 (53 FR 3567 3570, February 5, 1988). The Louisiana pearlshell occurs in Arkansas and Louisiana. In Louisiana, the species is known from Grant and Rapides parishes in the central part of the state (USFWS, 2015ae).

Suitable habitat for the Louisiana pearlshell consists of clear, relatively shallow headwater streams, with a moderately swift current and rocky outcroppings. They are usually associated with the riffle area of the stream and not typically found in stagnant pools or deeper sandy areas (USFWS, 2015ae). Threats to the species include siltation, pollution, and other factors affecting water quality, as well as beaver dams that alter the water flow in streams (LDWF, 2006e).

Pink Mucket (pearlymussel). The pink mucket has a smooth yellowish-brown colored round shell that is approximately 4 inches long. The shell is yellow to yellowish-brown in color. Females have a broadly rounded posterior, while males have a slightly pointed posterior (USFWS, 1985). This species was federally listed as endangered in 1976 (41 FR 24062 24067, June 14, 1976). Regionally, the pink mucket occurs in Arkansas, Alabama, Illinois, Kentucky, Louisiana, Missouri, Ohio, and Virginia. In Louisiana, this species is known or believed to occur in Morehouse Parish in the northeastern portion of the state (USFWS, 2015af).

Suitable habitat for the pink mucket consists of moderate to fast-flowing rivers and their tributaries with mud and sand in shallow riffle areas. Threats to the survival of this species include dams that disrupt the natural flow, impoundment, and water quality degradation (USFWS, 2015ag).

Rabbitsfoot. The rabbitsfoot can grow up to 6 inches in length. The shell of the rabbitsfoot mussel is generally yellowish, greenish, or olive in color and turns yellowish brown with age (USFWS, 2015ah). The rabbitsfoot mussel was federally listed as threatened in 2013 (78 FR 57076 57097, September 17, 2013). Species range exists throughout the Mississippi, Ohio, Wabash, Cumberland, and Tennessee River drainages in 13 states (LDWF, 2006f). In Louisiana, rabbitsfoot is known only from Morehouse Parish in the northeastern portion of the state (USFWS, 2015ah). It has been estimated that these mussels have been eliminated from about 64 percent of its existing historical range and only about 10 of the populations that exists are considered to be large enough to be viable for the long term (USFWS, 2015ai) (USFWS, 2011). A critical habitat designation was recorded in 2015 at 31 stream segments where the mussels are known to occur (80 FR 24691 24774, April 30, 2015); although no critical habitat for rabbitsfoot mussel is defined in Louisiana (USFWS, 2015aj).

The rabbitsfoot is a sedentary filter feeder that obtains its oxygen and food from the water column. The rabbitsfoot prefers the shallow area of streams and rivers with sand and gravel along the banks. These mussels seldom burrow and instead use the gravel along the banks as refuge in fast moving rivers and streams. For reproduction, this species prefers a stable and undisturbed habitat with a sufficient population of host fish including several genera of shiners (*Cyprinella, Luxilus, and Notropis*). The current threats to the rabbitsfoot mussels include the loss of habitat, isolation of populations, range restrictions, sedimentation, and presence of exotic non-native species. (USFWS, 2011)

Plants

Two endangered and one threatened plant species are federally listed for Louisiana as summarized in Table 8.1.6-11. The *Geocarpon minimum* occurs in north-central and northwestern Louisiana. The Louisiana Quillwort (*Isoetes louisianensis*) occurs in eastern Louisiana. The American Chaffseed (*Schwalbea americana*) occurs in southwestern Louisiana

(USFWS, 2015c) (USFWS, 2016c). Information on the habitat, distribution, and threats to the survival and recovery of each of these species in Louisiana is provided below.

Table 8.1.6-11: Federally Listed Plant Species of Louisiana

Common Name	Scientific Name	Federal Status [a]	Critical Habitat in Louisiana	Habitat Description
(No common name)	*Geocarpon minimum*	T	No	Areas with sparse vegetation and soils that have high concentrations of magnesium and sodium. Found in 4 parishes in north-central and northwestern Louisiana.
American Chaffseed	*Schwalbea americana*	E	No	Successional habitats such as pine flatwoods, fire-maintained savannas, and peaty wetlands. Found in Allen and Beauregard parishes, southwestern Louisiana.
Louisiana Quillwort	*Isoetes louisianensis*	E	No	Sandy soils and gravel bars in or near shallow backwater streams and overflow channels in riparian woodland/bayhead forests of pine flatwoods and upland longleaf pine. Found in St. Tammany and Washington parishes, eastern Louisiana.

[a] E = Endangered, T = Threatened
Source: (USFWS, 2015c)

No common name (Geocarpon minimum). *Geocarpon minimum* is a small annual species that is only easily visible for a few weeks during spring (USFWS, 2015ak). This species has opposite leaves and branches that measure approximately 0.4 to 1.5 inches long (USFWS, 1993b). *Geocarpon minimum* was listed as threatened in in 1987 (52 FR 22930 22933, June 16, 1987). This species is known to or believed to occur in Arkansas, Louisiana, Missouri, and Texas. In Louisiana, this species is known to occur in four parishes in the north-central and northwestern regions of the state (USFWS, 2015ak).

Throughout most its range, this species is found in areas with sparse vegetation and soils that have high concentrations of magnesium and sodium. Threats to the species include alteration or destruction of its habitat due to climate change, competition with other plant species, and changes in soil due to development. (USFWS, 1993b)

American Chaffseed. The American chaffseed is a perennial member of the figwort family that grows 12 to 24 inches high, with a large cluster of purple and yellow tubular flowers. It was listed as endangered in 1992 (57 FR 44703 44708, September 29, 1992). The American chaffseed is a Coastal Plain species and ranges throughout the Atlantic and Gulf coasts (USFWS, 2014e). In 2008, 53 known extant sites were recorded in this range. In Louisiana, the species is known from Allen and Beauregard parishes in the southwestern part of the state (USFWS, 2015al).

Suitable habitat for this species includes "pine flatwoods, fire-maintained savannas, and ecotonal areas between peaty wetlands and xeric (dry) sandy soils, bog borders, and other open grass-sedge systems." "The American chaffseed occurs in sandy (sandy peat, sandy loam), acidic, and seasonally moist to dry soils… [and]... in species-rich plant communities where grasses, sedges, and savanna dicots are numerous" (USFWS, 2014e). The American chaffseed is dependent on fire and fluctuating water tables to maintain crucial conditions that it requires. Threats to the

American chaffseed are loss of habitat due to development and natural vegetation succession (USFWS, 2014e).

Louisiana Quillwort. The Louisiana quillwort "is a small, semi-aquatic, facultative evergreen plant with spirally arranged leaves arising from a globose, two-lobed corm. The pliant, hollow leaves are transversely septate and measure 2 to 3 millimeters (mm) (0.12 inch) wide and up to 40 centimeters (cm) (16.0 inches) long. Spore-containing structures (sporangia) are embedded in the pale, broadened bases of the leaves" (USFWS, 1996). Louisiana quillwort was listed as endangered in 1992 (57 FR 48741 48747, October 28, 1992). The species is known or believed to occur in Alabama, Louisiana, and Mississippi; in Louisiana, the species is known or believed to occur in St. Tammany and Washington parishes in the far eastern portion of the state (USFWS, 2015am).

Suitable habitat for this species includes "sandy soils and gravel bars in or near shallow backwater streams and overflow channels in riparian woodland/bayhead forests of pine flatwoods and upland longleaf pine." The most serious threat to the species is "[h]abitat loss through land use practices that significantly transform riparian forest communities and alter stream quality and dynamics." "Dredging, ditching, channelization, road construction, and off-road vehicles (ORV) can alter natural processes and result in habitat loss." In addition, timber removal, mining, feral hogs, beaver dams, and plant collection are potential threats. (USFWS, 1996)

8.1.7 Land Use, Recreation, and Airspace

8.1.7.1 Definition of the Resource

The following summarizes major land uses, recreational venues, and airspace considerations in Louisiana, characterizing existing, baseline conditions for use in evaluating the potential environmental consequences resulting from implementing the Proposed Action or Alternatives.

Land Use and Recreation

Land use is defined as "the arrangements, activities and inputs people undertake in a certain land cover type to produce, change, or maintain it" (Di Gregorio & Jansen, 1998). A land use designation can include one or more pieces of land, and multiple land uses may occur on the same piece of land. Land use also includes the physical cover, observed on the ground or remote sensing and mapping, on the earth's surface; land cover includes vegetation and manmade development (USGS, 2012c).

Recreational uses are activities in which residents and visitors participate. They include outdoor activities, such as hiking, fishing, boating, athletic events (e.g., golf), and other attractions (e.g., historic monuments and cultural sites) or indoor activities, such as museums and historic sites. Recreational resources can include trails, lakes, forests, beaches, recreational facilities, museums, historic sites, and other areas/facilities. Recreational resources are typically managed by federal, state, parish, or local governments.

Descriptions of land uses are presented in four primary categories: forest and woodlands; agricultural; developed; and public land, surface water, and other land covers. Descriptions of land ownership are presented in four main categories: private, federal, state, and tribal. Descriptions of recreational opportunities are presented in a regional fashion, highlighting areas of recreational significance within five identified regions.

Airspace

The FAA operates a network of airport towers, air route traffic control centers, and flight service stations. The FAA also develops air traffic rules, assigns use of airspace, and controls air traffic in U.S. airspace. "The Air Traffic Organization (ATO) is the operational arm of the FAA responsible for providing safe and efficient air navigation services to approximately 30.2 million square miles of airspace. This represents more than 17 percent of the world's airspace and includes all of the U.S. and large portions of the Atlantic and Pacific Oceans and the Gulf of Mexico" (FAA, 2014). The ATO is composed of Service Units (organizations) that support the operational requirements.

The FAA Air Traffic Services Unit (the Unit) manages the National Airspace System (NAS) and international airspace assigned to U.S. control and is responsible for ensuring efficient use, security, and safety of the nation's airspace. FAA field and regional offices (e.g., Aircraft Certification Offices, Airports Regional Offices, Flight Standards District Offices [FSDOs], Regional Offices & Aeronautical Center, etc.) assist in regulating civil aviation to promote safety, and develop and carry out programs that control aircraft noise and other environmental effects (e.g., air pollutants) attributed from civil aviation (FAA, 2015c). The FAA works with state aviation officials and airport planners, military airspace managers, and other organizations in deciding how best to use airspace.

8.1.7.2 Specific Regulatory Considerations

Appendix C, Environmental Laws and Regulations, summarizes numerous federal environmental laws and regulations that, to one degree or another, may affect land use in Louisiana. However, local parish, city, and village laws and regulations govern most site-specific land use controls and requirements. Furthermore, many land use controls and requirements are implemented and enforced under the umbrella of land use planning, often with the help and support of state authorities. Louisiana Revised Statutes (LRS) Title 33, Section 106 establishes the authority of a parish or municipality to make and adopt a master plan in Louisiana (Louisiana State Legislature, 2015a).

Because federal laws govern the Nation's airspace, there are no specific Louisiana state laws that would alter the existing conditions relating to airspace for this PEIS. Title 2 - Aeronautics of Revised Statutes (LAR.S.), specifically RS 2:383, addresses tall structures (Louisiana State Legislature, 2015b).

8.1.7.3 Land Use and Ownership

For the purposes of this analysis, Louisiana has been classified into primary land use groups based on coverage type as forest and woodlands; agricultural land; developed land; and public land, surface water, and other land covers. Land ownership within Louisiana has been classified into four main categories: private, federal, state, and tribal.

Land Use

Forest and woodlands comprises the largest portion of land use with 52.8 percent of Louisiana's total land area occupied by this category (Table 8.1.7-1 and Figure 8.1.7-1). Agriculture is the second largest area of land use with 25.7 percent of the total land area. As the third largest category, public land, surface water, and other land covers that are not associated with specific land uses account for 15.5 percent of the total land area. Developed areas account for approximately 6 percent of the total land area. (USGS, 2011)

Table 8.1.7-1: Major Land Use in Louisiana by Coverage Type

Land Use	Square Miles	Percent of Land
Forest and Woodland	22,810	52.8%
Agricultural Land	11,123	25.7%
Developed Land	2,593	6.0%
Public Land, Surface Water, and other Land Covers	6,678	15.5%

Source: (USGS, 2011)

Forest and Woodland

Forest and woodland areas can be found throughout the state, many of them interspersed with, and adjacent to, agricultural areas. The largest concentrations of forest are in the northwest, southwest, and southeast regions of Louisiana. The north delta (northeast region of the state) and the south delta (southern region of the state) are sparsely forested. The large majority of forest and woodland areas throughout Louisiana are privately owned (approximately 88 percent) (USFS, 2013). The Kisatchie National Forest consists of several units in central and northern Louisiana. Section 8.1.6 presents additional information about terrestrial vegetation.

<u>State Forests</u>

The Alexander State Forest (13 square miles) is the only state forest in Louisiana. The state forest is in central Louisiana and is owned and managed by the Louisiana Department of Agriculture and Forestry. The forest is primarily managed as a commercial forest. (LDWF, 2015i)

<u>Private Forest and Woodland</u>

Nearly both industrial (35 percent) and non-industrial (65 percent) private landowners own approximately 88 percent of Louisiana's total forestland, collectively. Reasons for private ownership of forest and woodland areas include aesthetics, cultural heritage, privacy, commercial use, and wildlife habitat (USFS, 2013). For additional information regarding forest and woodland areas, see Section 8.1.6, Biological Resources, and Section 8.1.8, Visual Resources.

Agricultural Land

Agricultural land exists in every region of the state (Figure 8.1.7-1). Approximately 26 percent of Louisiana's total land area is classified as agricultural land (11,123 square miles). In 2012, there were 28,093 farms in Louisiana. Approximately 87 percent of the farms were owned and operated by small, family businesses, with the average farm size of 281 acres (USDA, 2012). Some of the state's largest agricultural uses include soybeans, sugarcane, rice, corn, and cattle. Other agricultural uses include hay, cotton, poultry, and aquaculture (USDA, 2014). For more information by parish, access the USDA Census of Agriculture website: http://www.agcensus.usda.gov/Publications/2012/Full_Report/Census_by_State/Louisiana/.

Developed Land

Developed land in Louisiana tends to be concentrated within major metropolitan areas and surrounding cities, towns, and suburbs (Figure 8.1.7-1). Although only 6 percent of Louisiana land is developed, these areas are highly utilized for residential, commercial, industrial, recreational, and government purposes. Table 8.1.7-2 lists the top five developed metropolitan areas within the state and their associated population estimates, and Figure 8.1.7-1 shows where these areas are within the Developed land use category.

Table 8.1.7-2: Top Five Developed Metropolitan Areas

Metropolitan Area	Population Estimate
New Orleans	1,251,849
Baton Rouge	825,478
Shreveport	445,142
Lafayette	484,974
Houma	211,348
Total Population of Metropolitan Areas	**3,218,791**
Total Estimated State Population	**4,649,676**

Source: (U.S. Census Bureau, 2015d)

Land Ownership

Land ownership within Louisiana has been classified into four main categories: private, federal, state, and tribal.[78]

[78] Land ownership data were retrieved from the Protected Areas Database of the United States (PAD-US), produced by USGS (http://gapanalysis.usgs.gov/padus/). This dataset categorizes lands across the U.S. by conservation, land management, planning, recreation, and ownership, as well as other uses. It is an extensive dataset that contains large quantities of information relevant to the Proposed Action. The data was queried to show Owner and used USGS' PAD-US ownership symbolization for consistency. The PADUS 1.3 geodatabase was downloaded in the summer of 2015, and used consistently throughout all these maps for each state and D.C.

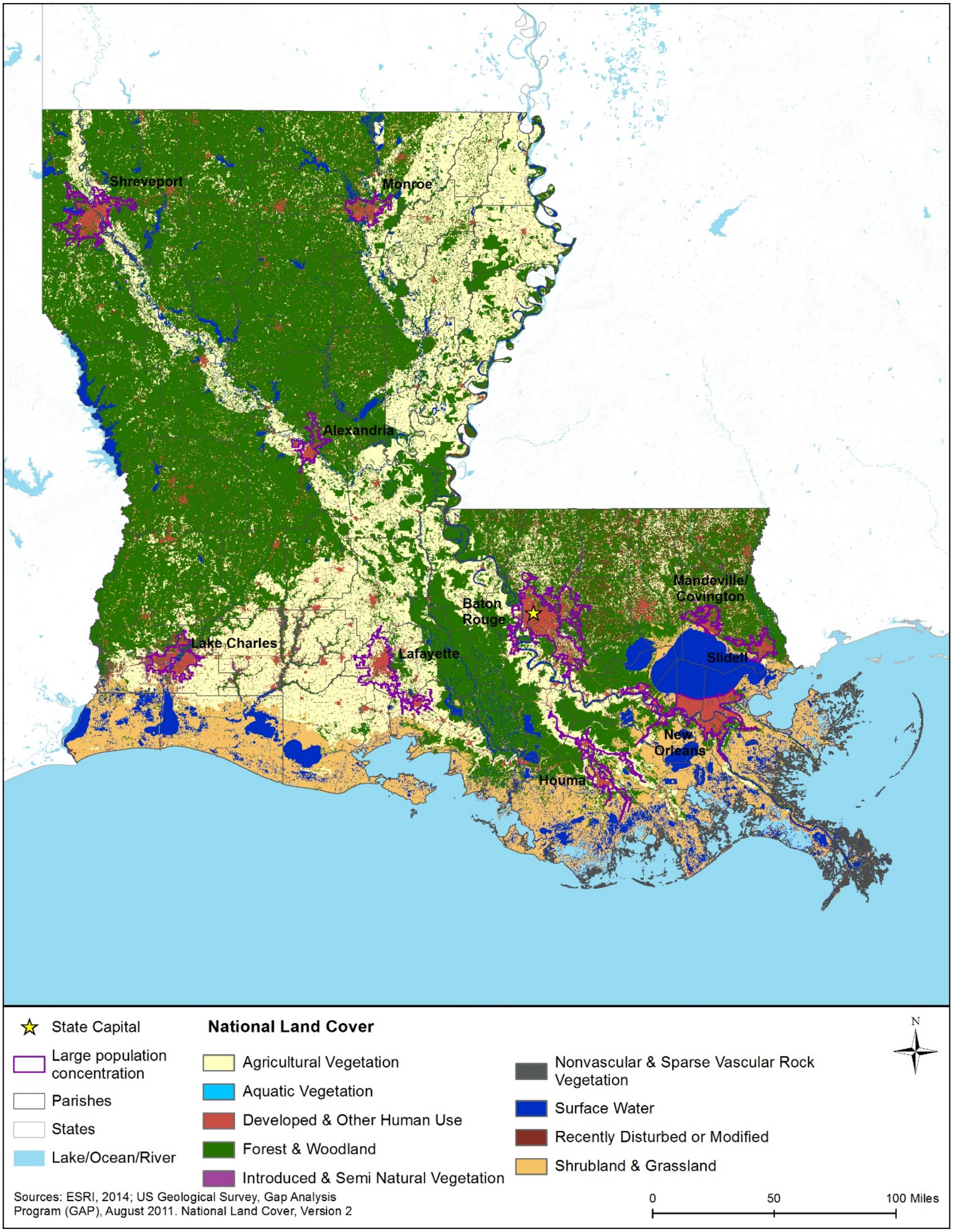

Figure 8.1.7-1: Major Land Use Distribution by Coverage Type

Private Land

The majority of land in Louisiana is privately owned, with most of this land falling under the land use categories of agricultural, forest and woodland, and developed (Figure 8.1.7-1). Highly developed, urban, metropolitan areas transition into suburban, agriculture, shrub, and woodland areas, which then transition into more wild and remote areas. Private land exists in all regions of the state[79].

Federal Land

The federal government manages 2,059 square miles (3.9 percent) of Louisiana land with a variety of land types and uses, including military bases and facilities, national wildlife refuges, national forest, heritage areas, historical parks, and national monuments (USGS, 2012d) (USGS, 2014e). Four federal agencies manage the majority of federal lands throughout the state (Table 8.1.7-3 and Figure 8.1.7-2). There may be other federal lands, but they are not shown on the map due to their small size relative to the entire state.

Table 8.1.7-3: Federal Land in Louisiana

Agency[a]	Square Miles	Representative Type
Department of Defense (DoD)	326	Military Bases, Facilities, USACE Recreation Areas
USFWS	830	National Wildlife Refuges
U.S. Forest Service (USFS)	863	National Forest
National Park Service (NPS)[b]	40	Heritage Areas, Historical Parks, Monument
Total	**2,059**	**NA**

[a] Table identifies land wholly managed by the Agency; additional properties may be managed by or affiliated with the Agency.
[b] Additional trails and corridors pass through Connecticut that are part of the National Park System.
Sources: (USGS, 2012d) (USGS, 2014e)

- The DoD owns and manages 326 square miles used for military bases, military facilities, forts, and 12 USACE recreation areas;
- The USFWS owns and manages 830 square miles consisting of 23 National Wildlife Refuges in Louisiana;
- The USFS owns and manages 863 square miles set aside as the Kisatchie National Forest; and
- The NPS manages 40 square miles consisting of one National Monument, two National Historical Parks, one National Historical Trail, and one National Historical Park and Preserve. (USGS, 2012d) (USGS, 2014e)

State Land[80]

The Louisiana state government owns approximately 2,158 square miles of land composed of forest and woodland, wildlife management areas, wildlife refuges, state parks, and recreation

[79] Total acreage of private land could not be obtained for the state.
[80] State land use data for tables and narrative text were derived from specific state sources and may not correspond directly with USGS data that was used for developing maps and figures.

areas. Two state agencies, the Department of Fish and Wildlife and Department of Natural Resources manage most of the state land (Table 8.1.7-4). (USGS, 2012d)

Table 8.1.7-4: State Land in Louisiana[a]

Agency	Square Miles	Representative Type
Department of Agriculture and Forestry	13	State Forest
Department of Natural Resources	715	
Department of Fish and Wildlife	1,313	Wildlife Management Areas, Wildlife Refuges, Conservation Areas
State Land Office	40	State Lands, School Indemnity Lands
State Parks	49	State Parks, Recreation Areas
Other State Land	28	Miscellaneous

[a] Acres are not additive due to overlapping boundaries of the State Forests, State Parks and Recreation Areas, and Wildlife Management Areas.
Source: (USGS, 2012d)

- The Department of Agriculture and Forestry manages 13 square miles that consists of the Alexander State Forest (LDWF, 2015i).
- The Department of Natural Resources manages 715 square miles consisting of state lands with energy and natural resources.
- The LDWF manages 1,313 square miles consisting of 52 wildlife management areas, 4 wildlife refuges, and 2 conservation areas and corridors (LDWF, 2015j).
- The State Land Office manages 40 acres of state land consisting of state lands and school indemnity lands that are held in trust for public school purposes.
- The Louisiana State Parks owns and manages 49 square miles consisting of 22 State Parks, 1 Preservation Area, and 19 Historic Sites (Louisiana State Parks, 2015). (USGS, 2012d)

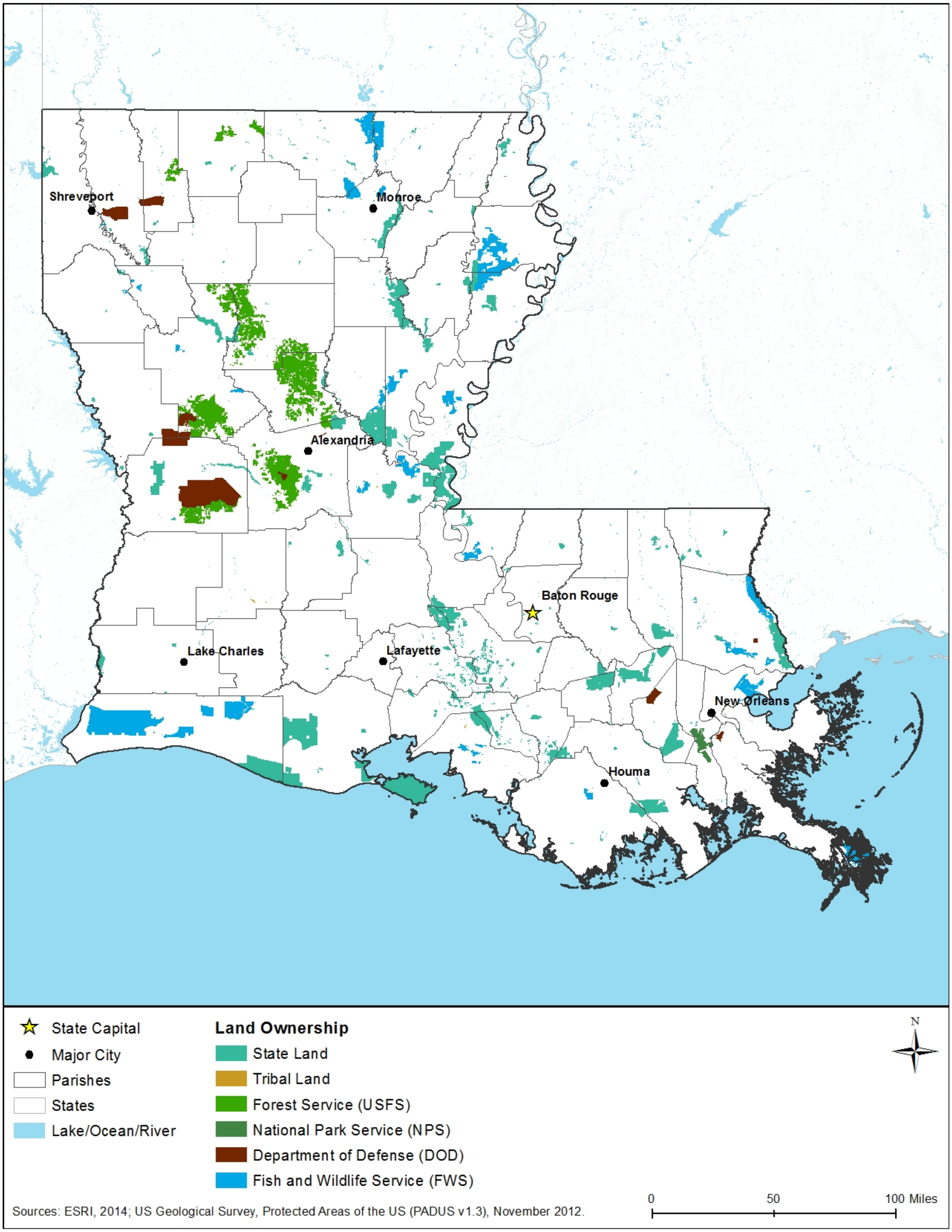

Figure 8.1.7-2: Major Land Ownership Distribution

Tribal Land

The Bureau of Indian Affairs, along with individual tribes, manages 1.8 square miles, or less than 0.1 percent of the total land within Louisiana.[81] These lands are composed of four Indian Reservations in the state (Table 8.1.7-5). For additional information regarding tribal land, see Section 8.1.11, Cultural Resources.

Table 8.1.7-5: Indian Reservations and Other Land Holdings in Louisiana

Reservation Name	Square Miles
Chitimacha Reservation	0.4
Coushatta Reservation	1.2
Jena Band of Choctaw	<0.1
Tunica-Biloxi Reservation	0.2
Total	**1.8**

Sources: (USGS, 2012d) (USGS, 2014e)

8.1.7.4 Recreation

Louisiana consists of forests, swamps, and beaches. The Mississippi and other major rivers and the Gulf of Mexico influence recreation in the state; recreational areas in forests, wetlands, and barrier islands. The state is known for its assortment of wildlife: 23 national wildlife refuges are in the state, with recreational activities including fishing, boating, and seasonal, licensed hunting (USFWS, 2015an). *A Birder's Guide to Louisiana* contains trails and directions to over 100 areas popular for birdwatching and wildlife viewing (Atchafalaya National Heritage Area, 2015). On the community level, towns, cities, and parishes provide an assortment of indoor and outdoor recreational facilities, including athletic fields and courts, playgrounds, picnicking areas, and lake, river, or beach access points. Availability of community-level facilities is typically commensurate to the population's needs.

This section discusses recreational opportunities available at various locations throughout Illinois. For information on visual resources, see Section 8.1.8, Visual Resources, and for information on the historical significance of locations, see Section 8.1.11, Cultural Resources.

Northern Region

Also known as Sportsman's Paradise, the Northern Region is bordered by Arkansas to the north, the Mississippi River and Mississippi to the east, and Texas to the west (see Figure 8.1.7-3).[82] The Northern Region is known for its wildlife; fishing and hunting are popular recreational activities.

[81] Although the Bureau of Indian Affairs "manages" American Indian lands, the Bureau of Indian Affairs is different than other land management agencies as the lands are held in trust for sovereign nations.

[82] Recreational area data was retrieved from the Protected Areas Database of the United States (PAD-US), produced by USGS (http://gapanalysis.usgs.gov/padus/). This dataset categorizes lands across the U.S. by conservation, land management, planning, recreation, and ownership, as well as other uses. It is an extensive dataset that contains large quantities of information relevant to the Proposed Action. The data was queried to show the Primary Designation Type of area. To show these in the map, recognizable symbols (e.g., varying shades of green for National Parks and Forests) were used as PAD-US does not have a standard symbolization for recreational resources. The PADUS 1.3 geodatabase was downloaded in the summer of 2015, and used consistently throughout all these maps for each state and D.C.

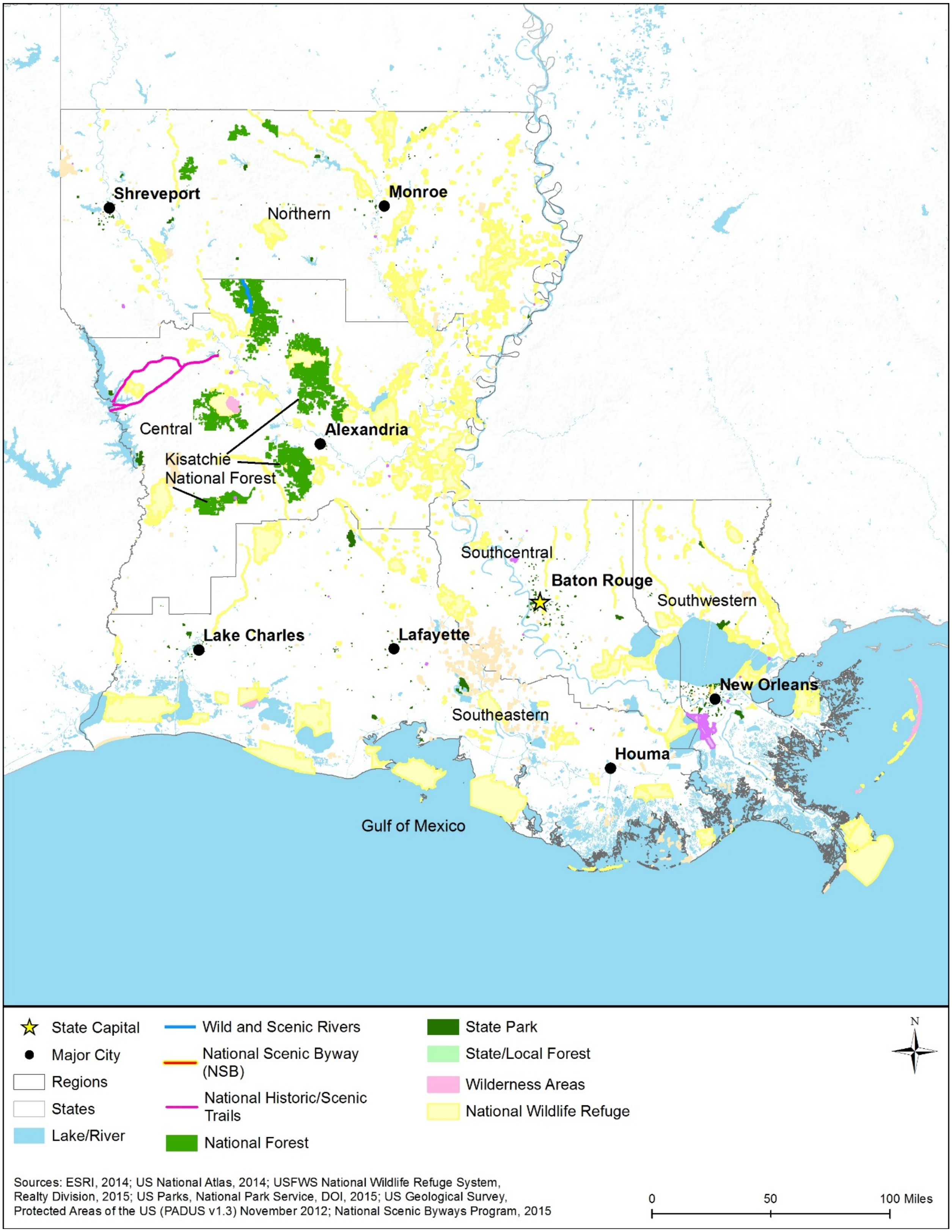

Figure 8.1.7-3: Louisiana Recreation Resources

The Chemin-A-Haut, Lake Claiborne, Lake D'Arbonne, Lake Bistineau, Jimmie Davis, and Poverty Point Reservoir State Parks are all in the Northern Region: parks have hiking, bicycling, and other trail use; camping and picnicking; canoeing, boating, fishing, swimming beaches and pools, and other water activities (CRT, 2015a).

Shreveport is the major city in this region, often visited for its recreational activities. Golf courses in and around Shreveport host high-profile tournaments, casinos are another large tourism draw. Available recreation in and around the city include hiking, bicycling, and other trail use on multi-use paths within public parks; swimming, sailing, canoeing, kayaking, and other water activities on the Red River or Cross Lake and Lake Bistineau. (The Official Website of Shreveport, 2013)

Central Region

Louisiana's Central Region, also known as the Crossroads, is bordered to the west by Texas and to the east by Mississippi (Figure 8.1.7-3). This region is composed of hills, deciduous forests, lakes, and reservoirs all utilized for recreational activities. State parks in this region are the North Toledo Bend, South Toledo Bend, Hodges Gardens, and Chicot State Park: parks have hiking, bicycling, and other trail use; camping and picnicking; canoeing, boating, fishing, swimming beaches and pools, and other water activities (CRT, 2015a).

The Kisatchie National Forest is known for fishing and hunting, and has multi-use trails with varying distances and difficulty. Activities within the forest include hiking, horseback riding, birdwatching, and other trail use; camping and picnicking; fishing, boating, swimming, and other water activities; and, licensed, seasonal big game, small game, and game bird hunting. (USFS, 2015)

Southwestern Region

The Southwestern Region, also known as Cajun Country, is bordered to the east by Texas and the south by the Gulf of Mexico (see Figure 8.1.7-3). The region consists of hills and prairies, leading into wetlands on the Gulf coast. Fishing in the Southwestern Region is quite extensive, with available locations in fresh, brackish, and saltwater. In addition to fish, shrimping, oystering, crabbing, crawfishing, and hunting reptiles and amphibians are also major recreational activities. In addition to the barrier islands, offshore rigs and manmade reefs provide additional fishing areas, attracting baitfish and their predators. (LDWF, 2015k)

Southcentral Region

The Southcentral Region, or Plantation Country, is bordered Mississippi to the north and the Mississippi River passes through the center of the region to the west of Baton Rouge (see Figure 8.1.7-3). Tourists visit the region to see restored plantations and antebellum homes (Visit Baton Rouge, 2015). Plantation homes such as The Myrtles Plantation, Rosedown Plantation State Historic Site, and Laura Plantation provide historical tours of restored buildings and grounds (The Myrtles Plantation, 2015) (CRT, 2015b) (Laura Plantation, 2015).

Southeastern Region

The Southeastern Region is composed mainly of the greater New Orleans metropolitan area. It is bordered to the north by Mississippi, the east by the Pearl River and Mississippi, and the south by the Gulf of Mexico (see Figure 8.1.7-3).

Nearly 9.3 million tourists visited New Orleans in 2013 (The City of New Orleans, 2015). New Orleans is a city rich in attractions, known for music venues, festivals attended by thousands such as Mardi Gras, and neighborhoods famous for their history and culture. Popular outdoor activities in New Orleans include golfing, fishing, and horseback riding. (Visit New Orleans, 2015)

8.1.7.5 Airspace

The FAA uses the NAS to provide for aviation safety. The NAS includes Special Use Airspace (SUA) consisting of Restricted Areas, Warning Areas, and Military Operations Areas (MOAs). The FAA controls the use of the NAS with various procedures and practices (such as established flight rules and regulations, airspace management actions, and air traffic control procedures) to ensure the safety of aircraft and protection of the public.

Airspace Categories

There are two categories of airspace or airspace areas:

1) Regulatory airspace consists of controlled airspace (Class A, B, C, D, and E airspace areas in descending order of restrictive operating rules), and restricted and prohibited areas.
2) Non-regulatory airspace consists of MOAs, warning areas, alert areas, and controlled firing areas.

Within each of these two categories, there are four types of airspace: controlled, uncontrolled, special use, and other airspace. The categories and types of airspace are dictated by the complexity or density of aircraft movements, the nature of the operations conducted within the airspace, the level of safety required, and the national and public interest. Figure 8.1.7-4 depicts the different classifications and dimensions for controlled airspace. Air Traffic Control (ATC)[83] service is based on the airspace classification (FAA, 2008).

[83] ATC – Approved authority service to provide safe, orderly and expeditious flow of air traffic operations. (FAA, 2015d)

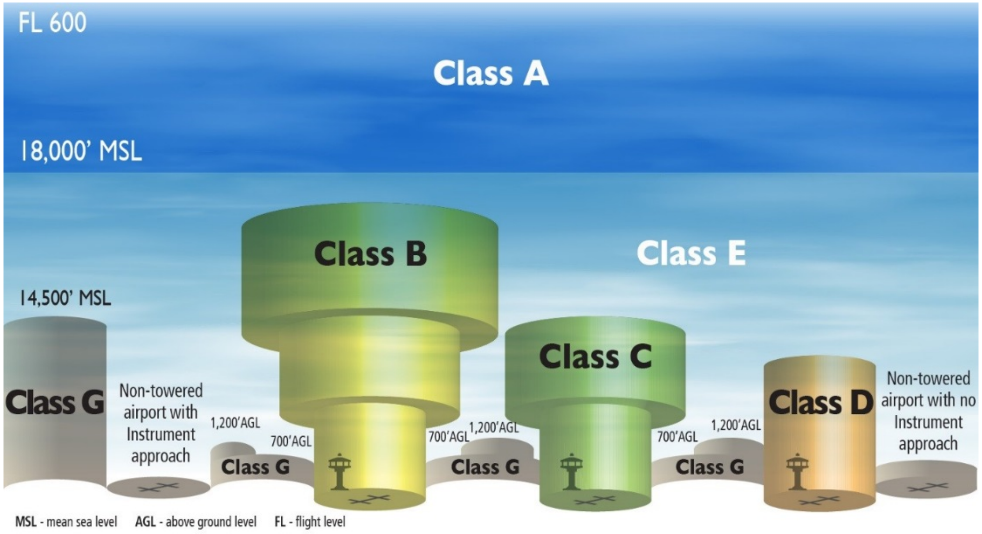

Figure 8.1.7-4: National Air Space Classification Profile

Source: Derived from (FAA, 2008)

Controlled Airspace

- **Class A:** Airspace from 18,000 feet to 60,000 feet Mean Sea Level (MSL)[84]. Includes the airspace over waters off the U.S. coastlines (48 contiguous states and Alaska) within 12 Nautical Miles (NM). All operations must be conducted under Instrument Flight Rules (IFR).[85]
- **Class B:** Airspace from the surface up to 10,000 feet MSL near the busiest airports with heavy traffic operations. The airspace is tailored to the specific airport in several layers. An ATC clearance is required for all aircraft to operate in this area.
- **Class C:** Airspace from the surface to 4,000 feet above the airport elevation surrounding the airport. Applies to airports with an operational control tower, serviced by a radar approach control, and certain number of IFR operations or total number of passengers boarding aircrafts. Airspace is tailored in layers, but usually extends out to 10 NM from 1,200 feet to 4,000 feet above the airport elevation. Entering Class C airspace requires radio contact with the controlling ATC authority, and an ATC clearance is ultimately required for landing.
- **Class D:** Airspace from the surface to 2,500 feet above the airport elevation surrounding airports with an operational control tower. Airspace area is tailored. Aircraft entering the airspace must establish and maintain radio contact with the controlling ATC.
- **Class E:** Controlled airspace not designated as Class A, B, C, or D. Class E airspace extends upward from the surface or a designated altitude to the overlying or adjacent controlled airspace (FAA, 2008).

[84] MSL – The average level of for the surface of the ocean; "The height of the surface of the sea midway between the average high and low tides" (Merriam Webster Dictionary, 2015).
[85] IFR – Rules for the conduct of flights under instrument meteorological conditions (FAA 2015a).

Uncontrolled Airspace

- **Class G:** No specific definition. Refers generally to airspace not designated as Class A, B, C, D, or E. Class G airspace is from the surface to the base of Class E airspace.

Special Use Airspace

SUA designates specific airspace that confines or imposes limitations on aircraft activities (See Table 8.1.7-6).

Table 8.1.7-6: SUA Designations

SUA Type	Definition
Prohibited Areas	"Airspace of defined dimensions identified by an area on the surface of the earth within which the flight of aircraft is prohibited. Such areas are established for security or other reasons associated with the national welfare. These areas are published in the Federal Register and are depicted on aeronautical charts."
Restricted Areas	"Airspace identified by an area on the surface of the earth within which the flight of aircraft, while not wholly prohibited, is subject to restrictions. Activities within these areas must be confined because of their nature or limitations imposed upon aircraft operations that are not a part of those activities or both. Restricted areas denote the existence of unusual, often invisible, hazards to aircraft such as artillery firing, aerial gunnery, or guided missiles. Penetration of restricted areas without authorization from the using or controlling agency may be extremely hazardous to the aircraft and its occupants. Restricted areas are published in the Federal Register and constitute 14 CFR Part 73."
Warning Areas	"Airspace of defined dimensions, extending from three NM from the U.S. coast, which contains activity that may be hazardous to nonparticipating aircraft. The purpose of such warning areas is to warn non-participating pilots of the potential danger. A warning area may be located over domestic or international waters or both."
MOAs	"Airspace of defined vertical and lateral limits established for separating certain military activities (e.g., air combat maneuvers, air intercepts, testing, etc.) from IFR traffic. Whenever an MOA is in use, non-participating IFR traffic may be cleared through a MOA if IFR separation can be provided by ATC. Otherwise, ATC will reroute or restrict nonparticipating IFR traffic."
Alert Areas	"Depicted on aeronautical charts to inform non-participating pilots of areas that may contain a high volume of pilot training or an unusual type of aerial activity. Pilots should be particularly alert when flying in these areas. All activity within an alert area must be conducted in accordance with CFRs, without waiver, and pilots of participating aircraft and pilots transiting the area are responsible for collision avoidance."
Controlled Firing Areas (CFAs)	"Activities that, if not conducted in a controlled environment, could be hazardous to nonparticipating aircraft. The distinguishing feature of the CFA, as compared to other special use airspace, is that its activities are suspended immediately when spotter aircraft, radar, or ground lookout positions indicate an aircraft might be approaching the area. There is no need to chart CFAs since they do not cause a nonparticipating aircraft to change its flight path."
National Security Areas (NSA)	"Airspace of defined vertical and lateral dimensions established at locations where there is a requirement for increased security and safety of ground facilities. Pilots are requested to avoid voluntarily flying through the depicted NSA. When it is necessary to provide a greater level of security and safety, flight in NSAs may be temporarily prohibited by regulation under the provisions of 14 CFR Section 99.7. Regulatory prohibitions are issued by System Operations, System Operations Airspace and Aeronautical Information Manual (AIM) Office, Airspace and Rules, and disseminated via Notices to Airmen (NOTAM). Inquiries about NSAs should be directed to Airspace and Rules."

Sources: (FAA, 2015d) (FAA, 2008)

Other Airspace Areas

Other airspace areas, explained in Table 8.1.7-7, include Airport Advisory, Military Training Routes (MTRs), Temporary Flight Restrictions (TFRs), Parachute Jump Aircraft Operations, published Visual Flight Rules (VFR) and IFRs, and Terminal Radar Service Areas.

Table 8.1.7-7: Other Airspace Designations

Type	Definition
Airport Advisory	There are three types: • Local Airport Advisory – Operated within 10 statute (5,280 feet/mile) miles of an airport where there is a Flight Service Station (FSS) located on an airport, but no operational control tower. The FSS advises the arriving and departing aircraft on particular conditions. • Remote Airport Advisory – Operated within 10 statute miles for specific high activity airports with no operational control tower. • Remote Airport Information Service – Used for short-term special events.
MTRs	MTRs are for use by the military for training, specifically low level combat tactics where low altitudes and high speed are needed.
TFRs	TFRs are established to: • Protect people and property from a hazard; • Provide safety for disaster relief aircraft during operations; • Avoid unsafe aircraft congestion associated with an incident or public interest event; • Protect the U.S. President, Vice President, and other public figures; • Provide safety for space operations; and • Protect in the State of Hawaii declared national disasters for humanitarian reasons. Only those TFRs annotated with an ending date and time of “permanent” are included in this Draft PEIS, since it indicates a longer, standing condition of the airspace. Other TFRs are typically a shorter duration of for a one-time specific event.
Parachute Jump Aircraft Operations	Parachute jump area procedures are in 14 CFR Part 105, while the U.S. parachute jump areas are contained in the regional Airport/Facility Directory.
Published VFRs and IRs	These are established routes for moving around and through complex airspace, like Class B airspace. VFRs are procedures used to conduct flights under visual conditions. IFRs are procedures used to conduct flights with instruments and meteorological conditions.
Terminal Radar Service Areas	Airspace areas that are not one of the established U.S. airspace classes. These areas provide additional radar services to pilots.

Sources: (FAA, 2015d) (FAA, 2008)

Aerial System Considerations

Unmanned Aerial Systems

Unmanned Aerial Systems (UASs) are widely used by the military, private entities, public service, educational institutions, federal/state/local governments, and other agencies. The FAA’s Unmanned Aircraft Systems Integration Office integrates Unmanned Aircraft Systems (UAS) into the NAS. The *Integration of Civil Unmanned Aircraft Systems (UAS) in the National Airspace System (NAS) Roadmap of 2013* addresses the actions and considerations needed to integrate UAS into the NAS “without reducing existing capacity, decreasing safety, negatively impacting current operators, or increasing the risk to airspace users or persons and property on the ground any more than the integration of comparable new and novel technologies" (FAA, 2013 First Edition).

UAS at airports is a complex operational challenge with the need to separate UAS flight operations from mainstream air traffic. Separation can be achieved with specific UAS launch windows, special airports, or off-airport locations that allow the UAS to easily launch and recover. Special aviation procedures are applied to UAS flights. There must be the capability of Sense and Avoid (SAA) and Control and Communication (C2) during UAS operations. An Unmanned Aircraft (UA) must be able to see (or sense) other aircraft in the area and avoid the aircraft through corrected flight path changes. General equipment and operational requirements can include aircraft anti-collision lights, an altitude encoding transponder, cameras, sensors, and collision avoidance maneuvers. The C2 of the UA occurs with the pilot/operator, the UAS control station, and ATC. Research efforts, a component of the FAA's UAS roadmap, continue to mature the technology for both SAA and C2 capabilities.

Balloons

Moored balloons and unmanned free balloons cannot be operated in a prohibited or restricted area unless approval is obtained from the controlling agency. Balloons also cannot be operated if they pose a hazard to people and their property.

Obstructions to Airspace Considerations

The Airports Division of the FAA is responsible for the evaluation and analysis of proposed construction or alterations on airports. The FAA Air Traffic Office is responsible for determining obstructions to air navigation as a result of construction off airports that may affect the safe and efficient use of navigable airspace and the operation of planned or existing air navigation and communication facilities. Such facilities include air navigation aids, communication equipment, airports, federal airways, instrument approach or departure procedures, and approved off-airway routes. An Obstruction Evaluation and Airport Airspace Analysis (OE/AAA) is required when there is the potential for airport construction/alteration of a facility that may impinge upon the NAS. Per 14 CFR Part 77.9, the FAA is to be notified about construction or alterations when:

- "Any construction or alteration exceeding 200 ft. aboveground level
- Any construction or alteration:
  - within 20,000 ft. of a public use or military airport which exceeds a 100:1 surface from any point on the runway of each airport with its longest runway more than 3,200 ft.
  - within 10,000 ft. of a public use or military airport which exceeds a 50:1 surface from any point on the runway of each airport with its longest runway no more than 3,200 ft.
  - within 5,000 ft. of a public use heliport which exceeds a 25:1 surface
- Any highway, railroad, or other traverse way whose prescribed adjusted height would exceed the above noted standards
- When requested by the FAA

- Any construction or alteration located on a public use airport or heliport regardless of height or location" (FAA, 2015e).

Construction or alternative facilities (such as towers) that are subject to FCC licensing requirements are also required to have an OE/AAA performed by the FAA Airport Division.

Louisiana Airspace

The Louisiana Aviation Section, an office within the Louisiana Department of Transportation and Development, is responsible for ensuring a safe and modern airport system to include improving the aviation infrastructure. The Aviation Section's stated mission is "to improve our aviation infrastructure which provides convenient and efficient access to the state for tourism, commerce, industrial interest, recreation and economic development and continually modernize the state's public airports to meet the changing needs of the aviation community (DOTD, 2015c). There is one FAA FSDO for Louisiana is in Baton Rouge (FAA, 2015c).

Louisiana airports are classified as those included in the State Aviation System Plan (SASP) and those that are not part of the SASP. The SASP addresses the strategic planning and future development for the state's airport system, as well as addressing key associated with their airports. (NASAO, 2015)

Figure 8.1.7-5 presents the different aviation airports/facilities residing in Louisiana, while Figure 8.1.7-6 and Figure 8.1.7-7 present the breakout by public and private airports/facilities. There are approximately 475 airports within Louisiana as presented in Table 8.1.7-8 and Figures 8.1.7-5 through 8.1.7-7 (USDOT, 2015).

Table 8.1.7-8: Type and Number of Louisiana Airports/Facilities

Type of Airport or Facility	Public	Private
Airport	70	160
Heliport	4	213
Seaplane	0	11
Ultralight	0	17
Balloonport	0	0
Gliderport	0	0
Total	74	401

Source: (USDOT, 2015)

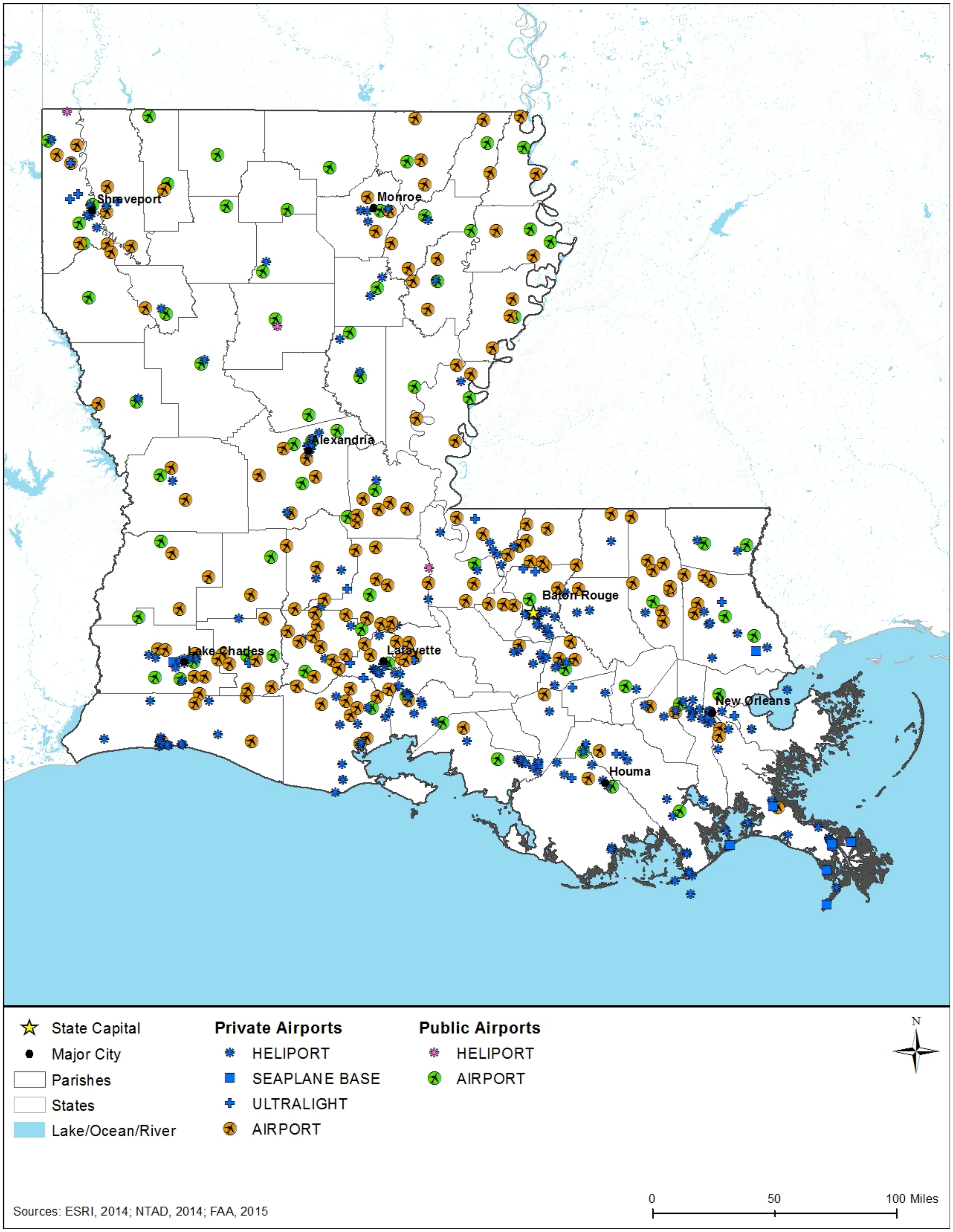

Figure 8.1.7-5: Composite of Louisiana Airports/Facilities

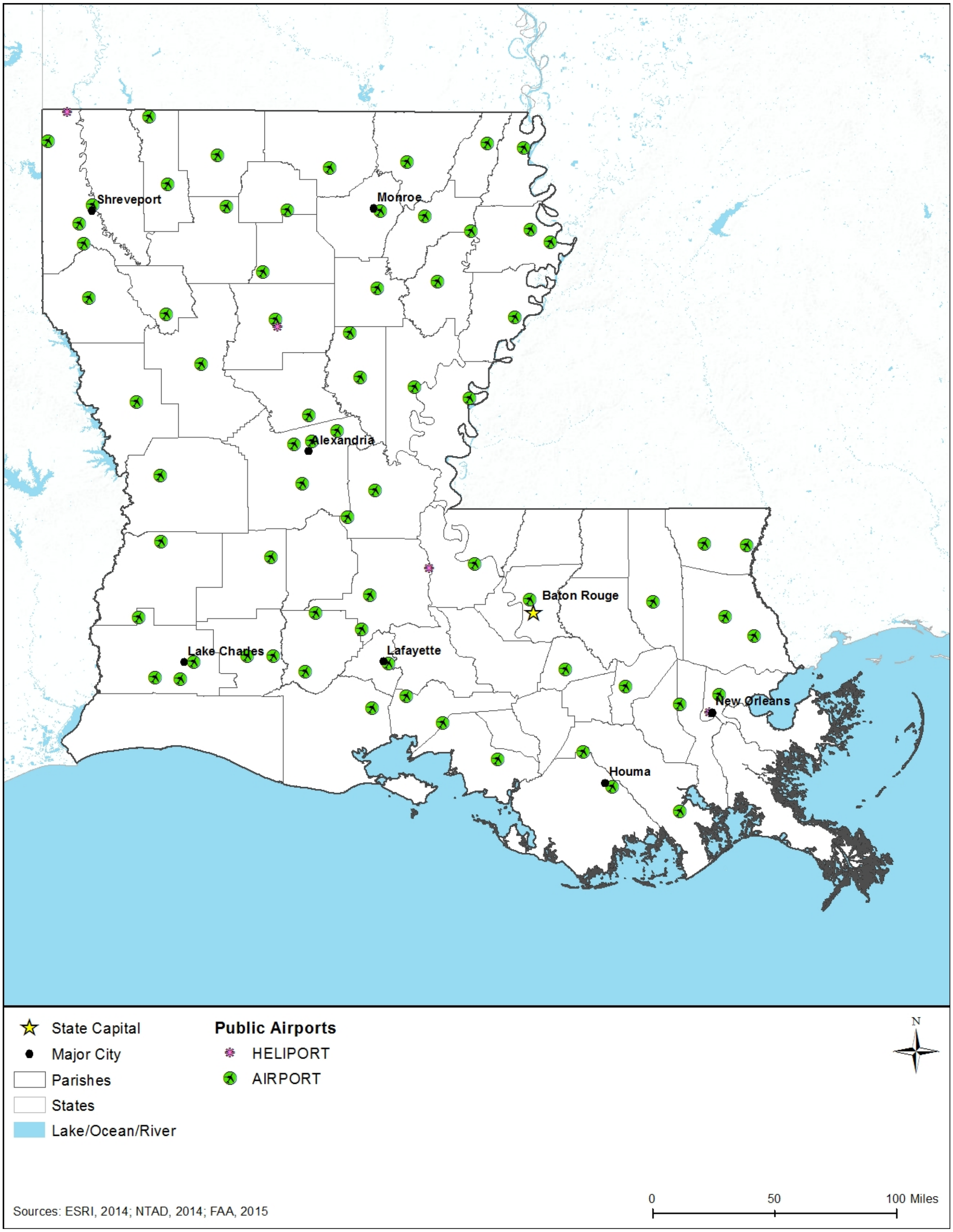

Figure 8.1.7-6: Public Louisiana Airports/Facilities

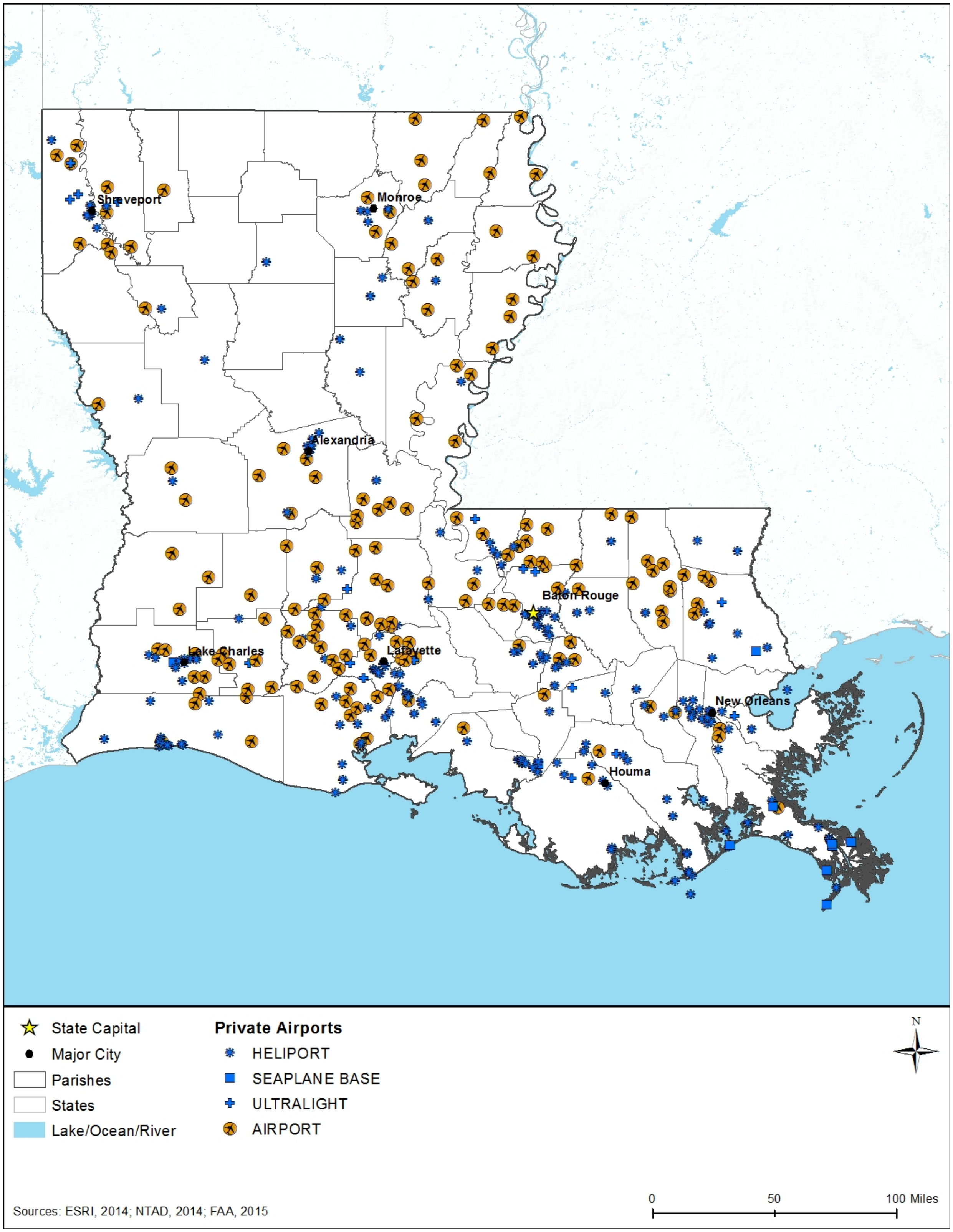

Figure 8.1.7-7: Private Louisiana Airports/Facilities

There are Class B, Class C, and Class D controlled airports in Louisiana as follows:

- One Class B –
  - Louis Armstrong New Orleans International Airport (originally named Moisant Field).
- Four Class C –
  - Shreveport, Barksdale Air Force Base;
  - Baton Rouge Metropolitan, Ryan Field;
  - Lafayette Regional; and
  - Shreveport Regional.
- Ten Class D –
  - Alexandria International;
  - Fort Polk, Polk Army Airfield;
  - Houma-Terrebonne;
  - Lake Charles Regional;
  - Lake Charles, Chennault International;
  - Monroe Regional;
  - New Iberia, Acadiana Regional;
  - New Orleans Lakefront;
  - New Orleans Naval Air Station, Alvin Callender Field; and
  - Shreveport Downtown. (FAA, 2015f)

SUAs (i.e., 8 restricted areas and 10 MOAs) located in Louisiana are as follows:

- Camp Claiborne (Restricted)
  - R-3801A – Surface to, but not including, 10,000 feet MSL;
  - R-3801B – 10,000 feet MSL to, but not including, flight level (FL) 180; and
  - R-3801C – FL 180 to FL 230.
- Fort Polk
  - R-3803A – Surface to FL 180;
  - R-3803B – FL 180 up to, but not including, FL 350;
  - R-3804A – Surface to FL 180;
  - R-3804B – Surface to 3,000 feet MSL; and
  - R-3804C – FL 180 up to, but not including, FL 350. (FAA, 2016)

The 10 MOAs for Louisiana are as follows:

- Claiborne –
  - A – 100 feet above ground level (AGL) to, but not including, 10,000 feet MSL; and
  - B – 10,000 feet MSL to, but not including, FL 180.
- Hackett – 7,000 feet MSL to, but not including, FL 180; excluding airspace below 10,000’ MSL within the following area: Beginning at lat. 31°50’31”N., long. 92°55’26”W.; to lat. 31°45’00”N., long. 93°04’26”W.; to lat. 31°51’02”N., long. 93°12’16”W.; to the point of beginning.

- Jena 1 – 100 feet AGL to 5,000 feet MSL; Excluding that airspace at and below 1,500 feet AGL within a 3 NM radius of: David G. Joyce Airport (OR5), Winnfield, LA (lat. 31°57'49"N., long. 92°39'37"W.); Olla Airport (LA32), Olla, LA (lat. 31°53'44"N., long. 92°13'04"W.); Columbia Airport (F86), Columbia, LA (lat. 32°07'20"N., long. 92°03'10"W.); Jena Airport (1R1), Jena, LA (lat. 31°40'16"N., long. 92°09'31"W.),
- Warrior –
  - 1 High – 10,000 feet MSL to, but not including, FL 180;
  - 1 Low – 100 feet AGL to, but not including, 10,000 feet MSL;
  - 2 High – 10,000 feet MSL to, but not including, FL 180;
  - 2 Low – 100 feet AGL to, but not including, 10,000 feet MSL;
  - 3 High – 10,000 feet MSL to, but not including FL 180; and
  - 3 Low – 100 feet AGL to, but not including, 10,000 feet MSL. (FAA, 2016)

The MOA of Gulfport Mississippi (Snake and Snake Low), associated with the Commander, Combat Readiness Training Center, extends into the eastern portion of the state. Altitude restrictions for the Snake MOA are 6,000 feet MSL to, but not including, FL 180; while for Snake Low the restrictions are 3,000 feet MSL to, but not including, 6,000 feet MSL. (FAA, 2016)

The SUAs for Louisiana are presented in Figure 8.1.7-8; there is one TFR (40658), one Alert Area in the southern portion of the state along the Gulf of Mexico (FAA, 2015g) – A- 381 (Surface to and including 2,000 feet MSL) (FAA, 2016). The restrictions associated with this Alert Area, when active, may impact the airspace in the area. MTRs in Louisiana, presented in Figure 8.1.7-9, consist of seven Visual Routes and four Instrument Routes.

UAS Considerations

The NPS signed a policy memorandum on June 24, 2014 that "directs superintendents nationwide to prohibit launching, landing, or operating unmanned aircraft on lands or waters administered by the National Park Service" (NPS, 2014a). There are five National Park Service units in Louisiana that must comply with this agency directive (NPS, 2015a).

Obstructions to Airspace Considerations

Title 2– Aeronautics, RS 2:383, addresses tall structures whereby parishes, towns, cities, villages, and other political subdivision can administer airport zoning regulations for those airports and landing fields within their jurisdiction. Zoning can specify the land uses permitted and regulate the height of structures and trees (Louisiana State Legislature, 2015b). The applicable jurisdiction considers the following: "the character of the flying operations to be conducted at the airport or landing field, the nature of the terrain, the height of existing structures and trees above the level of the airport or landing field, the possibility of lowering or removing existing obstructions, and the views of the agency of the federal government charged with fostering of civil aeronautics, as to the aerial approaches necessary to safe flying operations at the airport or landing field" (Louisiana State Legislature, 2015b).

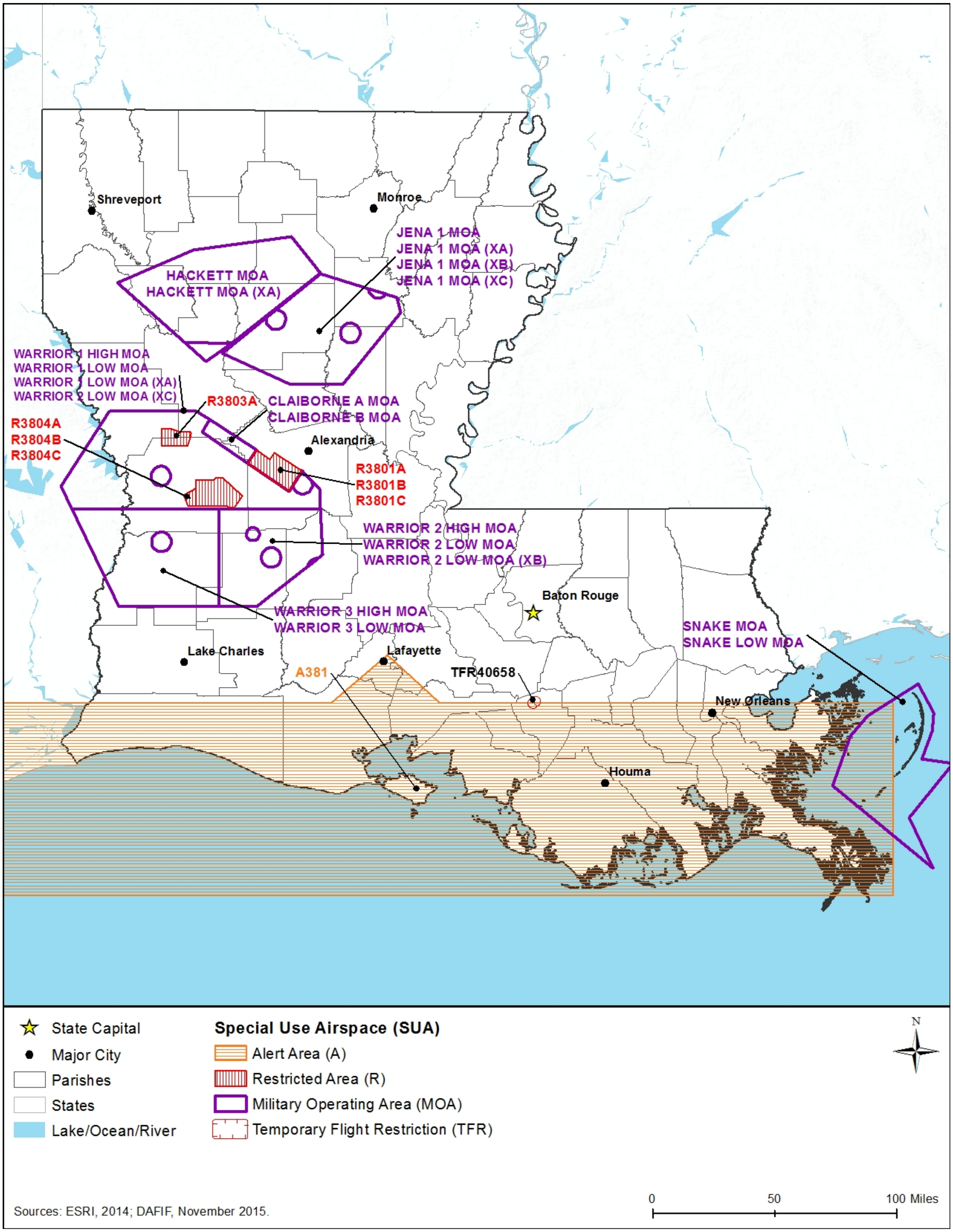

Figure 8.1.7-8: SUAs in Louisiana

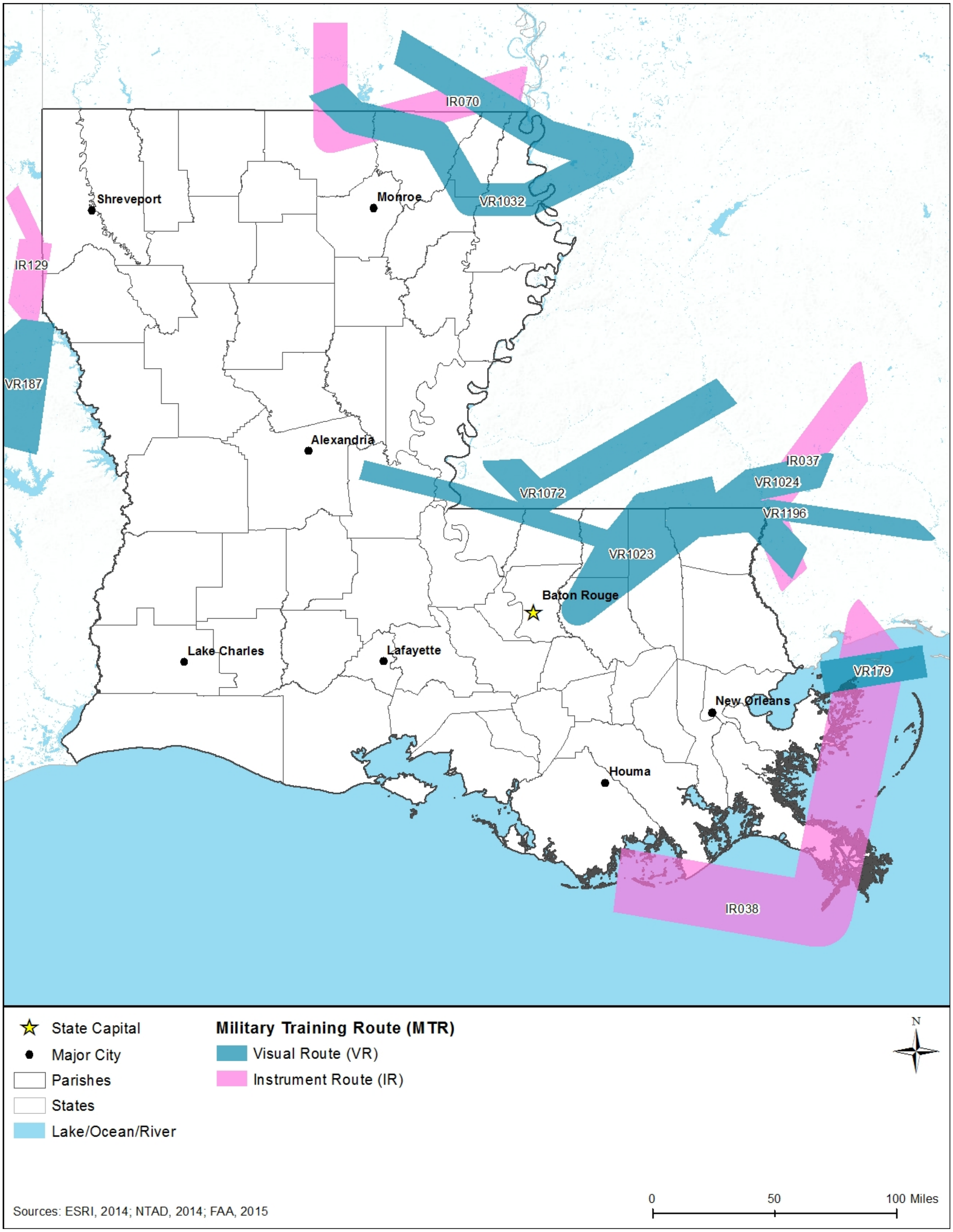

Figure 8.1.7-9: MTRs in Louisiana

8.1.8 Visual Resources

8.1.8.1 Definition of the Resource

Visual resources influence the human experience of a landscape. Various aspects combine to create visual resources, such as color, contrast, texture, line, and form. Features such as mountain ranges, city skylines, ocean views, unique geological formations, rivers, and constructed landmarks such as bridges, memorials, cultural resources, or statues are considered visual resources. For some, cityscapes are valued visual resources, whereas others prefer natural areas. While many aspects of visual resources are subjective, evaluating potential impacts on the character and continuity of the landscape is a consideration when evaluating proposed actions for NEPA and NHPA compliance. The federal government does not have a single definition of what constitutes a visual resource; therefore, this PEIS will use the general definition of visual resources used by the Bureau of Land Management, "the visible physical features on a landscape (e.g., land, water, vegetation, animals, structures, and other features)" (BLM, 1984).

8.1.8.2 Specific Regulatory Considerations

Table 8.1.8-1 presents state and local laws and regulations that relate to visual resources.

Table 8.1.8-1: Relevant Louisiana Visual Resources Laws and Regulations

State Law/Regulation	Regulatory Agency	Applicability
Louisiana Scenic Rivers Act, Title 76, Part IX § 105, 115 and 117	LDWF	Gives the Department of Wildlife and Fisheries the ability to "preserve, protect, develop, reclaim and enhance the wilderness qualities, scenic beauties and ecological regime of rivers and streams or segments thereof included within the Louisiana Natural and Scenic Rivers and Historic and Scenic Rivers System and for the further purposes of preserving aesthetic, scenic, recreational, fish, wildlife, ecological, archaeological, geological, botanical and other natural and physical features and resources found along these rivers and streams or segments thereof."
LRS Title 56 – Wildlife and Fisheries (RS 56:1848)	LDWF	Requires evaluation of natural and scenic areas surrounding designated natural and scenic rivers in development decisions.
LRS Title 56 – Wildlife and Fisheries (RS 56:1682)	Office of State Parks	Establishes the purpose of the Office of State Parks as "preserving and protecting natural areas of unique or exceptional scenic value."
LRS Title 56 – Wildlife and Fisheries (RS 56:1948.1)	Department of Culture, Recreation and Tourism: Louisiana Byways Commission	Establishes the Louisiana Byways Program to "designate and develop educational, historical, recreational, cultural, natural, and scenic routes along Louisiana's highways."
LRS Title 56 – Wildlife and Fisheries (RS 56:1862)	LDWF	Establishes the state register of natural areas "to identify and make known the types and locations of plant and animal life, geological areas, and other natural areas in this state, and that a system of protection and management of these areas should be implemented and maintained through a procedure of voluntary action by the owners of the property on which these areas may be located."

State Law/Regulation	Regulatory Agency	Applicability
LRS Title 25 – Libraries, museums, and other scientific (RS 56:802)	Art, Historical, and Cultural Preservation Agency	Confers responsibility for creation of state register of historic places and preservation of the state's art, historical and cultural treasures.

In addition to the state laws and regulations, in Louisiana any municipality designated a governmental unit has the authority to establish an historic district commission (or utilize the zoning and planning commission as such) to determine historic preservation districts for preservation of historic and cultural resources, which contain important visual resources. Additionally, in Louisiana local jurisdictions determine zoning laws and regulations for development that may or may not restrict impacts to the state's visual resources.

8.1.8.3 Character and Visual Quality of the Existing Landscape

Louisiana is composed of visual resources definitive of a mostly flat state. The state's coastal border is a landscape of sea-level marsh for as much as 25 miles inland. Wide coastal prairie and some rolling hills characterize most of the remainder of the state. Longleaf pine forests and wetland savannas are more prevalent in these areas. The most significant waterway in the state is the Mississippi River, but its southern border is the Gulf of Mexico and numerous other rivers and large lakes dot its interior. The Mississippi River delta that spans a large portion of the state gives rise to significant biodiversity of wetland inhabitants, including birds, reptiles, and fish (World Atlas, 2015).

Forested lands and croplands (Figure 8.1.7-1 in Section 8.1.7) characterize most of Louisiana. Forested lands are the state's most dominant visual resource, comprising 51 percent of total land cover in the state. Visual resources within forested areas are generally composed of continuous, natural looking cover with gradual transitions of line and color. They are typically characterized by the lack of disturbance or disruption of the landscape. Croplands comprise 16 percent of total land cover in Louisiana and visual resources within them consist of either row crops, closely sown crops or fallow land awaiting planting. Crops may include hay, silage, fruit trees, berries, tree nuts, vegetables, or melons (ERS, 2014). One aspect of importance for visual resources is to maintain the character of the area. For example, in a farm community, keeping the character of the town consistent with farm-style houses, barns, and silos would be key in maintaining the character of the community. In a more metropolitan area, there may be many different visual styles within each neighborhood, but keeping the character of the neighborhood is important to maintain if new development were to occur. Section 8.1.10 discusses land use and contains further descriptions of land cover within the state.

While the state and many municipalities have some regulation of scenic and visual resources, not all scenic areas within the state have been identified or have policy or regulations for management or protection by the state. The areas listed below have some measure of management, significance, or protection through state or federal policy, as well as being identified as a visually significant area.

8.1.8.4 Visually Important Historic Properties and Cultural Resources

Visual and aesthetic qualities of historic properties can contribute to the overall importance of a particular site. Such qualities relate to the integrity of the appearance and setting of these properties or resources. Viewsheds (the natural and manmade environment visible from one or more viewing points) can also contribute to the significance of historic properties or cultural resources (NASA, 2013). Viewsheds containing historic properties and cultural resources may be considered important because of their presence in the landscape. Figure 8.1.8-2 shows areas that are included in the National Register of Historic Places (NRHP) that may be considered visually sensitive. In Louisiana, there are 1,721 NRHP listed sites, which include two National Heritage Areas, two National Historical Parks, one National Historical Park and Preserve, and 1 National Historic Trail. Some State Historic Sites and State Historic Districts may also be included in the NRHP, whereas others are not designated at this time (NPS, 2015k) (NPS, 2015c).

The *Secretary of the Interior's Standards for the Treatment of Historic Properties* addresses four aspects: preservation, rehabilitation, restoration, and reconstruction, whereas *The Guidelines for the Treatment of Cultural Landscapes*, both authored by the NPS, provides guidance for applying protections to all aspects of the historic and cultural landscape, such as forests, gardens, trails, structures, ponds, and farming areas, to meet the Standards (NPS 1995). The Standards "require retention of the greatest amount of historic fabric, including the landscape's historic form, features, and details as they have evolved over time," which directly protects historic properties and the visual resources therein (NPS 1995).

World Heritage Site

Sites are designated World Heritage sites if they reflect "the world's cultural and natural diversity of outstanding universal value." (UNESCO, 2015a) To be included on the World Heritage List, sites must meet one of 10 criteria reflecting cultural, natural, or artistic significance (UNESCO, 2015b). World Heritage sites are diverse and range from archaeological remains, national parks, islands, buildings, city centers, and cities. The importance of World Heritage-designated properties can be attributed to cultural or natural qualities that may be considered visual resources or are visually sensitive at these sites. In Louisiana, there is one World Heritage site, Poverty Point (see Figure 8.1.8-2) (Louisiana Office of Tourism, 2015). Poverty Point is an archeological site representative of a people and trading network that expanded for hundreds of miles over 3,000 years ago (NPS, 2015k).

Figure 8.1.8-1: Poverty Point World Heritage Site

Source: (NPS, 2015d)

National Heritage Areas

National Heritage Areas (NHAs) are “places where natural, cultural, and historic resources combine to form a cohesive, nationally important landscape” (NPS, 2011). These areas help tell the history of the United States. Based on this criteria, the Atchafalaya and Cane River NHAs in Louisiana may contain scenic or aesthetic areas considered visual resources or visually sensitive (see Figure 8.1.8-2) (NPS, 2015k).

National Historic Landmarks

National Historic Landmarks (NHLs) are defined as “nationally significant historic places designated by the U.S. Secretary of the Interior because they possess exceptional value or quality in illustrating or interpreting the heritage of the United States” (NPS, 2016). NHLs may include “historic buildings, sites, structures, objects, and districts” (NPS, 2016). Other types of historic properties include battlefields and canals. The importance of NHL-designated properties can be attributed to scenic or aesthetic qualities, among other attributes, that may be considered visual resources or visually sensitive at these sites. In Louisiana, there are 55 NHLs, including sites such as Acadian House, Fort de la Boulaye, Jackson Square, The St. Charles Line, and Yucca Plantation (see Figure 8.1.8-2) (NPS, 2015e). By comparison, there are over 2,500 NHLs in the United States, with 2 percent of these in Louisiana (NPS 2015b). Figure 8.1.8-1 provides a representative sample of some historic and cultural resources that may be visually sensitive.

National Historical Parks and Preserves

Louisiana has two (2) National Historical Parks and one National Historical Park and Preserve, which are preserved by the NPS to “commemorate persons, events, and activities important in the nation’s history.” (NPS, 2003). The two (2) National Historical Parks include Cane River Creole National Historical Park and New Orleans Jazz National Historical Park. The National Historical Park and Preserve is Jean Lafitte. These parks and preserves may contain aesthetic and scenic values associated with history. Locations of the above are identified on the map in Figure 8.1.8-2. (NPS, 2015k)

National Historic Trails

The National Trails System Act defines National Historic Trails as “extended trails which follow as closely as possible and practicable the original trails or routes of travel of national historic significance” (NPS, 2012). One National Historic Trail pass through Louisiana and/or surrounding states: El Camino Real de los Tejas National Historic Trail (NPS, 2015k). The El Camino Real de los Tejas National Historic Trail is a 2,500 mile route that connected Mexico City to what is now Louisiana and linked cultural and linguistic group and facilitated “cultural diffusion, biological exchange, and communication” (NPS, 2015f).

State Historic Sites and Museums

The Louisiana Department of Culture, Recreation, and Tourism maintains 19 state historic sites within the Louisiana State Parks system (CRT, 2015c). These sites include Kent Plantation

House, Los Adaes State Historic Site, Otis House at Fairview-Riverside State Park, and Winter Quarters State Historic Site (see Table 8.1.8-2) (CRT, 2015c).

Table 8.1.8-2: Louisiana State Historic Sites

State Historic Site Name	
Audubon State Historic Site	Mansfield State Historic Site
Centenary State Historic Site	Marksville State Historic Site
Fort Jesup State Historic Site	Otis House at Fairview-Riverside State Park
Fort Pike State Historic Site	Plaquemine Lock State Historic Site
Fort St. Jean Baptiste State Historic Site	Port Hudson State Historic Site
Forts Randolph & Buhlow State Historic Site	Poverty Point State Historic Site
Kent Plantation House State Historic Site	Rebel State Historic Site
Locust Grove State Historic Site	Rosedown Plantation State Historic Site
Longfellow-Evangeline State Historic Site	Winter Quarters State Historic Site
Los Adaes State Historic Site	

Source: (CRT, 2015c)

Figure 8.1.8-2: Representative Sample of Some Historic and Cultural Resources that May be Visually Sensitive

8.1.8.5 Parks and Recreation Areas

Parks and recreation areas include state parks, National Recreation Areas, National Seashores, National Forests, and National and State Trails. Parks and recreation areas often contain scenic resources and tend to be visited partly because of their associated visual or aesthetic qualities. Figure 8.1.7-1 in Section 8.1.7, Land Use, Recreation and Airspace, identifies parks and recreational resources that may be visually sensitive in Louisiana. Figure 8.1.8-2 displays natural areas that may be visually sensitive, including park and recreation areas.

National Park Service

The NPS manages National Parks that contain natural, historic, cultural, visual, ecological, and recreational resources of significance to the nation, and are maintained for the public's use. In Louisiana, there are five[86] National Park Service units. Louisiana contains one National Monument, two National Heritage Areas, two National Historical Parks, one National Historical Trail, and one National Historical Park and Preserve in Louisiana. Table 8.1.8-3 identifies the National Parks and affiliated areas in Louisiana (see Figure 8.1.8-2).

Figure 8.1.8-3: Cane River Creole National Historical Park

Source: (NPS, 2015g)

Table 8.1.8-3: Louisiana National Parks and Affiliated Areas

Area Name	
Atchafalaya National Heritage Area	Jean Lafitte National Historical Park and Preserve
Cane River National Heritage Area	New Orleans Jazz National Historical Park
Cane River Creole National Historical Park	Poverty Point National Monument
El Camino Real de los Tejas National Historic Trail	

Source: (NPS, 2015k)

[86] This count is based on the NPS website "by the numbers" current as of 9/30/2014 (NPS, 2015o). Actual lists of parks and NPS affiliated areas may vary here depending on when areas are designated by Congress.

National Monuments

NPS defines a national monument as a "nationally significant resource…smaller than a national park and [lacking]…diversity of attractions." Louisiana contains one national monument managed by NPS, Poverty Point (see Table 8.1.8-3 and Figure 8.1.8-2) (NPS, 2015k). Poverty Point is an archeological site representative of a people and trading network that expanded for hundreds of miles over 3,000 years ago (NPS, 2015k).

National Forests

Several agencies manage forested areas in Louisiana, including the USFS. There is one National Forest managed by the USFS in Louisiana: Kisatchie National Forest (see Figure 8.1.8-4) (USFS, 2015).[87] Kisatchie National Forest contains more than 604,000 acres and includes visual resources such as bald cypress groves, bayous, and pine stands (USFS, 2015). The USFS conducts inventories of the forest lands and assigns scenic resource categories from which they manage for scenic and visual resources (USFS, 1995). The scenic inventories are used to manage the forest landscape and to protect areas of high scenic integrity (USFS, 1995). For additional information regarding parks and recreation areas, see Section 8.1.7, Land Use, Recreation, and Airspace.

U.S. Army Corps of Engineers Recreation Areas

There are 12 USACE recreation areas within the state, as noted in Table 8.1.8-4 (USACE, 2015). These lakes are specifically managed by the USACE for scenic and aesthetic qualities in their planning guidance in addition to managing risks for floods (USACE, 1997).

Table 8.1.8-4: USACE Recreation Areas

Recreation Area Name	
Atchafalaya Basin	Ouachita – Black River – Columbia Pool
Bayou Bodcau Reservoir	Ouachita – Black River – Felsenthal Pool
Bonnet Carre Spillway	Ouachita – Black River – Jonesville Pool
Caddo Lake	Pearl River (3 Pools)
Old River Lock	Red River Waterway
Ouachita – Black River – Calion Pool	Wallace Lake

Source: (USACE, 2015)

[87] The natural areas data were retrieved from the Protected Areas Database of the United States (PAD-US), produced by USGS (http://gapanalysis.usgs.gov/padus/). This dataset categorizes lands across the U.S. by conservation, land management, planning, recreation, and ownership, as well as other uses. It is an extensive dataset that contains large quantities of information relevant to the Proposed Action. The data was queried and further combined by the Primary Designation Type into classifications that fit the multiple types of land applicable for Natural Areas. For this map, recognizable symbols (e.g., varying shades of green for National Parks and Forests) were used as PAD-US does not have a standard symbolization for natural areas. The PADUS 1.3 geodatabase was downloaded in the summer of 2015, and used consistently throughout all these maps for each state and D.C.

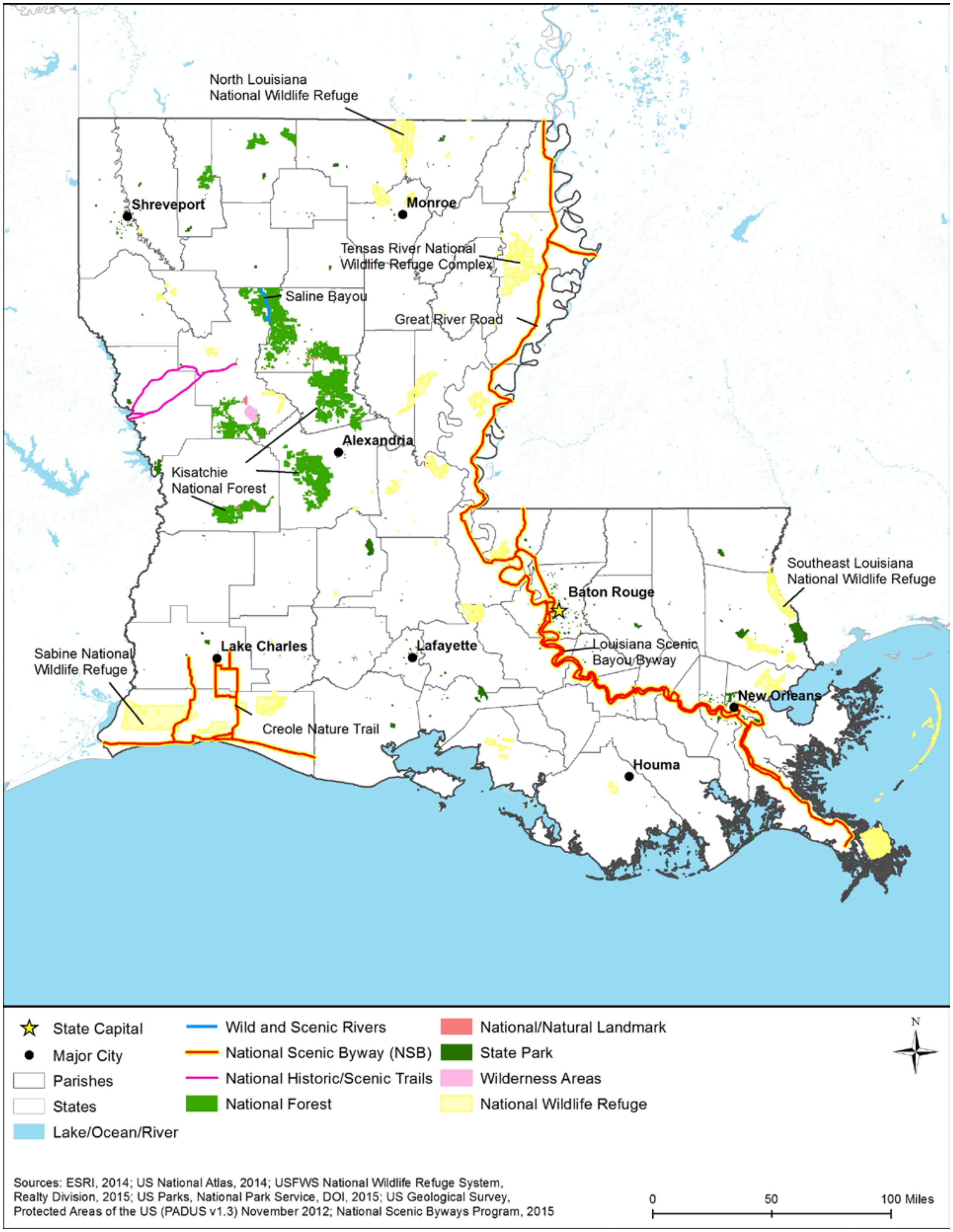

Figure 8.1.8-4: Natural Areas that May be Visually Sensitive

Federal and State Trails

Louisiana maintains a network of trails with in the state parks systems at state parks and historic sites for recreational purposes, including hiking, biking, canoeing, and horseback riding (CRT, 2015d). Due to their locations in the state parks and historic sites, these trails contain visual resources similar to those in the state park in which they reside. (CRT, 2015d).

In addition to National Scenic and Historic Trails, the National Trails System Act authorized the designation of National Recreational Trails near urban areas by either the Secretaries of the Interior or Agriculture, depending upon the ownership of the designated land (American Trails, 2015a). In Louisiana, there are 10 National Recreation Trails administered by USFWS, USFS, and local and state governments (American Trails, 2015b).

State Parks

State parks contain natural, historic, cultural, and/or recreational resources of significance to Louisiana residents and visitors. There are 22 state parks and 1 state preservation area in Louisiana (Figure 8.1.8-4), most of which contain scenic or aesthetic areas considered to be visual resources or visually sensitive. Table 8.1.8-5 contains a sampling of state parks and their associated visual attributes. (Louisiana State Parks, 2015).

Table 8.1.8-5: Examples of Louisiana State Parks and Associated Visual Attributes

State Park	Visual Attributes
Chicot State Park	Rolling hills, Lake Chicot, bottomland hardwood forest, beech-magnolia forest, native plants
Grand Isle State Park	Beach ridge, bayou, birds, lagoons, gulf shore, wildlife, beaches
Lake Claiborne State Park	Pine trees, foothills, sandy beach, Lake Claiborne, woods, wildlife
North Toledo Bend State Park	Reservoir, forests
Tickfaw State Park	Cypress/tupelo swamp, bottomland hardwood forest, mixed pine/hardwood forest, Tickfaw River

Source: (Louisiana State Parks, 2015)

Figure 8.1.8-5: Chicot State Park

Source: (Wikipedia, 2012)

State Forests

The Louisiana Department of Agriculture and Forestry operates and maintains one state forest in Louisiana, which is managed for timber production as well as for wildlife and recreation (hunting): Alexander State Forest (see Figure 8.1.8-4) (LDAF, 2013). This forest contains scenic landscapes such as loblolly pine, longleaf and slash pine stands, creeks, and wildlife (LDWF, 2015i).

8.1.5.6. Natural Areas

The abundance of natural areas varies by state depending on the amount of public or state lands managed within each. Although many natural areas may not be managed specifically for visual resources, these areas are allowed protection for their natural resources and the resulting management protects these scenic resources. Figure 8.1.8-4 identifies natural areas that may have sensitive visual resources.

Rivers Designated as National or State Wild, Scenic or Recreational

National Wild, Scenic, or Recreational Rivers are those rivers designated by Congress or the Secretary of the Interior in accordance with the Wild and Scenic Rivers Act of 1968 (16 U.S.C. 1271-1287). These rivers have outstanding natural, cultural, and recreational values, including potential visual resources. In Louisiana, 19 Miles of the Saline Bayou has been designated a National Wild and Scenic River (see Figure 8.1.8-4).

The Louisiana Natural and Scenic Rivers System was established in 1970 “to [preserve], [protect], [develop], [reclaim], and [enhance] the wilderness qualities, scenic beauties, and ecological regimes of certain free-flowing Louisiana streams” (LDWF, 2015l). The System currently includes 3,000 miles of rivers, streams, and bayous. The Program limits activities on these waterways to prevent “detrimental ecological impacts” (LDWF, 2015l). Additionally, Louisiana recognizes historic and scenic rivers and designates the Bayou St. John (within Orleans Parish) and Bayou Manchac (from the Amite to the Mississippi) accordingly (Justia US Law, 2015).

National Wildlife Refuges

National Wildlife Refuges (NWRs) are a network of lands and waters managed by the USFWS. These lands and waters are “set aside for the conservation, management and, where appropriate, restoration of fish, wildlife, and plant resources and their habitats” (USFWS, 2015ao). There are 23 NWRs in Louisiana (USFWS, 2015ap) (see Figure 8.1.8-4) (see Table 8.1.8-6) including the Catahoula NWR. This refuge is composed of 25,162 acres in two units for wintering migratory birds (USFWS, 2015aq). Visual resources within this NWR include lowland hardwood forest, wildlife, and waterfowl. The NWR includes Catahoula Lake, which is a designated Wetlands of International Importance (USFWS, 2015ar).

Table 8.1.8-6: Louisiana National Wildlife Refuges

NWR Name	
Atchafalaya NWR	Delta NWR
Bayou Cocodrie NWR	Grand Cote NWR
Bayou Sauvage NWR	Handy Brake NWR
Bayou Teche NWR	Lacassine NWR
Big Branch Marsh NWR	Lake Ophelia NWR
Black Bayou Lake NWR	Mandalay NWR
Bogue Chitto NWR	Red River NWR
Breton NWR	Sabine NWR
Cameron Prairie NWR	Shell Keys NWR
Cat Island NWR	Tensas River NWR
Catahoula NWR	Upper Ouachita NWR
D'Arbonne NWR	

Source: (USFWS, 2015as)

State Wildlife Management Areas and Refuges

The Louisiana Department of Wildlife and Fisheries manages 52 State Wildlife Management Areas (WMAs), 5 refuges, and 2 conservation areas on approximately 1.6M acres[88] (see Table 8.1.8-7) (LDWF, 2014b) (LDWF, 2016a).

Table 8.1.8-7: Louisiana Wildlife Management Areas and Refuges

WMA Name	
Alexander State Forest WMA	Marsh Island Refuge
Arcadiana Conservation Corridor	Maurepas Swamp WMA
Atchafalaya Delta WMA	Ouachita WMA
Attakapas WMA	Pass-a-Loutre WMA
Bayou Macon WMA	Pearl River WMA
Bayou Pierre WMA	Peason Ridge WMA
Ben Lily WMA	Point-aux Chenes WMA
Big Colewa WMA	Pomme de Terre WMA
Big Lake WMA	Richard K. Yancey WMA
Biloxi WMA	Rockefeller Wildlife Refuge
Bodcau WMA	Russell Sage WMA
Boeuf WMA	Sabine Island WMA
Buckhorn WMA	Sabine WMA
Camp Beauregard WMA	Salvador WMA
Clear Creek WMA	Sandy Hollow WMA
Dewey W. Wills WMA	Sherburne WMA
Elbow Slough WMA	Sicily Island Hills WMA
Elm Hall WMA	Soda Lake WMA
Floy Ward McElroy WMA	Spring Bayou WMA
Fort Polk Vernon WMA	State Wildlife Refuge
Grassy Lake WMA	St. Tammany Refuge
Hutchinson Creek WMA	Tangipahoa Parish School Board WMA
Isle Dernieres Barrier Islands Refuge	Thistlethwaite WMA
Jackson Bienville WMA	Timken WMA

[88] The state of Louisiana owns approximately 1.3M acres of the 1.6M that composes the WMAs, refuges, and conservation areas. The remaining .3M is leased from private owners and other agencies.

WMA Name	
Joyce WMA	Tunica Hills WMA
Lake Boeuf WMA	Union WMA
Lake Ramsey WMA	Walnut Hill WMA
Little River WMA	West Bay WMA
Loggy Bayou WMA	White Lake Wetlands Conservation Area
Manchac WMA	

Source: (LDWF, 2014b)

National Wilderness Areas

In 1964, Congress enacted the Wilderness Act of 1964 as "an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain. A designation as a National Wilderness Area is the highest level of conservation protection given by Congress to federal lands. This Act defined wilderness as land untouched by man and primarily affected only by the "forces of nature" and as that which "may also contain ecological, geological, or other features of scientific, education, scenic, or historical value." Over 106 million acres of federal public lands have been designated as wilderness areas. Twenty-five percent of these federal lands are in 47 national parks (44 million acres) and part of the National Park System. These designated wilderness areas are managed by the USFS, BLM, USFWS, and NPS (NPS, 2015p). Louisiana contains three federally managed Wilderness Areas: Breton Wilderness, Kisatchie Hills Wilderness, and Lacassine Wilderness (Wilderness.net, 2015).

National Preserves

The NPS designates national preserves as "areas having characteristics associated with national parks, but in which Congress has permitted continued public hunting, trapping, oil/gas exploration and extraction" (NPS, 2015h). Louisiana contains one combined National Historical Park and Preserve, the Jean Lafitte National Historical Park and Preserve (see (NPS, 2015i). See *Visually Important Historic Properties and Cultural Resources* for additional information about this preserve.

State Preserves

The Louisiana Department of Culture, Recreation and Tourism's State Parks System includes one preservation area, Louisiana State Arboretum State Preservation Area. This preservation area encompasses more than 300 acres of varied and dramatic topography. Visual resources in the preservation area include lakes, steep slopes, flat lands, terrace ridges, wooded areas and diverse flora and fauna. (CRT, 2015e)

Additionally, natural and conservation areas also include 17 properties owned and managed by The Nature Conservancy (The Nature Conservancy, 2015a). These properties include Cypress Island Preserve, Frederick's Swamp Preserve, Lake Cocodrie, Persimmon Gully Preserve, and Schoolhouse Springs Preserve (The Nature Conservancy, 2015a). Persimmon Gully Preserve is one of the last old growth longleaf pine savannas in the West Coastal Plains and includes visual resources such as dense herbaceous grass cover, trees, shrubs, grasses, sedges, wildflowers and birds (The Nature Conservancy, 2015b).

8.1.5.7. Additional Areas

State and National Scenic Byways

National Scenic Byways are resources designated specifically for scenic or aesthetic areas or qualities which would be considered visual resources or visually sensitive. Louisiana has two designated National Scenic Byways: Creole Nature Trail (180 miles) and Great River Road (2,069 miles) (see Figure 8.1.1-1 in Section 8.1.1, Infrastructure) (FHWA, 2015d).

Similar to National Scenic Byways, Louisiana recognizes 17 state scenic byways (see Section 8.1.1, Infrastructure) (see Table 8.1.8-8). The Zydeco Cajun Prairie Byway highlights the state's contributions to music and includes stops such as the Cajun Music Hall of Fame and Museum (Louisiana Travel, 2016).

Table 8.1.8-8: Louisiana State Byways

State Byway Name	Mileage
Bayou Tech Byway	184
Boom or Bust Byway	136
Cajun Corridor	33
Cane River National Heritage Trail	35
Creole Nature Trail All-American Road	180
Dixie Overland	105
Flyway Byway	54
Longleaf Trail Byway	17
Louisiana Colonial Trails Byway	567
Louisiana Great River National Scenic Byway	700
Myths and Legends Byway	178
San Bernardo Byway	38
Southern Swamps	67
Toledo Bend Forest Scenic Byway	78
Tunica Trace Byway	20
Wetlands Cultural Byway	204
Zydeco Cajun Prairie Byway	231

Source: (Louisiana Travel, 2016)

8.1.9 Socioeconomics

8.1.9.1 Definition of the Resource

NEPA requires consideration of socioeconomics; specifically, Section 102(A) of NEPA requires federal agencies to "insure the integrated use of the natural and social sciences…in planning and in decision making" (42 U.S.C. § 4332(A)). Socioeconomics refers to a broad, social science-based approach to understanding a region's social and economic conditions. It typically includes population, demographic descriptors, economic activity indicators, housing characteristics, property values, and public revenues and expenditures (BLM, 2005). When applicable, it includes qualitative factors such as community cohesion. Socioeconomics provides important context for analysis of FirstNet Proposed Actions, and in addition, FirstNet Proposed Actions may affect the socioeconomic conditions of a region.

The choice of socioeconomic topics and depth of their treatment depends on the relevance of potential topics to the types of federal actions under consideration. FirstNet's mission is to provide public safety broadband and interoperable emergency communications coverage throughout the nation. Relevant socioeconomic topics include population density and growth, economic activity, housing, property values, and Louisiana and local taxes. The financial arrangements for deployment and operation of the FirstNet network may have socioeconomic implications. This socioeconomics section provides some additional, broad context, including data and discussion of state and local government revenue sources that FirstNet may affect.

Environmental justice is a related topic that specifically addresses the presence of minority populations (defined by race and Hispanic ethnicity) and low-income populations, in order to give special attention to potential impacts on those populations, per Executive Order 12898. This PEIS addresses environmental justice in a separate section (Section 8.1.10). This PEIS also addresses the following topics, sometimes included within socioeconomics, in separate sections: Infrastructure (Section 8.1.1), Land Use, Recreation, and Airspace (Section 8.1.7), and aesthetic considerations (Section 8.1.8).

Wherever possible, this section draws on nationwide datasets from federal sources such as the U.S. Census Bureau (Census Bureau)[89] and U.S. Bureau of Labor Statistics (BLS). This ensures consistency of data and analyses across the states examined in this PEIS. In all cases, this section uses the most recent data available for each geography at the time of writing. At the parish (county), state, region, and United States levels, the data are typically for 2013 or 2014. For smaller geographic areas, this section uses data from the Census Bureau's American Community Survey (ACS). The ACS is the Census Bureau's flagship demographic estimates program for years other than the decennial census years. This PEIS uses the 2009-2013 ACS, which is based on surveys (population samples) taken across that five-year period; thus, it is not

[89] For U.S. Census Bureau sources, a URL (see references section) that begins with "http://factfinder.census.gov" indicates that the American FactFinder (AFF) interactive tool can be used to retrieve the original source data via the following procedure. If the reference's URL begins with "http://dataferrett.census.gov," significant socioeconomic expertise is required to navigate this interactive tool to the specific data. However, the data can usually be found using AFF. As of May 24, 2016, the AFF procedure is as follows: 1) Go to http://factfinder.census.gov. 2) Select "Advanced Search," then "Show Me All." 3) Select from "Topics" choices, select "Dataset," then select the dataset indicated in the reference; e.g., "American Community Survey, 2013 1-Year Estimates" or "2012 Census of Governments." Click "Close." Note: ACS is the abbreviation in the AFF for the American Community Survey. SF is the abbreviation used with the 2000 and 2010 "Summary Files." For references to the "2009-2013 5-Year Summary File," choose "2013 ACS 5-year estimates" in the AFF. 4) Click the "Geographies" box. Under "Select a geographic type," choose the appropriate type; e.g., "United States – 010" or "State – 040" or "...County – 050" then select the desired area or areas of interest. Click "Add to Your Selections," then "Close." For Population Concentration data, select "Urban Area - 400" as the geographic type, then select 2010 under "Select a version" and then choose the desired area or areas. Alternatively, do not choose a version, and select "All Urban Areas within United States." Regional values cannot be viewed in the AFF because the regions for this PEIS do not match Census Bureau regions. All regional values were developed by downloading state data and using the most mathematically appropriate calculations (e.g., sums of state values, weighted averages, etc.) for the specific data. 5) In "Refine your search results," type the table number indicated in the reference; e.g., "DP04" or "LGF001." The dialogue box should auto-populate with the name of the table(s) to allow the user to select the table number/name. Click "Go." 6) In the resulting window, click the desired table under "Table, File, or Document Title" to view the results. If multiple geographies were selected, it is often easiest to view the data by clicking the "Download" button above the on-screen data table. Choose the desired comma-delimited format or presentation-ready format (includes a Microsoft Excel option). In some cases, the structure of the resulting file may be easier to work with under one format or another. Note that in most cases, the on-screen or downloaded data contains additional parameters besides those used in the FirstNet PEIS report table. Readers must locate the FirstNet PEIS-specific data within the Census Bureau tables. Additionally, the data contained in the FirstNet tables may incorporate data from multiple sources and may not be readily available in one table on the Census site.

appropriate to attribute its data values to a specific year. It is a valuable source because it provides the most accurate and consistent socioeconomic data across the nation at the sub-parish (sub-county) level (U.S. Census Bureau, 2016).

The remainder of this section addresses the following subjects: regulatory considerations specific to socioeconomics in the state, communities and populations, economic activity, housing, property values, and taxes.

8.1.9.2 Specific Regulatory Considerations

Research for this section did not identify any specific state, local, or tribal laws or regulations that are directly relevant to socioeconomics for this PEIS.

8.1.9.3 Communities and Populations

This section discusses the population and major communities of Louisiana (LA) and it includes the following topics:

- Recent and projected statewide population growth;
- Current distribution of the population across the state; and
- Identification of the largest population concentrations in the state.

Statewide Population and Population Growth

Table 8.1.9-1 presents the 2014 population and population density of Louisiana in comparison to the South region[90] and the nation. The estimated population of Louisiana in 2014 was 4,649,676. The population density was 108 persons per square mile (sq. mi.), which is lower than the population density of the region (114 persons/sq. mi.) and higher than that of the nation (90 persons/sq. mi.). In 2014, Louisiana was the 25th largest state by population among the 50 states and the District of Columbia, 33rd largest by land area, and had the 24th greatest population density (U.S. Census Bureau, 2015e; U.S. Census Bureau, 2015f).

Table 8.1.9-1: Land Area, Population, and Population Density of Louisiana

Geography	Land Area (sq. mi.)	Estimated Population 2014	Population Density 2014 (persons/sq. mi.)
Louisiana	43,204	4,649,676	108
South Region	914,471	104,109,977	114
United States	3,531,905	318,857,056	90

Sources: (U.S. Census Bureau, 2015e; U.S. Census Bureau, 2015f)

Population growth is an important subject for this PEIS given FirstNet's mission. Table 8.1.9-2 presents the population growth trends of Louisiana from 2000 to 2014 in comparison to the South region and the nation. The state's annual growth rate more than quadrupled in the 2010 to

[90] The South region is composed of the states of Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, New Mexico, Oklahoma, South Carolina, Tennessee, and Texas. Throughout the socioeconomics section, figures for the South region represent the sum of the values for all states in the region, or an average for the region based on summing the component parameters. For instance, the population density of the South region is the sum of the populations of all its states, divided by the sum of the land areas of all its states.

2014 period compared to 2000 to 2010, from 0.14 percent to 0.64 percent. Louisiana had lower growth rates in both periods compared to the region and the nation.

Table 8.1.9-2: Recent Population Growth of Louisiana

Geography	Population			Numerical Population Change		Rate of Population Change (AARC)[a]	
	2000	2010	2014 (estimated)	2000 to 2010	2010 to 2014	2000 to 2010	2010 to 2014
Louisiana	4,468,976	4,533,372	4,649,676	64,396	116,304	0.14%	0.64%
South Region	86,516,862	99,487,696	104,109,977	12,970,834	4,622,281	1.41%	1.14%
United States	281,421,906	308,745,538	318,857,056	27,323,632	10,111,518	0.93%	0.81%

[a] AARC = Average Annual Rate of Change (compound growth rate)
Sources: (U.S. Census Bureau, 2015g; U.S. Census Bureau, 2015e)

Demographers prepare future population projections using various population growth modeling methodologies. For this nationwide PEIS, it is important to use population projections that apply the same methodology across the nation. It is also useful to consider projections that use different methodologies, since no methodology is a perfect predictor of the future. The Census Bureau does not prepare population projections for the states. Therefore, Table 8.1.9-3 presents projections of the 2030 population from two sources that are national in scope and use different methodologies: the University of Virginia's Weldon Cooper Center for Public Service and ProximityOne, a private sector demographic and economic data and analysis service (ProximityOne, 2015) (University of Virginia Weldon Cooper Center, 2015). The table provides figures for numerical change, percentage change, and annual growth rate based on averaging the projections from the two sources. The average projection indicates Louisiana's population will increase by approximately 432,000 people, or 9.3 percent, from 2014 to 2030. This reflects an average annual projected growth rate of 0.56 percent, which is slightly lower than the historical growth rate from 2010 to 2014 of 0.64 percent. The projected growth rate of the state is lower than that of the region (0.97 percent) and the nation (0.80 percent).

Table 8.1.9-3: Projected Population Growth of Louisiana

Geography	Population 2014 (estimated)	Projected 2030 Population			Change Based on Average Projection		
		UVA Weldon Cooper Center Projection	Proximity One Projection	Average Projection	Numerical Change 2014 to 2030	Percent Change 2014 to 2030	Rate of Change (AARC)[a] 2014 to 2030
Louisiana	4,649,676	4,718,136	5,445,280	5,081,708	432,032	9.3%	0.56%
South Region	104,109,977	122,323,551	120,794,020	121,558,786	17,448,809	16.8%	0.97%
United States	318,857,056	360,978,449	363,686,916	362,332,683	43,475,627	13.6%	0.80%

[a] AARC = Average Annual Rate of Change (compound growth rate)
Sources: (U.S. Census Bureau, 2015e; ProximityOne, 2015; UVA Weldon Cooper Center, 2015)

Population Distribution and Communities

Figure 8.1.9-1 (below) presents the distribution and relative density of the population of Louisiana. Each brown dot represents 500 people, and massing of dots indicates areas of higher population density – therefore, areas that are solid in color are particularly high in population density. The map uses ACS estimates based on samples taken from 2009 to 2013 (U.S. Census Bureau, 2015h).

This map also presents the 10 largest population concentrations in the state, outlined in purple. These population concentrations reflect contiguous, densely developed areas as defined by the Census Bureau based on the 2010 census (U.S. Census Bureau, 2012; U.S. Census Bureau, 2015i). These population concentrations often include multiple incorporated areas as well as some unincorporated areas.

Other groupings of brown dots on the map represent additional, but smaller, population concentrations. Dispersed dots indicate dispersed population across the less densely settled areas of the state. Table 8.1.9-4 provides the populations of the 10 largest population concentrations in Louisiana, based on the 2010 census. It also shows the changes in population for these areas between the 2000 and 2010 censuses.[91] In 2010, the largest population concentration was the New Orleans area, which had nearly 900,000 people. The state had one other area (Baton Rouge) with a population between 500,000 and 1 million, and five with populations between 100,000 and 500,000. The smallest of these 10 population concentrations was the Alexandria area, with a 2010 population of 82,804. The fastest growing area, by average annual rate of change from 2000 to 2010, was the Lafayette area, with an annual growth rate of 3.56 percent. However, this area had a large increase in its area definition. The area expansion may have taken in some existing populations; thus, its growth rate may reflect this factor as well as organic growth (net in-migration and/or births exceeding deaths). The state had four other areas with a growth rate over 1.00 percent (Baton Rouge, Houma, Mandeville/Covington, and Slidell areas). The New Orleans area experienced a population decline during this period.

Table 8.1.9-4 also shows that the top 10 population concentrations in Louisiana accounted for nearly 60 percent of the state's population in 2010. Further, population growth in the 10 areas from 2000 to 2010 amounted to 275.1 percent of the entire state's growth. This figure of over 100 percent indicates that the population of the remainder of the state, as a whole, declined from 2000 to 2010.

[91] Census Bureau boundaries for these areas are not fixed. Area changes from 2000 to 2010 may include accretion of newly developed areas into the population concentration, Census Bureau classification of a subarea as no longer qualifying as a concentrated population due to population losses, and reclassification by the Census Bureau of a subarea into a different population concentration. Thus, population change from 2000 to 2010 reflects change within the constant area and change as the overall area boundary changes. Differences in boundaries in some cases introduce anomalies in comparing the 2000 and 2010 populations and in calculation of the growth rate presented in the table.

Table 8.1.9-4: Population of the 10 Largest Population Concentrations in Louisiana

Area	Population				Population Change 2000 to 2010	
	2000	2010	2009–2013	Rank in 2010	Numerical Change	Rate (AARC)[a]
Alexandria	78,504	82,804	83,217	10	4,300	0.53%
Baton Rouge	479,019	594,309	599,370	2	115,290	2.18%
Houma	125,929	144,875	146,285	5	18,946	1.41%
Lafayette[b]	178,079	252,720	256,957	4	74,641	3.56%
Lake Charles	132,977	143,440	144,234	6	10,463	0.76%
Mandeville/Covington[b]	62,866	88,925	89,935	9	26,059	3.53%
Monroe	113,818	116,533	119,306	7	2,715	0.24%
New Orleans	1,009,283	899,703	918,436	1	(109,580)	-1.14%
Shreveport	275,213	298,317	299,940	3	23,104	0.81%
Slidell	79,926	91,151	92,193	8	11,225	1.32%
Total for Top 10 Population Concentrations	**2,535,614**	**2,712,777**	**2,749,873**	**NA**	**177,163**	**0.68%**
Louisiana (statewide)	**4,468,976**	**4,533,372**	**4,567,968**	**NA**	**64,396**	**0.14%**
Top 10 Total as Percentage of State	**56.7%**	**59.8%**	**60.2%**	**NA**	**275.1%**	**NA**

[a] AARC = Average Annual Rate of Change (compound growth rate)
[b] The large population increases from 2000 to 2010 for the Lafayette and the Mandeville/Covington areas reflect correspondingly large increases in the area definition for these two areas.
Sources: (U.S. Census Bureau, 2012; U.S. Census Bureau, 2015j; U.S. Census Bureau, 2015k)

8.1.9.4 Economic Activity, Housing, Property Values, and Government Revenues

This section addresses other socioeconomic topics that are potentially relevant to FirstNet. These topics include:

- Economic activity;
- Housing;
- Property values; and
- Government revenues.

Social institutions – educational, family, political, public service, military, and religious – are present throughout the state. The institutions most relevant to the FirstNet Proposed Action are public services such as medical and emergency medical services and facilities. This PEIS addresses public services in Section 8.1.1, Infrastructure. Project-level NEPA analyses may need to examine other institutions, depending on specific locations and specific types of actions.

Economic Activity

Table 8.1.9-5 compares several economic indicators for Louisiana to the South region and the nation. The table presents two indicators of income[92] – per capita and median household – as income is a good measure of general economic health of a region.

Per capita income is total income divided by the total population. As a mathematical average, the very high incomes of a relatively small number of people tend to bias per capita income figures upwards. Nonetheless, per capita income is useful as an indicator of the relative income level across two or more areas. As shown in Table 8.1.9-5, the per capita income in Louisiana in 2013 ($24,695) was $316 lower than that of the region ($25,011), and $3,489 than that of the nation ($28,184).

Household income is a useful measure, and often used instead of family income, because in modern society there are many single-person households and households composed of non-related individuals. Median household income (MHI) is the income at which half of all households have higher income, and half have lower income. Table 8.1.9-5 shows that in 2013, the MHI in Louisiana ($44,234) was $2,328 lower than that of the region ($46,562), and $8,016 lower than that of the nation ($52,250).

Employment status is a key socioeconomic parameter because employment is essential to the income of a large portion of the adult population. The federal government calculates the unemployment rate as the number of unemployed individuals who are looking for work divided by the total number of individuals in the labor force. Table 8.1.9-5 compares the unemployment rate in Louisiana to the South region and the nation. In 2014, Louisiana's statewide unemployment rate of 6.4 percent was very similar to that of region (6.1 percent) and the nation (6.2 percent).[93]

Table 8.1.9-5: Selected Economic Indicators for Louisiana

Geography	Per Capita Income 2013	Median Household Income 2013	Average Annual Unemployment Rate 2014
Louisiana	$24,695	$44,234	6.4%
South Region	$25,011	$46,562	6.1%
United States	$28,184	$52,250	6.2%

Sources: (BLS, 2015b; U.S. Census Bureau, 2015l; U.S. Census Bureau, 2015m; U.S. Census Bureau, 2015n)

[92] The Census Bureau defines income as follows: "'Total income' is the sum of the amounts reported separately for wage or salary income; net self-employment income; interest, dividends, or net rental or royalty income or income from estates and trusts; Social Security or Railroad Retirement income; Supplemental Security Income (SSI); public assistance or welfare payments; retirement, survivor, or disability pensions; and all other income. Receipts from the following sources are not included as income: capital gains, money received from the sale of property (unless the recipient was engaged in the business of selling such property); the value of income "in kind" from food stamps, public housing subsidies, medical care, employer contributions for individuals, etc.; withdrawal of bank deposits; money borrowed; tax refunds; exchange of money between relatives living in the same household; gifts and lump-sum inheritances, insurance payments, and other types of lump-sum receipts." (U.S. Census Bureau, 2015q)

[93] The timeframe for unemployment rates can change quarterly.

Figure 8.1.9-1 and Figure 8.1.9-2 show how MHI in 2013 (U.S. Census Bureau, 2015l) and unemployment in 2014 (BLS, 2015b) varied by parish across the state. These maps also incorporate the same population concentration data as Table 8.1.9-4 (U.S. Census Bureau, 2012; U.S. Census Bureau, 2015i). Following these two maps, Table 8.1.9-6 presents MHI and unemployment for the 10 largest population concentrations in the state. The table reflects survey data taken from 2009 to 2013. Thus, its figures are not directly comparable to those on the maps. Nonetheless, both the maps and the table help portray differences in income and unemployment across Louisiana.

Figure 8.1.9-1 shows that, in general, parishes with a MHI above the national median were mostly distributed sporadically throughout the southeastern portion of the state. Most of the remainder of the state, including all of the northern and western portions had MHI levels below the national average. Table 8.1.9-6 is consistent with those observations. It shows that MHI in the Baton Rouge, Mandeville/Covington, Lafayette, Houma, and Slidell areas was above the state average. MHI in all other population concentrations was below the state average. MHI was lowest in the Alexandria and Monroe areas. These are the smallest and third smallest of the areas shown in the table. Figure 8.1.9-2 presents variations in the 2014 unemployment rate across the state, by parish. It shows that parishes with unemployment rates below the national average (that is, better employment performance) were distributed throughout the state, with higher concentration in the southeastern and southwestern portions of the state. Most of the central and northern parishes had unemployment rates above the national average. The highest unemployment rates were generally in the northeast. When comparing unemployment in the population concentrations to the state average (Table 8.1.9-6), four areas (Alexandria, Lake Charles, New Orleans, and Slidell) had 2009–2013 unemployment rates that were higher than the state average. Detailed employment data provides useful insights into the nature of a local, state, or national economy.

Table 8.1.9-7 provides figures on employment percentages by type of worker and by industry based on surveys conducted in 2013 by the Census Bureau. By class of worker (type of worker: private industry, government, self-employed, etc.), the percentage of private wage and salary workers was nearly identical in Louisiana compared to the South region and the nation. The percentage of government workers was slightly higher in the state than in the region and nation. Self-employed workers were a similar percentage in the state as the region and the nation.

By industry, Louisiana has a mixed economic base and some notable figures in the table are as follows. Louisiana in 2013 had a considerably higher percentage of persons working in “agriculture, forestry, fishing and hunting, and mining” than in the region or nation. “Manufacturing,” “finance and insurance, and real estate and rental and leasing,” “other services, except public administration” and “professional, scientific, management, administrative, and waste management services” had somewhat lower percentages of workers compared to the region and the nation. All industries except “agriculture, forestry, fishing and hunting, and mining” had percentage of workers within two percentage points of the percentages for the region and the nation.

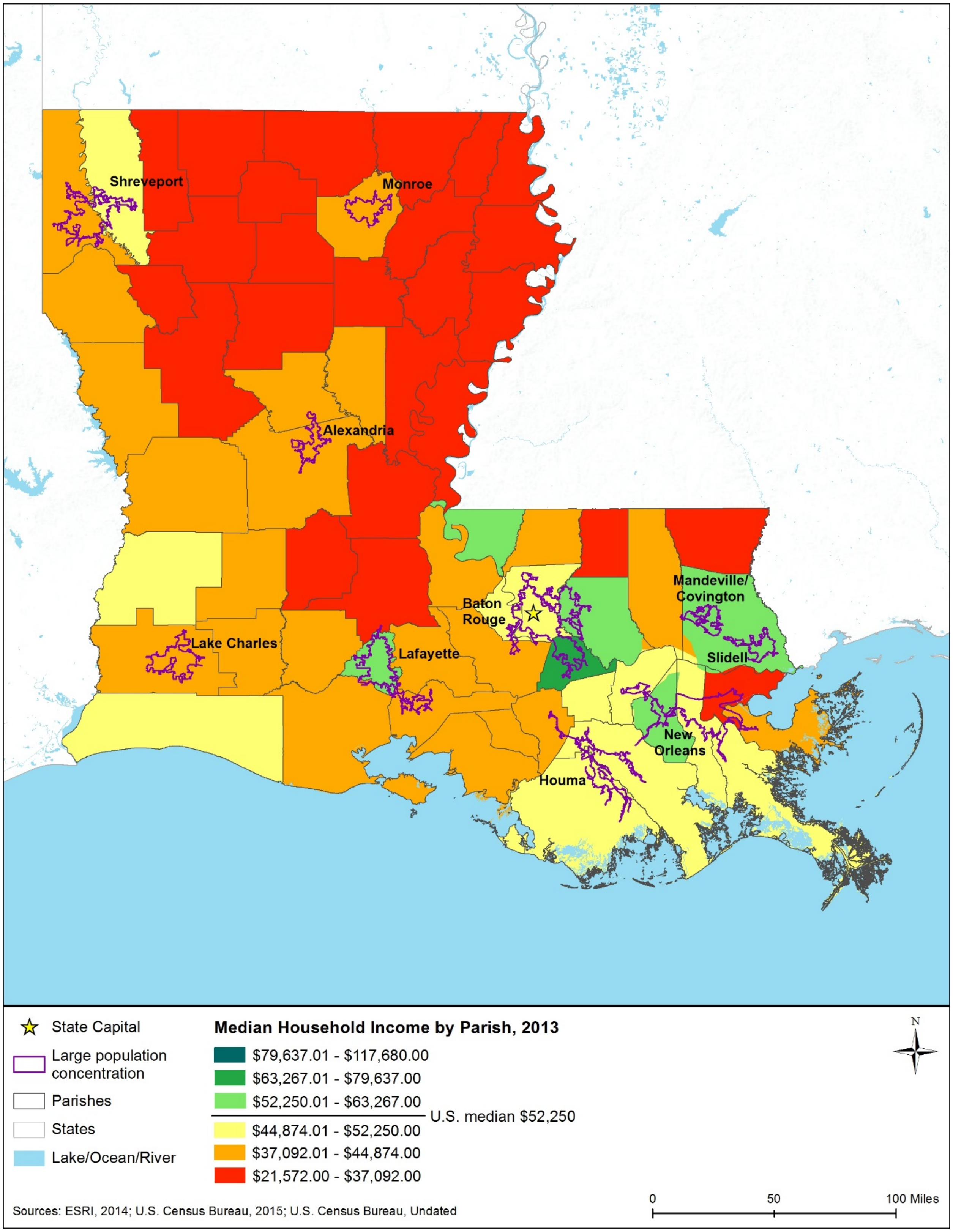

Figure 8.1.9-1: Median Household Income in Louisiana, by Parish, 2013

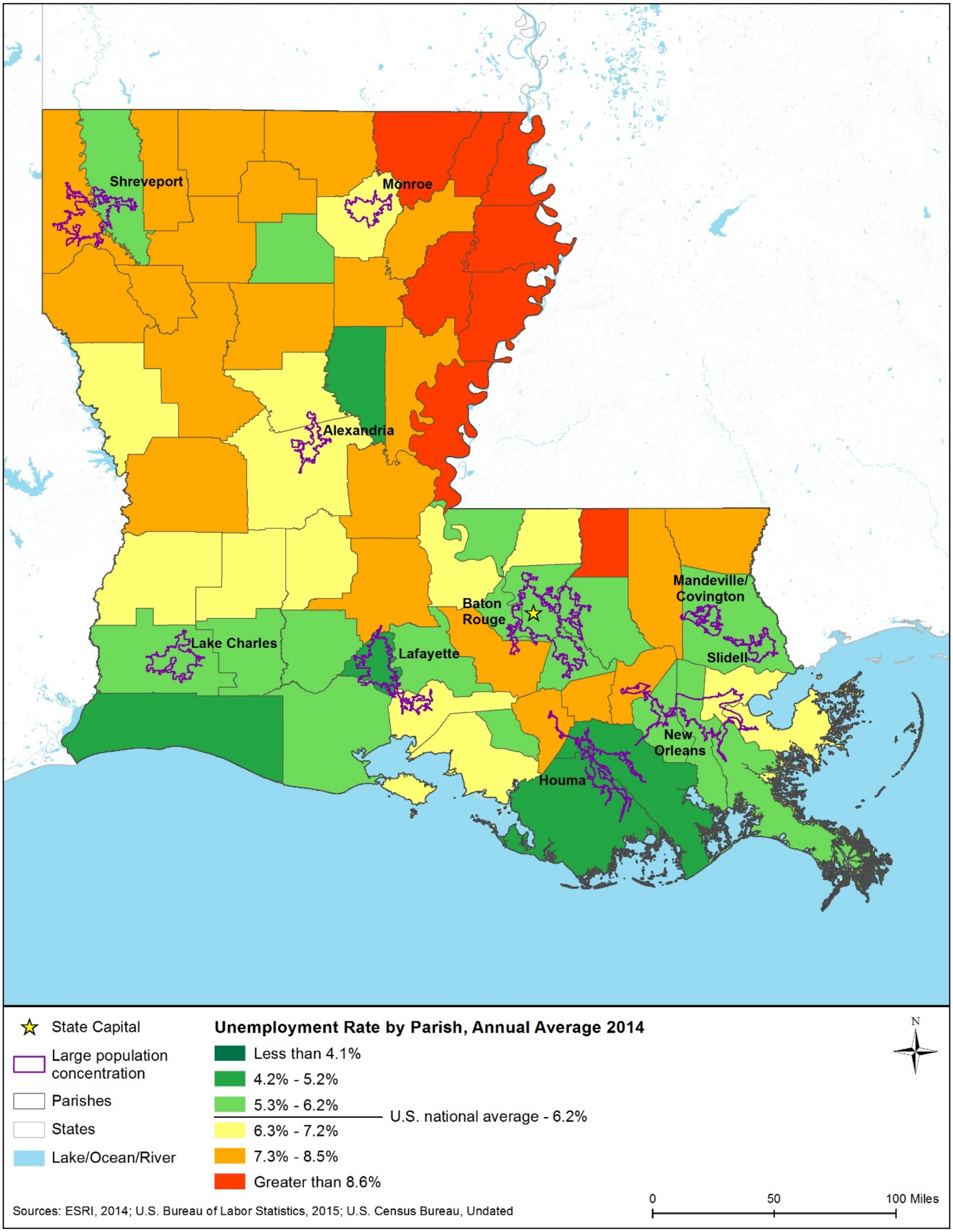

Figure 8.1.9-2: Unemployment Rates in Louisiana, by Parish, 2014

Table 8.1.9-6: Selected Economic Indicators for the 10 Largest Population Concentrations in Louisiana, 2009–2013

Area	Median Household Income	Average Annual Unemployment Rate
Alexandria	$37,215	9.5%
Baton Rouge	$51,690	7.7%
Houma	$49,992	6.2%
Lafayette	$49,377	7.0%
Lake Charles	$41,803	9.7%
Mandeville/Covington	$72,207	5.7%
Monroe	$35,030	8.8%
New Orleans	$44,206	9.5%
Shreveport	$42,953	8.0%
Slidell	$51,805	9.7%
Louisiana (statewide)	$44,874	8.8%

Source: (U.S. Census Bureau, 2015o)

Table 8.1.9-7: Employment by Class of Worker and by Industry, 2013

Class of Worker and Industry	Louisiana	South Region	United States
Civilian Employed Population 16 Years and Over	2,011,783	45,145,155	145,128,676
Percentage by Class of Worker			
Private wage and salary workers	79.1%	79.4%	79.7%
Government workers	15.1%	14.5%	14.1%
Self-employed in own not incorporated business workers	5.7%	5.9%	6.0%
Unpaid family workers	0.1%	0.2%	0.2%
Percentage by Industry			
Agriculture, forestry, fishing and hunting, and mining	5.0%	2.4%	2.0%
Construction	8.1%	6.9%	6.2%
Manufacturing	8.3%	9.9%	10.5%
Wholesale trade	2.8%	2.8%	2.7%
Retail trade	11.2%	12.1%	11.6%
Transportation and warehousing, and utilities	5.4%	5.2%	4.9%
Information	1.5%	1.9%	2.1%
Finance and insurance, and real estate and rental and leasing	5.3%	6.3%	6.6%
Professional, scientific, management, administrative, and waste management services	9.0%	10.5%	11.1%
Educational services, and health care and social assistance	23.4%	22.0%	23.0%
Arts, entertainment, and recreation, and accommodation and food services	10.0%	9.9%	9.7%
Other services, except public administration	4.8%	5.2%	5.0%
Public administration	5.3%	4.8%	4.7%

Source: (U.S. Census Bureau, 2015p)

Table 8.1.9-8 presents employment shares for selected industries for the 10 largest population concentrations in the state. The table reflects survey data taken by the Census Bureau from 2009 to 2013. Thus, its figures for the state are slightly different from those in Table 8.1.9-7 for 2013.

Table 8.1.9-8: Employment by Selected Industries for the 10 Largest Population Concentrations in Louisiana, 2009–2013

Area	Construction	Transportation and Warehousing, and Utilities	Information	Professional, Scientific, Management, Administrative and Waste Management Services
Alexandria	4.0%	4.2%	1.0%	7.8%
Baton Rouge	8.7%	3.7%	1.9%	10.3%
Houma	6.9%	6.3%	1.1%	6.7%
Lafayette	5.8%	4.2%	1.7%	10.0%
Lake Charles	8.4%	4.7%	1.5%	8.3%
Mandeville/Covington	8.5%	3.9%	1.3%	11.7%
Monroe	5.5%	4.2%	2.7%	7.4%
New Orleans	8.3%	5.8%	1.7%	10.9%
Shreveport	5.6%	5.5%	1.8%	8.1%
Slidell	9.6%	4.8%	1.0%	10.4%
Louisiana (statewide)	8.2%	5.2%	1.5%	8.6%

Source: (U.S. Census Bureau, 2015o)

Housing

The housing stock is an important socioeconomic component of communities. The type, availability, and cost of housing in an area reflect economic conditions and affect quality of life. Table 8.1.9-9 compares Louisiana to the South region and nation on several common housing indicators.

As shown in Table 8.1.9-9, in 2013, Louisiana had similar percentages of housing units that were occupied (86.8 percent) compared to the region (85.2 percent) and the nation (87.6 percent). Of the occupied units, Louisiana had a slightly higher percentage of owner-occupied units (66.0 percent) than the region (64.6 percent) or nation (63.5 percent). Louisiana in 2013 had a slightly higher percentage of detached single-unit housing (also known as single-family homes) (65.1 percent) compared to the region (63.8 percent) and nation (61.5 percent). The homeowner vacancy rate in Louisiana (1.6 percent) was lower than the rate for the region (2.2 percent) and nation (1.9 percent). This rate reflects "vacant units that are 'for sale only" (U.S. Census Bureau, 2015q). The vacancy rate among rental units was lower in Louisiana (7.6 percent) than in the region (8.5 percent) and higher than in the nation (6.5 percent).

Table 8.1.9-9: Selected Housing Indicators for Louisiana, 2013

Geography	Total Housing Units	Housing Occupancy & Tenure				Units in Structure
		Occupied Housing	Owner-Occupied	Homeowner Vacancy Rate	Rental Vacancy Rate	1-Unit, Detached
Louisiana	1,990,967	86.8%	66.0%	1.6%	7.6%	65.1%
South Region	44,126,724	85.2%	64.6%	2.2%	8.5%	63.8%
United States	132,808,137	87.6%	63.5%	1.9%	6.5%	61.5%

Source: (U.S. Census Bureau, 2015r)

Table 8.1.9-10 provides housing indicators for the largest population concentrations in the state by survey data taken from 2009 to 2013. Thus, its figures are not directly comparable to the more recent data in the previous table. However, it does present variation in these indicators for population concentrations across the state and compared to the state average for the 2009 to 2013 period.

Table 8.1.9-10: Selected Housing Indicators for the 10 Largest Population Concentrations in Louisiana, 2009–2013

Area	Total Housing Units	Housing Occupancy & Tenure				Units in Structure
		Occupied Housing	Owner-Occupied	Homeowner Vacancy Rate	Rental Vacancy Rate	1-Unit, Detached
Alexandria	34,032	84.8%	56.3%	0.8%	5.6%	70.3%
Baton Rouge	248,438	89.9%	65.0%	2.1%	8.8%	65.9%
Houma	57,308	91.3%	72.7%	1.5%	4.9%	68.7%
Lafayette	108,054	91.1%	64.9%	0.9%	6.3%	64.9%
Lake Charles	63,266	88.1%	66.5%	2.1%	9.8%	69.4%
Mandeville/Covington	36,496	92.8%	77.5%	2.0%	7.1%	79.9%
Monroe	50,202	88.2%	54.1%	2.3%	7.9%	67.2%
New Orleans	427,156	84.3%	57.6%	3.0%	10.4%	56.7%
Shreveport	130,680	89.0%	59.3%	2.3%	7.2%	67.4%
Slidell	37,135	90.0%	75.0%	3.5%	8.4%	76.1%
Louisiana (statewide)	1,974,313	86.5%	67.0%	1.9%	8.2%	65.2%

Source: (U.S. Census Bureau, 2015s)

Property Values

Property values have important relationships to both the wealth and affordability of communities. Table 8.1.9-11 provides indicators of residential property values for Louisiana and compares these values to values for the South region and nation. The figures on median value of owner-occupied units are from the Census Bureau's ACS, based on owner estimates of how much their property (housing unit and land) would sell for if it were for sale (U.S. Census Bureau, 2015q).

The table shows that the median value of owner-occupied units in Louisiana in 2013 ($140,300) was higher than the corresponding value for the South region ($137,752) and lower than the figure for the nation ($173,900).

Table 8.1.9-11: Residential Property Values in Louisiana, 2013

Geography	Median Value of Owner-Occupied Units
Louisiana	$140,300
South Region	$137,752
United States	$173,900

Source: (U.S. Census Bureau, 2015r)

Table 8.1.9-12 presents residential property values for the largest population concentrations in the state. The table reflects survey data taken from 2009 to 2013. Thus, its figures are not directly comparable to the more recent data in the previous table. However, it does show variation in property values for population concentrations across the state and compared to the state average for the 2009 to 2013 period. Five areas (Baton Rouge, Lafayette, Mandeville/Covington, New Orleans, and Slidell areas) had median values higher than the state median value ($138,900). All other population concentrations had property values below the state value. The lowest value was in the Monroe area ($117,400), which also had the lowest median household income (Table 8.1.9-6).

Table 8.1.9-12: Residential Property Values for the 10 Largest Population Concentrations in Louisiana, 2009–2013

Area	Median Value of Owner-Occupied Units
Alexandria	$122,200
Baton Rouge	$163,200
Houma	$136,600
Lafayette	$155,300
Lake Charles	$122,000
Mandeville/Covington	$231,300
Monroe	$117,400
New Orleans	$172,700
Shreveport	$133,300
Slidell	$165,300
Louisiana (statewide)	$138,900

Source: (U.S. Census Bureau, 2015s)

Government Revenues

State and local governments obtain revenues from many sources. FirstNet projects may affect flows of revenue sources between different levels of government due to program financing and intergovernmental agreements for system development and operation. Public utility taxes are a subcategory of selective sales taxes that include taxes on providers of land and mobile telephone, telegraph, cable and internet services (U.S. Census Bureau, 2006). These service providers may obtain new taxable revenues from operation of components of the public safety broadband network. These revenue streams are typically highly localized and therefore are best considered in the deployment phase of FirstNet.

Table 8.1.9-13 presents total and selected state and local government revenue sources as reported by the Census Bureau's 2012 Census of Governments. It provides both total dollar figures (in millions of dollars) and figures per capita (in dollars), based on total population for each geography. The per capita figures are particularly useful in comparing the importance of certain revenue sources in the state relative to other states in the region and the nation. State and local governments may obtain some additional revenues related to telecommunication infrastructure. General and selective sales taxes may change, reflecting expenditures during system development and maintenance.

Table 8.1.9-13 shows that state and local governments in Louisiana received more total revenue in 2012 on a per capita basis than their counterparts in the region and less total revenue than their counterparts in the nation. The state government received more intergovernmental revenue[94] from the federal government than its counterparts in the region and nation, while Louisiana local governments received similar amounts. Louisiana state and local governments obtained less revenues on a per capita basis from property taxes compared to their counterparts in the region and the nation. The Louisiana state government obtained less revenue, and the Louisiana local governments obtained more revenue, from general sales taxes on a per capita basis compared to their counterparts in the region and the nation. Selective sales taxes were roughly similar on a per capita basis for Louisiana d local governments comparted to their counterparts in, the region and nation. Public utilities taxes specifically were a minor revenue source for the Louisiana state government, and were roughly similar on a per capita basis for Louisiana local governments compared to local governments in the region, and nation. Louisiana local governments did not obtain revenue from individual or corporate income taxes in 2012. Individual income tax revenue per capita was higher for the state government compared to its counterparts in the region, and lower compared to its counterpart in the nation. Corporate income taxes per capita were lower for the Louisiana state government compared to those of the region and nation.

[94] Intergovernmental revenues are those revenues received by one level of government from another level of government, such as shared taxes, grants, or loans and advances (U.S. Census Bureau, 2006).

Table 8.1.9-13: State and Local Government Revenues, Selected Sources, 2012

Type of Revenue		Louisiana		Region		United States	
		State Govt. Amount	Local Govt. Amount	State Govt. Amount	Local Govt. Amount	State Govt. Amount	Local Govt. Amount
Total Revenue	($M)	$26,931	$22,213	$524,374	$449,683	$1,907,027	$1,615,194
	Per capita	$5,852	$4,827	$5,148	$4,414	$6,075	$5,145
Intergovernmental from Federal	($M)	$11,136	$980	$160,706	$18,171	$514,139	$70,360
	Per capita	$2,420	$213	$1,578	$178	$1,638	$224
Intergovernmental from State	($M)	$0	$7,040	$0	$115,088	$0	$469,147
	Per capita	$0	$1,530	$0	$1,130	$0	$1,495
Intergovernmental from Local	($M)	$77	$0	$2,815	$0	$19,518	$0
	Per capita	$17	$0	$28	$0	$62	$0
Property Taxes	($M)	$51	$3,587	$2,073	$109,687	$13,111	$432,989
	Per capita	$11	$779	$20	$1,077	$42	$1,379
General Sales Taxes	($M)	$2,816	$3,842	$82,651	$25,836	$245,446	$69,350
	Per capita	$612	$835	$811	$254	$782	$221
Selective Sales Taxes	($M)	$2,073	$339	$41,447	$9,394	$133,098	$28,553
	Per capita	$450	$74	$407	$92	$424	$91
Public Utilities Taxes	($M)	$13	$207	$5,101	$4,745	$14,564	$14,105
	Per capita	$3	$45	$50	$47	$46	$45
Individual Income Taxes	($M)	$2,475	$0	$38,637	$1,226	$280,693	$26,642
	Per capita	$538	$0	$379	$12	$894	$85
Corporate Income Taxes	($M)	$290	$0	$8,099	$114	$41,821	$7,210
	Per capita	$63	$0	$80	$1	$133	$23

Sources: (U.S. Census Bureau, 2015t; U.S. Census Bureau, 2015u)

Note: This table does not include all sources of government revenue. Summation of the specific source rows does not equal total revenue.

8.1.10 Environmental Justice

8.1.10.1 Definition of the Resource

Executive Order (EO) 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, issued in 1994, sets out principles of environmental justice and requirements that federal agencies should follow to comply with the EO (see Section 1.8.12, Executive Order 12898 – Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations). The fundamental principle of environmental justice is "fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies" (USEPA, 2016e). Under the EO, each federal agency must "make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations" (Executive Office of the President, 1994). In response to the EO, the USDOC developed an Environmental Justice Strategy in 1995, and published an updated strategy in 2013 (USDOC, 2013b).

In 1997, the Council on Environmental Quality (CEQ) issued *Environmental Justice: Guidance under the National Environmental Policy Act (NEPA)* to assist federal agencies in meeting the requirements of the EO (CEQ, 1997). Additionally, the USEPA's Office of Environmental Justice (USEPA, 2016e) offers guidance on Environmental Justice issues and provides an "environmental justice screening and mapping tool," EJSCREEN (USEPA, 2015d).

The CEQ guidance provides several important definitions and clarifications that this PEIS utilizes:

- Minority populations consist of "Individual(s) who are members of the following population groups: American Indian or Alaskan Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic."
- Low-income populations consist of individuals living in poverty, as defined by the U.S. Census Bureau (Census Bureau).
- Environmental effects include social and economic effects. Specifically, "Such effects may include ecological, cultural, human health, economic, or social impacts on minority communities, low-income communities, or Indian tribes when those impacts are interrelated to impacts on the natural or physical environment" (CEQ, 1997).

8.1.10.2 Specific Regulatory Considerations

The DEQ established the Environmental Justice Program in November 1993 as part of a pilot program using USEPA grant funds. The program, through its Environmental Justice Panels, provided opportunities for citizens facing environmental hazards to engage with "industrial representatives and governmental officials to discuss and resolve environmental justice concerns." The DEQ also gave Toxics Release Inventory (TRI) Workshops to educate communities about chemical information, facilities that may have local impact, and available resources and assistance (DEQ, 2015h), (University of California Hastings, 2010). The Environmental Justice Program was replaced with the Community & Industry Relations Program in 1996 "to facilitate communication and ease tensions that may arise between industry and members of the community." Currently, DEQ's Enviroschool Program provides community training sessions on environmental regulations (with emphasis on waste management facility siting and air emissions) and regulatory processes to encourage community participation (University of California Hastings, 2010) (DEQ, 2015i).

The Environmental Justice section of the Louisiana Environmental Quality Act required DEQ to analyze the effects of both permitted and unpermitted air pollutants and waste discharge from facilities "located in or near residential areas." "The department shall not commence the study authorized in this Section until funds have been specifically approved for the study by the legislature. The department shall not divert existing funds or fees from other budgeted programs to fund this study but may provide in-kind services to match any federal grants received" (Louisiana State Legislature, 1997). Federal laws relevant to environmental justice are described in Section 1.8, Overview of Relevant Federal Laws and Executive Orders.

8.1.10.3 Environmental Setting: Minority and Low-Income Populations

Table 8.1.10-1 presents 2013 data on the composition of Louisiana's population by race and by Hispanic origin. The state's population has a considerably higher percentage of individuals who identify as Black/African American (32.3 percent) than the populations of the South region (18.4 percent) and the nation (12.6 percent). In addition, the state's population has considerably lower percentages (more than two percentage points) of individuals who identify as Asian (1.6 percent) and Some Other Race (1.0 percent) compared to the nation. The percentages for all other races are similar or differ by only a few percentage points across the state, region, and nation. The state's population of persons identifying as White (62.9 percent) is somewhat smaller than that of the South region (72.3 percent) or the nation (73.7 percent).

The percentage of the population in Louisiana that identifies as Hispanic (4.7 percent) is considerably lower than in the South region (18.8 percent) and the nation (17.1 percent). Hispanic origin is a different category than race; persons of any race may identify as also being of Hispanic origin.

The category All Minorities consists of all persons who consider themselves Hispanic or of any race other than White. Louisiana's All Minorities population percentage (40.5 percent) is similar to that of the South region (42.3 percent) and slightly higher than that of the nation (37.6 percent).

Table 8.1.10-2 presents the percentage of the population living in poverty in 2013, for the state, region, and nation. The figure for Louisiana (19.8 percent) is higher than that of the South region (18.2 percent) and considerably higher than the figure for the nation (15.8 percent).

Table 8.1.10-1: Population by Race and Hispanic Status, 2013

Geography	Total Population (estimated)	Race							Hispanic	All Minorities[a]
		White	Black/ African Am	Am. Indian/ Alaska Native	Asian	Native Hawaiian /Pacific Islander	Some Other Race	Two or More Races		
Louisiana	4,625,470	62.9%	32.3%	0.6%	1.6%	0.0%	1.0%	1.7%	4.7%	40.5%
South Region	102,853,019	72.3%	18.4%	0.9%	2.6%	0.1%	3.3%	2.4%	18.8%	42.3%
United States	316,128,839	73.7%	12.6%	0.8%	5.1%	0.2%	4.7%	3.0%	17.1%	37.6%

[a] "All Minorities" is defined as all persons who consider themselves Hispanic or of any race other than White. Because some Hispanics identify as both Hispanic and of a non-White race, "All Minorities" is less than the sum of Hispanics and non-White races.
Source: (U.S. Census Bureau, 2015v)

Table 8.1.10-2: Percentage of Population (Individuals) in Poverty, 2013

Geography	Percent Below Poverty Level
Louisiana	19.8%
South Region	18.2%
United States	15.8%

Source: (U.S. Census Bureau, 2015w)

8.1.10.4 Environmental Justice Screening Results

Analysis of environmental justice in a NEPA document typically begins by identifying potential environmental justice populations in the project area. Appendix D, Environmental Justice Methodology, presents the methodology used in this PEIS to screen each state for the presence of potential environmental justice populations. The methodology builds on CEQ guidance and best practices used for environmental justice analysis. It uses data at the census-block group level; block groups are the smallest geographic units for which regularly updated socioeconomic data are readily available at the time of writing.

Figure 8.1.10-1 visually portrays the results of the environmental justice population screening analysis for Louisiana. The analysis used block group data from the Census Bureau's American Community Survey 2009-2013 5-Year Estimates (U.S. Census Bureau, 2015h; U.S. Census Bureau, 2015x; U.S. Census Bureau, 2015y; U.S. Census Bureau, 2015z) and Census Bureau urban classification data (U.S. Census Bureau, 2012; U.S. Census Bureau, 2015i)

Figure 8.1.10-1 shows that Louisiana has many areas with high potential for environmental justice populations. The distribution of these high potential areas is fairly even across the state, and occurs both within and outside of the 10 largest population concentrations. The distribution of areas with moderate potential for environmental justice populations is also fairly even across the state.

It is important to understand how the data behind Figure 8.1.10-1 affect the visual impact of this map. Block groups have similar populations (hundreds to a few thousand individuals) regardless of population density. In sparsely populated areas, a single block group may cover tens or even hundreds of square miles, while in densely populated areas, block groups each cover much less than a single square mile. Thus, while large portions of the state outside the areas defined as large population concentrations show moderate or high potential for environmental justice populations, these low density areas reflect modest numbers of minority or low-income individuals compared to the potential environmental justice populations within densely populated areas. The overall effect of this relative density phenomenon is that the map visually shows large areas of the state having environmental justice potential, but this over-represents the presence of environmental justice populations.

It is also very important to note that Figure 8.1.10-1 does not definitively identify environmental justice populations. It indicates *degrees of likelihood of the presence* of populations of potential concern from an environmental justice perspective. Two caveats are important. First, environmental justice communities are often highly localized. Block group data may under- or over-represent the presence of these localized communities. For instance, in the large block groups in sparsely populated regions of the state, the data may represent dispersed individuals of minority or low-income status rather than discrete, place-based communities. Second, the definition of the moderate potential category draws a wide net for potential environmental justice populations. As discussed in Appendix D, the definition includes some commonly used thresholds for environmental justice screening that tend to over-identify environmental justice potential. Before FirstNet deploys Proposed Actions, additional site-specific analyses to identify specific, localized environmental justice populations may be warranted. Such analyses could tier-off the methodology of this PEIS.

This map also does not indicate whether FirstNet Proposed Actions would have actual impacts on environmental justice populations. An environmental justice effect on minority or low-income populations only occurs if the effect is harmful or significant (according to the significance criteria), and “appreciably exceeds or is likely to appreciably exceed the risk or rate to the general population or other appropriate comparison group” (CEQ, 1997). The Environmental Consequences section (Section 8.2) addresses the potential for disproportionately high and adverse environmental or human health impacts on environmental justice populations.

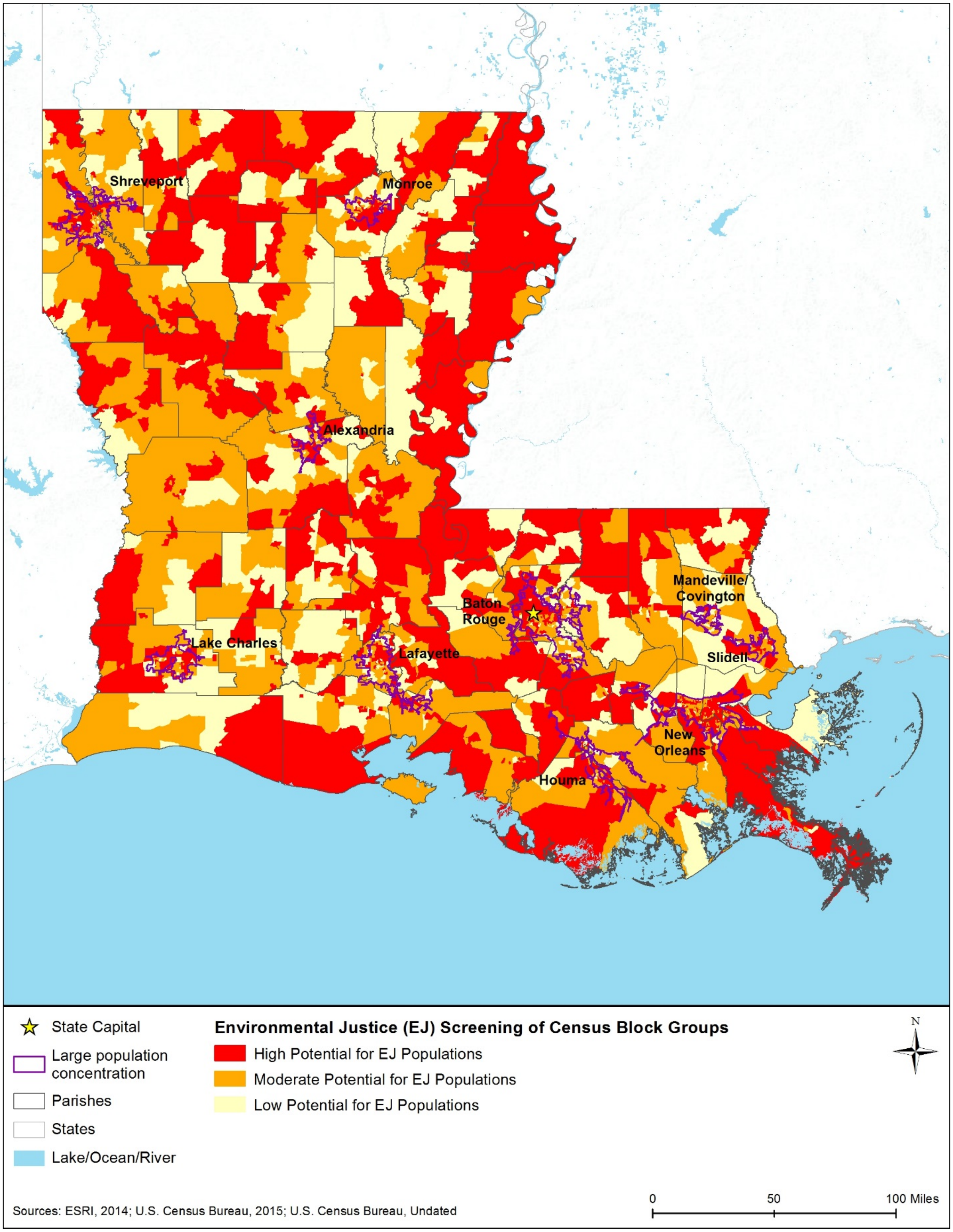

Figure 8.1.10-1: Potential for Environmental Justice Populations in Louisiana, 2009–2013

8.1.11 Cultural Resources

8.1.11.1 Definition of Resource

For the purposes of this PEIS, cultural resources are defined as:

> Natural or manmade structures, objects, features, locations with scientific, historic, and cultural value, including those with traditional religious or cultural importance and any prehistoric or historic district, site, or building included in, or eligible for inclusion in, the NRHP.

This definition is consistent with the how cultural resources are defined in the:

- Statutory language and implementing regulations for Section 106 of the NHPA, as amended, formerly 16 U.S.C. 470a(d)(6)(A) (now 54 U.S.C. 306131(b)) and 36 CFR 800.16(l)(1);
- Statutory language and Implementing regulations for the Archaeological Resources Protection Act of 1979 (ARPA), 16 U.S.C. 470cc(c) and 43 CFR 7.3(a);
- Statutory language and implementing regulations for the Native American Graves Protection and Repatriation Act (NAGPRA), 25 U.S.C. 3001(3)(D) and 43 CFR 10.2(d);
- The NPS program support of public and private efforts to identify, evaluate, and protect America's historic and archeological resources (NPS, 2015j); and
- Advisory Council on Historic Preservation's (ACHP) guidance for protection and preservation of sites and artifacts with traditional religious and cultural importance to Indian tribes or Native Hawaiian organizations (Advisory Council on Historic Preservation, 2004).

8.1.11.2 Specific Regulatory Considerations

Applicable federal laws and regulations that apply to Cultural Resources include the NHPA (detailed in Section 1.8, Overview of Relevant Federal Laws and Executive Orders), the American Indian Religious Freedom Act (AIRFA), ARPA, and NAGPRA. Appendix C, Environmental Laws and Regulations, summarizes these pertinent federal laws. While federal agencies may take into account compatible state laws and regulations, their actions that are subject to federal environmental review under NEPA and NHPA are not subject to compliance with such state laws and regulations. Table 8.1.11-1 presents state and local laws and regulations that relate to cultural resources.

Table 8.1.11-1: Relevant Louisiana Cultural Resources Laws and Regulations

State Law/Regulation	Regulatory Agency	Applicability
LRS Title 25 – Libraries, museums, and other scientific (RS 56:802)	Art, Historical, and Cultural Preservation Agency	Confers responsibility for creation of state register of historic places and preservation of the state's art, historical and cultural treasures.

In addition to the state laws and regulations, in Louisiana any municipality designated a governmental unit has the authority to establish an historic district commission (or utilize the zoning and planning commission as such) to determine historic preservation districts for preservation of historic and cultural resources.

8.1.11.3 Cultural and Natural Setting

Human beings have inhabited the Louisiana region for more than 13,500 years. The majority of evidence of Louisiana's early human habitation comes from the study of archeological sites of pre-European contact and historic populations. In addition to the hundreds of archaeological sites listed in the state's inventory, there are 30 archaeological sites in Louisiana listed on the NRHP: 10 are historic, 19 are prehistoric, and one has both historic and prehistoric provenience (NPS, 2014b). Louisiana has one major physiographic region: the Atlantic Plain (Coastal Plain Province), shown in Figure 8.1.3-1.

Most archeological evidence in Louisiana is found in relatively shallow deposits on the surface or within one to two feet of the surface. However, in some cases, natural factors have buried sites beneath multiple layers of sediment or organic materials, such as in floodplain deposits found along streams and rivers or peat deposits in wetlands. These alluvial deposits can range 1-10 feet below the current surface, with older sites in the deeper sediments. Disturbed ground, including urban areas, may contain archaeological resources in deeper or shallower strata than undisturbed areas. (CRT, 2015f)

The following sections provide additional detail about Louisiana's prehistoric periods (approximately 11500 B.C. to A.D. 1700) and the historic period since European colonization in the 1600s. There is some overlap between the prehistoric period and the historic period, as American Indians continued to carry on their traditional way of life in parts of Louisiana after European contact. Section 8.1.11.4 presents an overview of the initial human habitation in Louisiana and the cultural development that occurred before European contact. Section 8.1.11.5 discusses the federally recognized American Indian tribes with a cultural affiliation to the state. Section 8.1.11.6 provides a current list of significant archaeological sites in Louisiana and tools that the state has developed to ensure their preservation. Section 8.1.11.7 documents the historic context of the state since European contact, and Section 8.1.11.8 summarizes the architectural context of the state during the historic period.

8.1.11.4 Prehistoric Setting

Archaeologists divide Louisiana's prehistoric past into four periods: Paleoindian Period (11500 - 8000 B.C.), Archaic Period (8000 - 800 B.C.), Woodland Period (800 B.C. - A.D. 1200), and Mississippian Period (A.D. 1200 - 1700). Figure 8.1.11-1 shows a timeline representing these periods of early human habitation of present day Louisiana. Evidence of human occupation is found throughout the state. Due to advancements in archaeological techniques and the association of newly discovered artifacts with similar ones previously assigned to a particular range of the archaeological record, the dates associated with a particular phase in North American human development continue to become increasingly accurate (Pauketat, 2012; Haynes, Donahue, Jull, & Zabel, 1984; Haynes, Johnson, & Stafford, 1999).

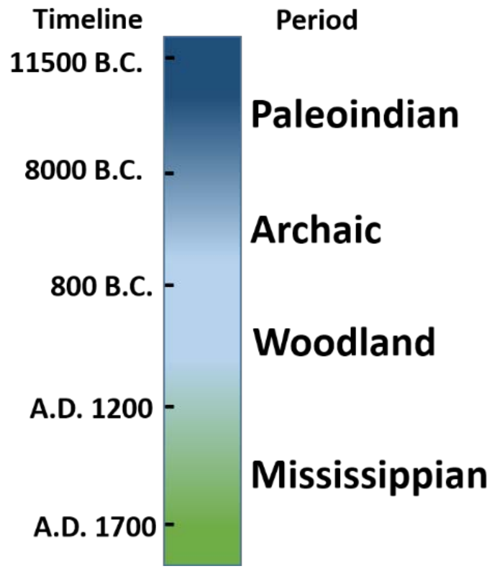

Figure 8.1.11-1: Timeline of Prehistoric Human Occupation

Sources: (Institute of Maritime History, 2015; CRT, 2015f)

Paleoindian Period (11500 – 8000 B.C.)

The Paleoindian Period represents the earliest human habitation of Louisiana. Paleoindians lived in small groups of nomadic hunters and gatherers that used chipped-stone tools, including the "fluted javelin head" arrow and spear points (referred to as the Clovis or Folsom fluted point). Studies show that that such technology was prevalent in northeastern Asia, the Arabian Peninsula, and Spain prior to human arrival into North America (Charpentier, Inizan, & Feblot-Augustins, 2002).

During the Paleoindian Period many large mammals that are now extinct, such as giant bison, mammoths, and ground sloths, were being hunted. As the technologies changed and the large animals decreased in numbers, people began to exploit various other plant and animal species for sustenance (Jennings, 2008).

Most of the oldest known evidence of human settlement in Louisiana comes from the discovery of Clovis and Folsom fluted spear points. These artifacts are not distributed evenly throughout Louisiana, and vary in accordance with geographic and topographic factors. Out of the 11,257 projectile points discovered in the United States dating from the Paleoindian period, only 48 are from Louisiana (Anderson & Faught, 1998).

The San Patrice projectile point (a small point that likely tipped darts), used for hunting large game in this region, originated in Louisiana and east Texas during the Late Paleoindian Period. This technology spread east into Mississippi, north into Arkansas and Missouri, and west into Oklahoma and Texas. San Patrice point technology appears to have been primarily used in the heavily wooded gulf coastal plains (Jennings, 2008).

Archaic Period (8000 – 800 B.C.)

Based on archaeological evidence of present day Louisiana, Archaic Period inhabitants fished and hunted deer along major river valleys. Other flora and fauna, discussed below were opportunistically exploited for their nutritional and utilitarian value. The Conly (Bienville Parish), W Copes (northwest Louisiana), and Watson Brake (Ouachita Parish) sites in Louisiana bottomlands provide evidence that Archaic Period societies built fishing villages or camps, and relied heavily on aquatic species for survival. Contrary to technology development in other prehistoric societies, the diversity of procurement implements (tools) diminished in Louisiana during the Archaic Period, as people began to rely on a single abundant food source, fish (Jackson & Scott, 2001).

Approximately 110 mound complexes in Louisiana were initially identified in the 1960s as Woodland Period structures, even though the sites lacked ceremonial objects and pottery normally associated with the mound-building cultures of the southeastern United States. Various investigations of the sites conducted in the 1990s conclusively demonstrated that many Louisiana mound complexes date from the Archaic Period, and preceded the other mound-building cultures that developed across the southeastern United States in the Woodland Period (Russo 1994) (Saunders, Allen and Saucier 1994).

During the Late Archaic Period, a pre-agricultural society known as the Poverty Point Culture began to develop. The culture is named after the Poverty Point site, near Epps, LA, in the northeastern corner of the state. The complex site contains one of the largest groups of earthworks constructed in Louisiana and North America during this period. At its height, the broader Poverty Point Culture occupied large areas of present day Louisiana, Mississippi, and Arkansas, primarily along rivers, junctions of lakes and rivers, and in coastal marshes (CRT, 2015c).

Members of the Poverty Point Culture lived in small groups that were dispersed throughout the region, as well as in regional centers occupied year-round by large numbers of people. The regional centers contained large oval or horseshoe structures made out of earth or shell, and were probably used for ceremonial, political, and trading purposes. Artifacts show that these people were trading with other groups as far away as Wisconsin, Tennessee, and Florida. "People living in [regional centers] relied on hunting, fishing, and plant collecting…They gathered pecans, acorns, hickory nuts, persimmons, seeds of wild grasses, and other wild plant food" (CRT, 2015c). Their diets also included "deer, rabbits, squirrels, raccoons, muskrats, ducks, geese, turkeys, turtles, catfish, gar, bowfin, and bass" (CRT, 2015e).

Long distance trade allowed Poverty Point Culture people to acquire materials to expand production and modification of tools. Excavations of Poverty Point Culture sites have discovered oval-shaped plummets used as weights on fishing nets (called "bolas"), clay cooking balls, stone and pottery vessels, ornamental objects such as clay figurines, beads, and pendants. (CRT, 2015e).

Woodland Period (800 B.C. – A.D. 1200)

Archeological research shows that the transition from the Archaic to Woodland Periods in the lower Mississippi Valley was likely caused in part by a rapid rise of regional temperature and precipitation, and more frequent flood events. About 3000 years ago, recurrent flooding of present day Louisiana "led to major fluvial reorganization that caused settlement abandonment and is associated with the demise of certain cultures in the region." These physiographic changes caused a dramatic decline of human inhabitation of the state and resulting cultural changes (Kidder, T., 2006).

The flooding that occurred throughout the Mississippi River Valley during the Late Archaic Period created crevasse splays and sedimentary fluvial deposits, which created ideal settings for permanent or semi-permanent Woodland Period camps site and villages. The Raftman, St. Mary and Borrow Pit, and Panther Lake sites in Madison Parish provide evidence of how Early Woodland Period cultures occupied the new physiographic areas. The people formed small societies of villages, while exploiting their surrounding environment for food and shelter (Kidder, Roe, & Schilling, 2010).

The Tchefuncte (pronounced Che-funk'tuh) Culture flourished in Louisiana from about 600 B.C. - A.D. 200. Tchefuncte people inhabited coastal areas and built their campsites on natural levees, terraces, salt domes, cheniers, and ridges. They also built circular temporary shelters. Food sources included wild plants, game, oysters, and clams. There is some evidence to suggest that squash and gourd horticulture was practiced at some Tchefuncte settlements in present day Louisiana (CRT, 2015e).

Tchefuncte people traded with cultures from western Mississippi, coastal Alabama, eastern Texas, Arkansas, and southeastern Missouri. A Tchefuncte archeological site on the northwestern shore of Lake Pontchartrain revealed approximately 50,000 pieces of pottery, providing evidence of large-scale pottery manufacturing and use. Pottery was important because it increased the people's ability to store and cook food. Excavation of two shell middens at the site yielded artifacts made from bone, shell, and stone, and evidence of 43 human burials (CRT, 2015e).

Mississippian Period (A.D. 1200 – 1700)

Since 2009, there has been increasing research on the Mississippian culture due to considerable new theories, and the discovery of Mississippian Period tools and objects (e.g., stone knives, arrow points, bows, turtle shell rattles, polished stone axes, rare minerals, stone or clay smoking pipes, and animal teeth pendants, ceremonial objects, and jewelry), (CRT, 2015e). Before 2009, researched focused on the Chiefdom cultures that dominated most of the region and the hierarchal societies led by Chiefs that administered construction of mounds. Archeologists hypothesize that hierarchal leadership probably developed as a way to organize food gathering and hunting activities.

The distinguishing artifacts of the Mississippian Period Chiefdom culture are the elaborately engineered "large platform mounds which were often concentrated in civic-ceremonial centers at the political capital of the chiefdoms" (Bense, 1996). Examples of four sites representing the mound building culture of Louisiana are provided in Table 8.1.11-2.

Table 8.1.11-2: Examples of Mound Sites in Louisiana

Site Name	Location	Mound Site Description
Marksville Site	Avoyelles Parish	The Marksville Site was the first scientifically excavated site of the Marksville Culture. The site contains burial mounds surrounded by a 3,000-foot long horseshoe-shaped earthen embankment.
Greenhouse Site	Avoyelles Parish	The Greenhouse Site contains seven earthen mounds around an open plaza. The footprint of each mound is 200 feet by 350 feet. The mounds are believed to have been built for ceremonial purposes only, since no campsites or villages have been found within the vicinity.
Gahagan Site	Red River Parish	The Gahagan Site represents the early Caddo Indian culture of Louisiana. The mounds are situated around a large open plaza. There are three shaft burials, each containing the remains of up to six individuals. Objects found at the site include two clay, human effigy pipes, two copper cutouts of human hands, two copper, long-nosed-mask ear ornaments, two frog effigy pipes, and numerous triangular stone blades called "Gahagan knives."
Medora Site	Baton Rouge Parish	The Medora Site consists of two mounds approximately 400 feet apart with a plaza between them. One of the mounds had a flat-topped pyramid, about 13 feet high and was 125 feet on each side. The other mound is 2 feet high and 100 feet in diameter. A significant amount of pottery was recovered from this site.

Source: (CRT, 2015c)

Successful large-scale maize cultivation, exploitation of coastal resources, and storage of food for future use became commonplace in Louisiana during the Mississippian Period. Other sustenance was provided by deer, wild plants, and nuts (Bense, 1996).

A Cahokia copper long-nosed god mask found in the Big Mound in St. Louis, Missouri has been linked to the cultures of the Mississippian Period in Gulf Port, Louisiana. The mask is a "representation on engraved shell and embossed copper designs of the Mississippian Period" (Griffin, 1993). This artifact is evidence people of the Louisiana region were interacting with others through trade and exchange of ideas.

8.1.11.5 Federally Recognized Tribes of Louisiana

According to the Bureau of Indian Affairs and the National Conference of State Legislators, there are four federally recognized tribes in Louisiana: the Chitimacha Tribe; the Coushatta Tribe; the Jena Band of Choctaw Indians; and the Tunica Biloxi Indian Tribe (National Conference of State Legislators, 2015; GPO, 2015). Figure 8.1.11-2 shows the location of all the present federally recognized tribes in Louisiana. The other tribes depicted in the figure are general locations of tribes known to have existed in this region of the United States, but are not officially federally recognized.

Figure 8.1.11-2: Federally Recognized Tribes in Louisiana

8.1.11.6 Significant Archaeological Sites of Louisiana

As previously mentioned in Section 8.14.3, there are 30 archaeological sites in Louisiana listed on the NRHP. Table 8.1.11-3lists the names of the sites, the city they are closest to, and type of site. The list includes both prehistoric and historic archaeological sites. The number of archaeological sites may increase with the discovery of new sites. A current list of NRHP sites are listed on the NPS NRHP website at http://www.nps.gov/nr/ (NPS, 2014c).

Table 8.1.11-3: Archaeological Sites on the National Register of Historic Places in Louisiana

Closest City	Site Name	Type of Site
Angola	Bloodhound Site	Historic - Aboriginal, Prehistoric
Baton Rouge	Highland Stockade	Historic, Military
Baton Rouge	Lee Site (16EBR51)	Prehistoric
Baton Rouge	Louisiana State Campus Mounds	Prehistoric
Baton Rouge	Peralta, Sarah, Archeological Site	Prehistoric
Clarence	Fredericks Site	Prehistoric
Delhi	Thompson, Francis, Site (16MA112)	Prehistoric
Delhi	Marsden (16R13)	Prehistoric
Donaldsonville	Fort Butler	Historic
Ferriday	DePrato Mounds	Prehistoric
Frogmore	Frogmore (16CO9)	Prehistoric
Fullerton	Fullerton Mill and Town	Historic
Hebert	Landerneau Mound	Prehistoric
Jonesville	Caney Mounds	Prehistoric
Jonesville	Paul’s Camp South	Prehistoric
LaPlace	Bayou Jasmine Archeological Site	Prehistoric
Mandeville	Tchefuncte Site	Prehistoric
Mansfield	Mansfield Battle Park	Military
Marksville	Marksville Prehistoric Indian Site	Prehistoric
Natchitoches	Fish Hatchery 2 Site	Prehistoric
New Iberia	NEW IBERIA (steamboat) shipwreck	Shipwreck
New Orleans	Big Oak-Little Oak Islands	Prehistoric
Norco	Kenner and Kugler Cemeteries Archeological District	Historic
Phoenix	Fort De La Boulaye Site	Historic
Ringgold	Conly Site	Prehistoric
Sicily Island	Ferry Place	Historic - Aboriginal
St. Bernard	Magnolia Mound	Prehistoric
Thibodaux	Acadia Plantation	Historic
Tunica	Trudeau Landing	Historic - Aboriginal
Vienna	Hedgepeth Mounds	Prehistoric

Source: (NPS, 2015k)

8.1.11.7 Historic Context

In 1541-1542, Hernando de Soto explored the Mississippi River for Spain, and in 1682, Rene-Robert Cavelier, Sieur de la Salle claimed the Mississippi River watershed for France, naming the whole region “Louisiana” after King Louis XIV. Following the establishment of Fort Maurepas as the first capital of colonial Louisiana on the nearby Mississippi coast (then part of Louisiana), Natchitoches was established as a trading post in 1714, Baton Rouge as a fort in 1721 and New Orleans was founded in 1718 and became the capital of Louisiana in 1723. Following the French and Indian War (1754 to 1762), control of present day Louisiana transitioned to Spain, where it remained until 1800. As a part of the same events, French Acadians began moving to present day Louisiana from Newfoundland, New Brunswick and other parts of French Canada in the 1750s, as England now controlled France’s former territory in Canada and suspected them of aiding their former King. The Acadians, many of whom settled in the lowland areas and bayous, developed into the Cajun culture that exists today (State of Louisiana, 2015). Two great fires devastated the New Orleans in the late 18th century, and as a result, much of the French Quarter’s historic architecture was built under Spain. Louisiana was heavily involved in agriculture during the 18th and 19th centuries, with large plantations being established in the fertile countryside. Tobacco and indigo were grown first, eventually replaced by cotton and sugarcane. Rice was a major crop by the mid-1800s.

In 1803, the United States acquired the Louisiana Territory through the Louisiana Purchase, which also included much of the central portion of the country stretching as far north as Canada. On April 30, 1812, Louisiana was admitted to the Union as the 18th state with its current boundaries. During the War of 1812, General Andrew Jackson gained fame for his leadership at the Battle of New Orleans, during which he rebuffed the British attempt to capture New Orleans and gain control of the Mississippi River in the last battle of the war in January 1815. In 1849, Baton Rouge, which is further inland along the river, was chosen to be the new capital. During the Civil War, Louisiana was the sixth southern state to secede from the Union on January 26, 1861 and joined the Confederacy nine days later (State of Louisiana, 2015). New Orleans was captured by Union troops in April 1862, but numerous battles occurred in Louisiana during the war, revolving largely around securing and maintaining naval control of the Mississippi River (Louisiana Office of Cultural Development, 2011).

In 1869, sulphur was found in southwestern Louisiana, and oil was discovered in 1901; both of which became important state exports. Petroleum operations expanded during the 20th century, and Louisiana remains heavily reliant on the petroleum industry today. The forestry industry developed during the late 19th century, contributing to economic growth while timber supplies lasted (State of Louisiana, 2015). Infrastructure improvements were undertaken during the early 20th century, including road and bridge construction and expansion, being funded in large part by oil revenues. During World War I (WWI), Louisiana experienced growth associated with the war, including the construction of bases and training facilities. As the Great Depression hit the nation in 1929, like many states, Louisiana relied upon New Deal programs to infuse the economy with money, spark economic recovery, and ease unemployment (Louisiana Office of Cultural Development, 2011).

During World War II (WWII), further growth occurred, including the construction of additional military facilities. Fort Polk (1941), a training facility that also served as a German prisoner of war (POW) camp, is still active and in use today. One of the most important vessels to be made for the Allies, the Higgins boat troop landing craft, was made in New Orleans and was later credited by General Dwight D. Eisenhower for his successful strategy for D-Day and the Normandy invasion in 1944. Following WWII, Louisiana continued to experience growth, including "an explosion in the number of suburbs surrounding the state's major cities, and an accompanying growth of businesses to service this new population, much of it drawn from declining rural areas" (Louisiana Office of Cultural Development, 2011).

Louisiana has 1,721 NRHP sites, as well as 55 NHLs (NPS, 2014b). Louisiana contains two NHAs: the Cane River NHA and Atchafalaya NHA (NPS, 2015j). Figure 8.1.11-3 shows the location of NHA and NRHP sites within the state of Louisiana.[95]

8.1.11.8 Architectural Context

Early architecture in Louisiana dates to the 18th century when the French Creole style was commonly built. While this style was once present throughout much of the central portion of the country (such as Missouri) and along the Gulf coast—areas that were originally colonized by France, the majority of the remaining examples of French Creole architecture are in Louisiana (Louisiana Office of Cultural Development, 2011). This style occurred in vernacular structures, such as small houses and civic institutions, as well as in elaborate plantation architecture. The French Creole style, also referred to as French Colonial, is characterized by large inclusive porches (often wrapping three sides of the building), double pitched roofs (usually hipped), the principle rooms being above grade, generous galleries, and French doors. Destrehan Plantation (1787) is an existing example of a late 18th century French Creole plantation home (NPS, 2015l).

The entire French Quarter in New Orleans, which contains Louisiana's most well-known collection of historic structures, has been designated as a National Historic Landmark District (NPS, 2015m). St. Louis Cathedral was established in 1718, and while it has been rebuilt on multiple occasions, its location in Jackson Square has remained the same. The current structure dates to 1794 but was expanded during 19th century (State of Louisiana, 2015). While the French Quarter was established by France, it now contains few examples of French architecture due to two devastating fires during the late 18th century (Louisiana Office of Cultural Development, 2011). Madame John's Legacy (1788), which has been designated individually as a NHL, is one of the existing examples of French architecture (Louisiana State Museum, 2015). Most 18th century structures in the French Quarter were built under Spanish control, and as the area continued to evolve during the 19th century, "Greek Revival, Egyptian Revival, Gothic Revival, and Italianate styles are evident in housing, businesses, and government buildings from the later antebellum period" (Louisiana Office of Cultural Development, 2011). Shotgun houses from the late 19th and early 20th centuries are common throughout New Orleans' historic wards as well, particularly in lower income areas; these often exhibit Folk Victorian stylings.

95 See Section 8.1.7 for a more in-depth discussion of additional historic resources as they relate to recreational resources.

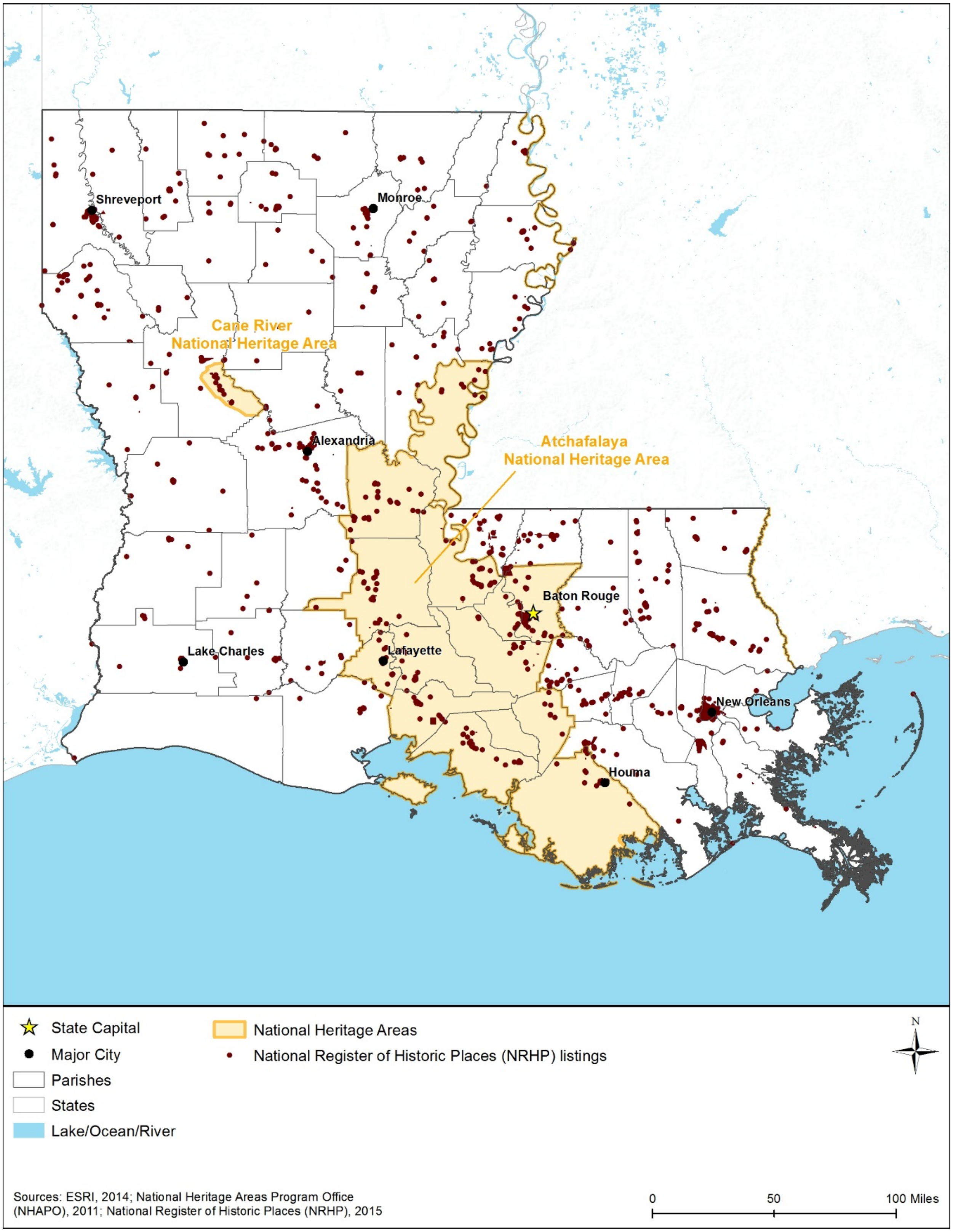

Figure 8.1.11-3: NHAs and NRHP Sites in Louisiana

During the Antebellum years, Louisiana plantations grew to be enormous cash crop producing entities, and the architecture associated with them was often very high style. "The 'big houses' came in a range of styles, some showing their colonial and Caribbean roots, others illustrating Federalist, neo-classical, and Gothic Revival styles popular elsewhere in the South" (Louisiana Office of Cultural Development, 2011). In the upland areas of the country, settled and populated by immigrants of Anglo and Scots-Irish heritage, housing types included single-pen cabins, I-houses, and dog trots, while the lowland areas typically exhibited Cajun architecture (Louisiana Office of Cultural Development, 2011). Many historic Cajun dwellings were on rivers and in bayous and can include both houseboats and dryland housing.

Louisiana has an important collection of forts and military sites associated with the early defense of the Mississippi River and its settlements. These are primarily concentrated around New Orleans and include sites associated with the Battle of New Orleans (1815), as well as resources dating from the Antebellum and Civil War periods. While many of these resources now exist only archaeologically, historic structures do still exist. "These include Forts Pike and Macomb east of the city, the crumbling ruins of Fort Livingston to the west, and Forts Jackson and St. Philip down the Mississippi" (Louisiana Office of Cultural Development, 2011). Louisiana also has a collection of historically important cemeteries, the most notable of which are the above-ground cemeteries in and around New Orleans. St. Louis Cemetery, outside of the French Quarter, is an example of this type of resource (Louisiana Office of Cultural Development, 2011).

Transportation infrastructure development is significant to Louisiana history. While the Mississippi River was the first, and perhaps most important method of transportation, the introduction of railroads during the second half of the 19th century opened rural areas to national trends and styles. In cities, streetcar development spawned early suburbs and "the development of 'garden districts' in Baton Rouge, Alexandria, and Shreveport (not to mention in much of New Orleans as well) reflected general trends towards suburbanization in the 1910s and after, with strong bungalow styles tailored to indigenous tastes and an abundance of Colonial, Spanish Colonial, and Tudor Revival examples on display" (Louisiana Office of Cultural Development, 2011). During the Great Depression, schools, jails, airports, community buildings, and civic institutions were built through New Deal programs. During and after WWII, growth occurred in the form of federally funded projects, but also resulted in the loss of many historic resources (Louisiana Office of Cultural Development, 2011).

Figure 8.1.11-4: Representative Architectural Styles of Louisiana

- Left – Capitol Building (Baton Rouge, LA) – (Highsmith, Capitol building, Baton Rouge, Louisiana, 1980a)
- Top Center – Ginnan Villa (New Orleans' Garden District, LA) – (Highsmith, Ginnan Villa estate in the Garden District of New Orleans, Louisiana, 1980b)
- Bottom Center – St. Louis Cemetery (New Orleans, LA) – (Detroit Publishing Company, 1901)
- Top Right – Chretien Point Plantation (Sunset, LA) – (Historic American Buildings Survey, 1933)
- Bottom Right – Building in New Orleans' French Quarter (New Orleans, LA) – (Johnston, 1930)

8.1.12 Air Quality

8.1.12.1 Definition of the Resource

Air quality in a geographic area is determined by the type and amount of pollutants emitted into the atmosphere, the size, and topography[96] of the area, and the prevailing weather and climate conditions. The levels of pollutants and pollutant concentrations in the atmosphere are typically expressed in units of parts per million (ppm)[97] or micrograms per cubic meter ($\mu g/m^3$) determined over various periods of time (averaging time).[98] This section discusses the existing air quality in Louisiana. USEPA designates areas within the United States as attainment,[99]

[96] Topography: The unique features and shapes of the land (e.g., valleys and mountains).
[97] Equivalent to 1 milligram per liter (mg/L).
[98] Averaging Time: "The period over which data are averaged and used to verify proper operation of the pollution control approach or compliance with the emissions limitation or standard" (USEPA, 2015c).
[99] Attainment areas: Any area that meets the national primary or secondary ambient air quality standard for the pollutant (USEPA, 2015r).

nonattainment,[100] maintenance,[101] or unclassifiable[102] depending on the concentration of air pollution relative to ambient air quality standards. Information is presented regarding national and state ambient air quality standards and nonattainment areas that would be potentially more sensitive to impacts from implementation of the Proposed Action or alternatives.

8.1.12.2 Specific Regulatory Considerations

National and State Ambient Air Quality Standards

The Clean Air Act (CAA) establishes National Ambient Air Quality Standards (NAAQS) for six criteria pollutants: Carbon monoxide (CO), lead, oxides of nitrogen (NO_X), particulate matter ($PM_{2.5}$ and PM_{10}), ozone (O_3), and oxides of sulfur (SO_X). The NAAQS establish various standards, either primary[103] or secondary,[104] for each pollutant with varying averaging times. Standards with short averaging times (e.g., 1-hour, 8-hour, and 24-hour) were developed to prevent the acute health effects from short-term exposure at high concentrations. Longer averaging periods (e.g., 3 months or annual) are intended to prevent chronic health effects from long-term exposure. A description of the NAAQS is presented in Appendix E.

In addition to the NAAQS, there are standards for hazardous air pollutants (HAP), which are those typically associated with specific industrial processes such as chromium electroplating (hexavalent chromium), dry cleaning (perchloroethylene), and solvent degreasing (halogenated solvents) (USEPA, 2016g). HAPs can have severe adverse impacts on human health and the environment, including increased risk of cancer, reproductive issues, or birth defects. HAPs are federally regulated under the CAA via the National Emission Standards for Hazardous Air Pollutants (NESHAPs). USEPA developed the NESHAPs for sources and source categories emitting HAPs that pose a risk to human health. Appendix E presents a list of federally regulated HAPs.

In conjunction with the federal NAAQS, Louisiana maintains its own air quality standards, the Louisiana Ambient Air Quality Standards (LAAAQS). Table 8.1.12-1 presents an overview of the LAAAQS as defined by the DEQ.

[100] Nonattainment areas: Any area that does not meet (or that contributes to ambient air quality in a nearby area that does not meet) the national primary or secondary ambient air quality standard for the pollutant (USEPA, 2015r).
[101] Maintenance areas: An area that was previously nonattainment, but has met the national primary or secondary ambient air quality standards for the pollutant, and has been designated as attainment (USEPA, 2015r).
[102] Unclassifiable areas: Any area that cannot be classified on the basis of available information as meeting the national primary or secondary air quality standard for a pollutant (USEPA, 2015r).
[103] Primary standard: The primary standard is set to provide public health protection, including protecting the health of sensitive populations such as asthmatics, children, and the elderly (USEPA, 2014b).
[104] Secondary standards: The secondary standard is set to provide public welfare protection, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings (USEPA, 2014b).

Table 8.1.12-1: Louisiana Ambient Air Quality Standards (LAAAQS)

Pollutant	Averaging Time	Primary Standard		Secondary Standard		Notes
		$\mu g/m^3$	ppm	$\mu g/m^3$	ppm	
CO	8-hour	10,000	9	Same as primary		Not to be exceeded more than once per year
	1-hour	40,000	35	Same as primary		
Lead	3-month	0.15	-	Same as primary		3-month rolling average
Nitrogen Dioxide (NO_2)	1-hour	-	0.1	-	-	98th percentile, averaged over 3 years
	Annual	-	0.053	Same as primary		Annual arithmetic mean
PM_{10}	24-hour	150	-	Same as primary		Not to be exceeded more than once per year averaged over a three-year period
$PM_{2.5}$	Annual	12	-	15.0	-	Annual arithmetic mean, averaged over 3 years
	24-hour	35	-	Same as primary		24-hour, averaged over 3 years
O_3	8-hour	-	0.075	Same as primary		Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years
Sulfur Dioxide (SO_2)	1-hour	-	0.075	-	-	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
	3-hour	-	-	-	0.5	Not to be exceeded more than once per year

Source: (DEQ, 2015j)

Title V Operating Permits/State Operating Permits

Louisiana has authorization to issue CAA Title V operating permits on behalf of the USEPA, as outlined in 40 CFR 70. The Title V program refers to Title V of the CAA that governs permitting requirements for major industrial air pollution sources and consolidates all CAA requirements for the facility into one permit (USEPA, 2015e). The overall goal of the Title V program is to "reduce violations of air pollution laws and improve enforcement of those laws" (USEPA, 2015e). Louisiana Administrative Code (LAC) Title33:III.507 (Part 70 Operating Permits Program) describes the applicability of Title V operating permits (DEQ, 2015j). Louisiana requires Title V operating permits for any major source if it emits or has the potential to emit pollutants in excess of the major source thresholds (see Table 8.1.12-2). The permit issued to a facility contains both state and federal portions and incorporates a reporting schedule (USEPA, 2014a).

Table 8.1.12-2: Major Air Pollutant Source Thresholds

Pollutant	TPY
Any Criteria Pollutant[a]	100
Single HAP	10
Total/Cumulative HAPs	25

[a] Sources in nonattainment areas will have lower thresholds for some criteria pollutants depending on the classification of the nonattainment area.
Source: (USEPA, 2014a)

In addition to Title V operating permits, the DEQ has two permits for minor sources including Small Source permits and General permits. LAC Title33:III.211.B.13.e (Methodology) states

"The small source permit, as defined by LAC 33:III.503.B.2, applies when a permitted source is not a *Part 70 source* as defined in LAC 33:III.502 (Minor Source Permit Requirements. This applies to sources emitting or have the potential to emit less than 25 tons/year of any criteria pollutant, and less than 10 tons per year [TPY] of any toxic air pollutant. The DEQ issues General permits under LAC Title33:III.513.A (General Permits, Temporary Sources, and Relocation of Portable Facilities). The regulation states, "The permitting authority may issue a general permit intended to cover numerous similar sources or activities." (DEQ, 2015j)

Exempt Activities

The following select activities, as defined by LAC Title33:III.311.A.3.b (Regulatory Permit for Stationary Internal Combustion Engines) and LAC Title33:III.501.B.5 (Exemptions and Special Provisions), are exempt from the registration and permitting provisions of LAC Title33:III.305 (Construction and Operation) for Louisiana regulatory (major source) permits.

- "Nonroad engines…;
- …External combustion equipment with a design rate greater than or equal to 1 million btu [British Thermal Units] per hour, but less than or equal to 10 million btu per hour, provided that the aggregate criteria pollutant emissions from all such units listed as insignificant do not exceed 5 [TPY]…;
- Emissions of any inorganic air pollutant that is not a regulated air pollutant as defined under LAC Title33:III.502, provided that the aggregate emissions from all such pollutants listed as insignificant do not exceed 5 [TPY];
- Generators, boilers, or other fuel burning equipment that is of equal or smaller capacity than the primary operating unit, that cannot be used in conjunction with the primary operating unit [except for short durations when shutting down the primary operating unit (maximum of 24 hours) and when starting up the primary operating unit until it reaches steady-state operation (maximum of 72 hours)], and that does not increase emissions of or the potential to emit any regulated air pollutant…;
- Emissions from *oil and gas well and pipeline* as defined in accordance with LAC Title33:III.502 (Definitions)…;
- Emergency electrical power generators used only during power outages at sites not otherwise required to have a permit under LAC Title33:III.Chapter 5 and operated no more than 500 hours per year…;
- The owner or operator of any source may apply for an exemption from the permitting requirements of this Chapter for any emissions unit provided each of the following criteria are met. Activities or emissions units exempt as insignificant based on these criteria shall be included in the permit at the next renewal or permit modification, as appropriate.
  - The emissions unit emits and has the potential to emit no more than 5 [TPY] of any criteria or toxic air pollutant.

- The emissions unit emits and has the potential to emit less than the minimum emission rate listed in LAC Title33:III.5112**,** Table 8.1.12-3, *De Minimis* Levels,[105] for each Louisiana toxic air pollutant.
- The emissions unit emits and has the potential to emit less than the *de minimis* rate established pursuant to section 112(g) of the federal Clean Air Act for each hazardous air pollutant.
- No new federally enforceable limitations or permit conditions are necessary to ensure compliance with any applicable requirement." (DEQ, 2015j)

Temporary Emissions Sources Permits

LAC Title33:III.311 (Regulatory Permit for Stationary Internal Combustion Engines) issues regulatory permits (major source) for the use of stationary internal combustion engines including electrical power generators. LAC Title33:III.311.A.2 states, "This regulatory permit may be used to authorize the use of both permanent and temporary engines[106]." (DEQ, 2015j)

State Preconstruction Permits

LAC Title33:III.501.A (Permit Procedures) requires the owner or operator of a source that emits in Louisiana to obtain a permit from the DEQ prior to the construction, reconstruction, or modification of a source. Sources covered by this regulation include:

- Major sources as defined in the LAC;
- Nonmajor (area) sources of HAPs required to obtain an operating permit under the CAA;
- Nonmajor (minor) sources required to obtain an air quality permit under LAC Title33:III.501;
- Affected sources[107]; and
- Program-specific permitting requirements (DEQ, 2015j).

General Conformity

Established under Section 176(c)(4) of the CAA, "the General Conformity Rule ensures that the actions taken by federal agencies in nonattainment and maintenance areas do not interfere with a state's plans to meet national standards for air quality" outlined in the state implementation plan (SIP) (USEPA, 2013a). An action in designated nonattainment and maintenance areas would be evaluated for the emission of those particular pollutants under the General Conformity Rule through an applicability analysis. Pursuant to Title 40 CFR 93.153(d)(2) and (e), federal actions "in response to emergencies which are typically commenced on the order of hours or days after

[105] de minimis: "USEPA states that "40 CFR 93 § 153 defines de minimis levels, that is, the minimum threshold for which a conformity determination must be performed, for various criteria pollutants in various areas." (USEPA, 2016i)
[106] Temporary Source: "A stationary source that changes its location or ceases to exist within one year from the date of initial start of operations." (DEQ, 2015j)
[107] Affected Source: "A source that includes one or more affected units regulated by the federal Acid Rain Program established pursuant to Title IV of the federal Clean Air Act." (DEQ, 2015j)

the emergency" and actions "which are part of part of a continuing response to emergency or disaster" that are taken up to 6 months after beginning response activities, will be exempt from any conformity determinations (GPO, 2010).

The estimated pollutant emissions are compared to *de minimis* levels. These values are the minimum thresholds for which a conformity determination must be performed (see Table 8.1.12-3). As a result, lower *de minimis* thresholds for VOCs and NO_X could apply depending on the attainment status of a parish.

Table 8.1.12-3: De Minimis Levels

Pollutant	Area Type	TPY
Ozone (volatile organic compound [VOC] or NO_X)	Serious Nonattainment	50
	Severe Nonattainment	25
	Extreme Nonattainment	10
	Other areas outside an ozone transport region (OTR)	100
Ozone (NO_X)	Maintenance	100
Ozone (VOC)	Maintenance outside an OTR	100
CO, SO_2, NO_2	All Nonattainment and Maintenance	100
PM_{10}	Serious Nonattainment	70
	Moderate Nonattainment and Maintenance	100
$PM_{2.5}$ (Direct Emissions) (SO_2) (NO_X (unless determined not to be a significant precursor)) (VOC or ammonia (if determined to be significant precursors))	All Nonattainment and Maintenance	100
Lead	All Nonattainment and Maintenance	25

Source: (GPO, 2010)

If an action does not result in an emissions increase above the *de minimis* levels in Table 8.1.12-3, then a conformity determination is not required. If the applicability analysis shows that the total direct and indirect emissions are above the *de minimis* levels in Table 8.1.12-3, then the action must undergo a conformity determination. The federal agency must first show that the action would meet all SIP control requirements and that any new emissions would not cause a new violation of the NAAQS. To demonstrate conformity[108], the agency would have to fulfill one or more of the following:

- Show any emissions increase is specifically identified and accounted for in the respective state's SIP;
- Receive acknowledgement from the state that any increase in emissions would not exceed the SIP emission budget;
- Receive acknowledgement from the state to revise the SIP and include emissions from the action;

[108] Conformity: Compliance with the State Implementation Plan.

- Show the emissions would be fully offset by implementing reductions from another source in the same area; and
- Conduct air quality modeling that demonstrates the emissions would not cause or contribute to new violations of the NAAQS, or increase the frequency or severity of any existing violations of the NAAQS (USEPA 2010).

State Implementation Plan Requirements

The Louisiana SIP is composed of many related actions to ensure ambient air concentrations of the six criteria pollutants comply with the NAAQS. Louisiana's SIP is a conglomeration of separate actions taken for each of the pollutants. All of Louisiana's SIP actions are codified under 40 CFR Part 52 Subpart T. A list of all SIP actions for all six criteria pollutants can be found on the DEQ website: http://www.deq.louisiana.gov/portal/DIVISIONS/AirPermitsEngineeringandPlanning/AirQualityPlanning/SIPStateImplementationPlan.aspx.

8.1.12.3 Environmental Setting: Ambient Air Quality

Nonattainment Areas

The USEPA classifies areas as attainment, nonattainment, maintenance, or unclassifiable for six criteria pollutants. When evaluating an area's air quality against regulatory thresholds (i.e., permitting and general conformity), maintenance areas are often combined with nonattainment, while unclassifiable areas are combined with attainment areas. Figure 8.1.12-1 and Table 8.1.12-4, below, present the nonattainment areas in Louisiana as of January 30, 2015. The year(s) listed in the table for each pollutant indicate when USEPA promulgated the standard for that pollutant; note that, for O3 and sulfur oxides (SO2), these standards listed are in effect. Table 8.1.12-4 contains a list of the parishes and their respective current nonattainment status for each criteria pollutant. Unlike Table 8.1.12-4, Table 8.1.12-1 does not differentiate between standards for the same pollutant. Additionally, given that particulate matter is the criteria pollutant of concern, PM10 and PM2.5 merge in the figure to count as a single pollutant.

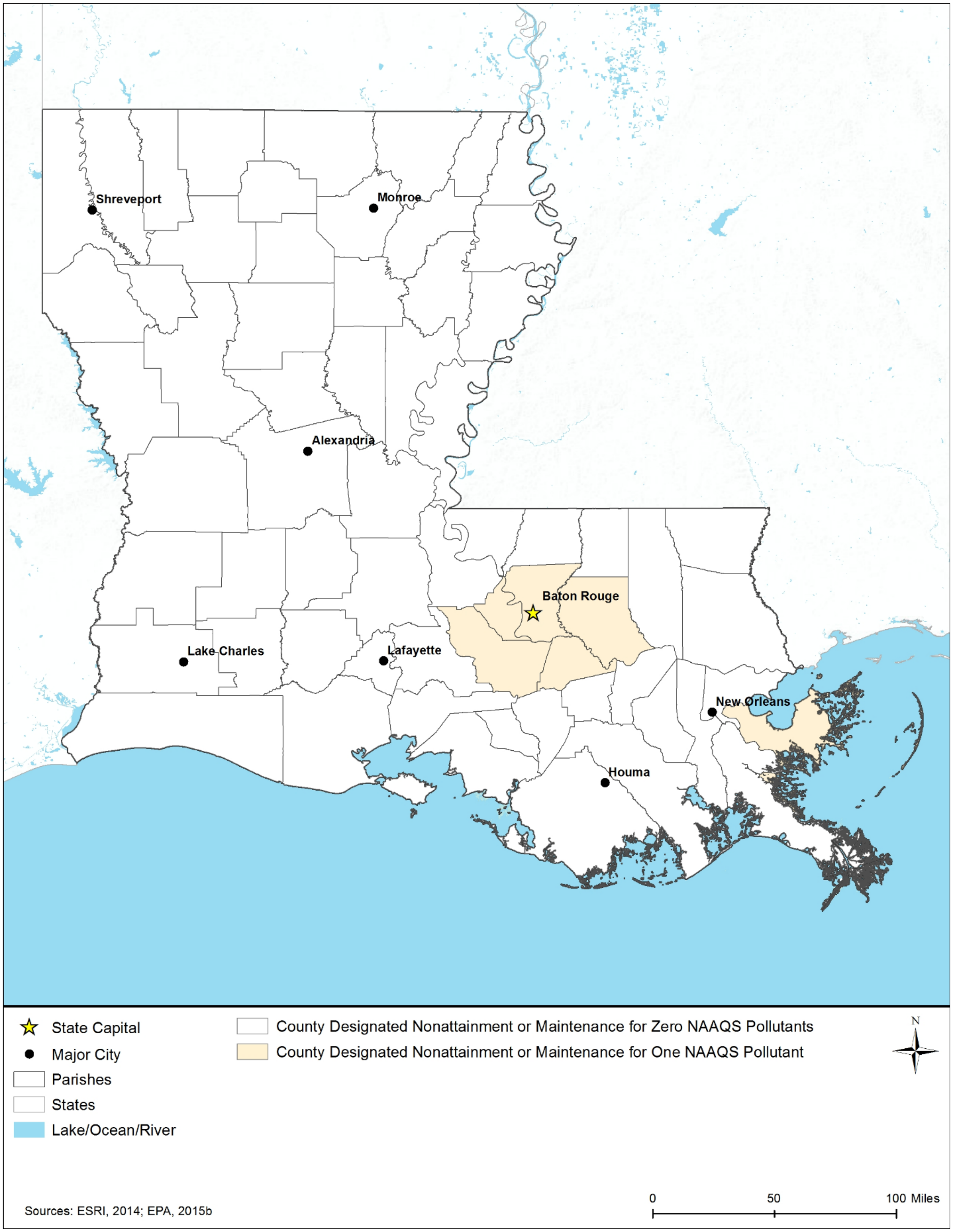

Figure 8.1.12-1: Nonattainment and Maintenance Parishes in Louisiana

Table 8.1.12-4: Louisiana Nonattainment and Maintenance Areas by Pollutant Standard and Parish

Parish	Pollutant and Year USEPA Implanted Standard										
	CO	Lead		NO_2	PM_{10}	$PM_{2.5}$		O_3		SO_2	
	1971	1978	2008	1971	1987	1997	2006	1997	2008	1971	2010
Ascension								M	X-5		
East Baton Rouge								M	X-5		
Iberville								M	X-5		
Livingston								M	X-5		
St. Bernard											X-6
West Baton Rouge								M	X-5		

X-1 = Nonattainment Area (Extreme)
X-2 = Nonattainment Area (Severe)
X-3 = Nonattainment Area (Serious)
X-4 = Nonattainment Area (Moderate)
X-5 = Nonattainment Area (Marginal)
X-6 = Nonattainment Area (Unclassified)
M = Maintenance Area
Source: (USEPA, 2015f)

Air Quality Monitoring and Reporting

The DEQ measures air pollutants at 36 sites across the state as part of the National Air Monitoring Stations Network and the State and Local Air Monitoring Stations Network (DEQ, 2015k). Annual Louisiana State Ambient Air Quality Reports are prepared, containing pollutant data summarized by region (DEQ, 2015l). The DEQ reports real-time pollution levels of O3, SO2, and PM2.5 on their website: http://airquality.deq.louisiana.gov/.

Throughout 2014, O3 measurements exceeded the federal standard of 0.075 ppm at nine locations in Louisiana with the following maximum values listed in Table 8.1.12-5.

Table 8.1.12-5: Louisiana 2014 Air Quality Exceedances

Parish	Location	Max Exceedance (ppm)
East Baton Rouge	Baton Rouge/Capitol	0.079
	Baton Rouge/Louisiana State University	0.08
St. James	Convent	0.087
Iberville	Carville	0.076
Ascension	Dutch Town	0.088
Livingston	French Settlement	0.077
Jefferson	Kenner	0.077
St. Tammany	Madisonville	0.083
Pointe Coupee	New Roads	0.082

Source: (DEQ, 2015l)

Air Quality Control Regions

USEPA classified all land in the United States as a Class I, Class II, or Class III Federal Air Quality Control Region (AQCR) (42 U.S.C. § 7470). Class I areas include international parks, national wilderness areas which exceed 5,000 acres in size, national memorial parks which exceed 5,000 acres in size, and national parks which exceed 6,000 acres in size. Class I areas cannot be re-designated as Class II or Class III and are intended to maintain pristine air quality. Although USEPA developed the standards for a Class III AQCR, to date they have not actually classified any area as Class III. Therefore, any area that is not classified as a Class I area is, by default, automatically designated as a Class II AQCR (42 U.S.C. § 7472).

In a 1979 USEPA memorandum, the Assistant Administrator for Air, Noise, and Radiation (USEPA, 1979) advised USEPA Regional Offices to provide notice to the Federal Land Manager (FLM) of any facility subject to the Prevention of Significant Deterioration (PSD) permit requirements and within 100 kilometers[109] of a Class I area. "The EPA's policy is that FLMs should be notified by the Regional Office about any project that is within 100 kilometers of a Class I area. For sources having the capability to affect air quality at greater distances, notification should also be considered for Class I areas beyond 100 kilometers" (Page, 2012). The 2005 USEPA guidelines for air quality modeling do not provide a precise modeling range for Class I areas.

PSD applies to new major sources or major modifications at existing sources for pollutants where the source is in an attainment or unclassifiable area. An air quality analysis is required for sources subject to PSD requirements and generally consists of using a dispersion model to evaluate emission impacts to the area. "Historically, the USEPA guidance for modeling air quality impacts under the PSD program has tended to focus more on the requirements for a Class II modeling analysis. Such guidance has provided that applicants need not model beyond the point of significant impact or the source or 100 kilometers (the normal useful range of EPA-approved Gaussian plume models" (USEPA, 1992).

Louisiana has one Class I area, the Breton Wilderness area. Louisiana does not have any adjacent states that contain Class 1 areas where the 100-kilometer buffer intersects Louisiana parishes. Any PSD-applicable action within these parishes would require FLMs notification from the appropriate Regional Office. Figure 8.1.12-2 provides a map of Louisiana highlighting all relevant Class I areas and all areas within the 100-kilometer radiuses. The numbers next to each of the highlighted Class I areas in Figure 8.1.12-2 correspond to the numbers and Class I areas listed in Table 8.1.12-6.

Table 8.1.12-6: Relevant Federal Class I Areas

#[a]	Area	Acreage	State
1	Breton Wilderness	5,000	LA

[a] The numbers correspond to the shaded regions in Figure 8.1.12-2.
Source: (USEPA, 2012d)

[109] The memorandum and associated guidance use kilometers. 100 kilometers is equal to about 62 miles.

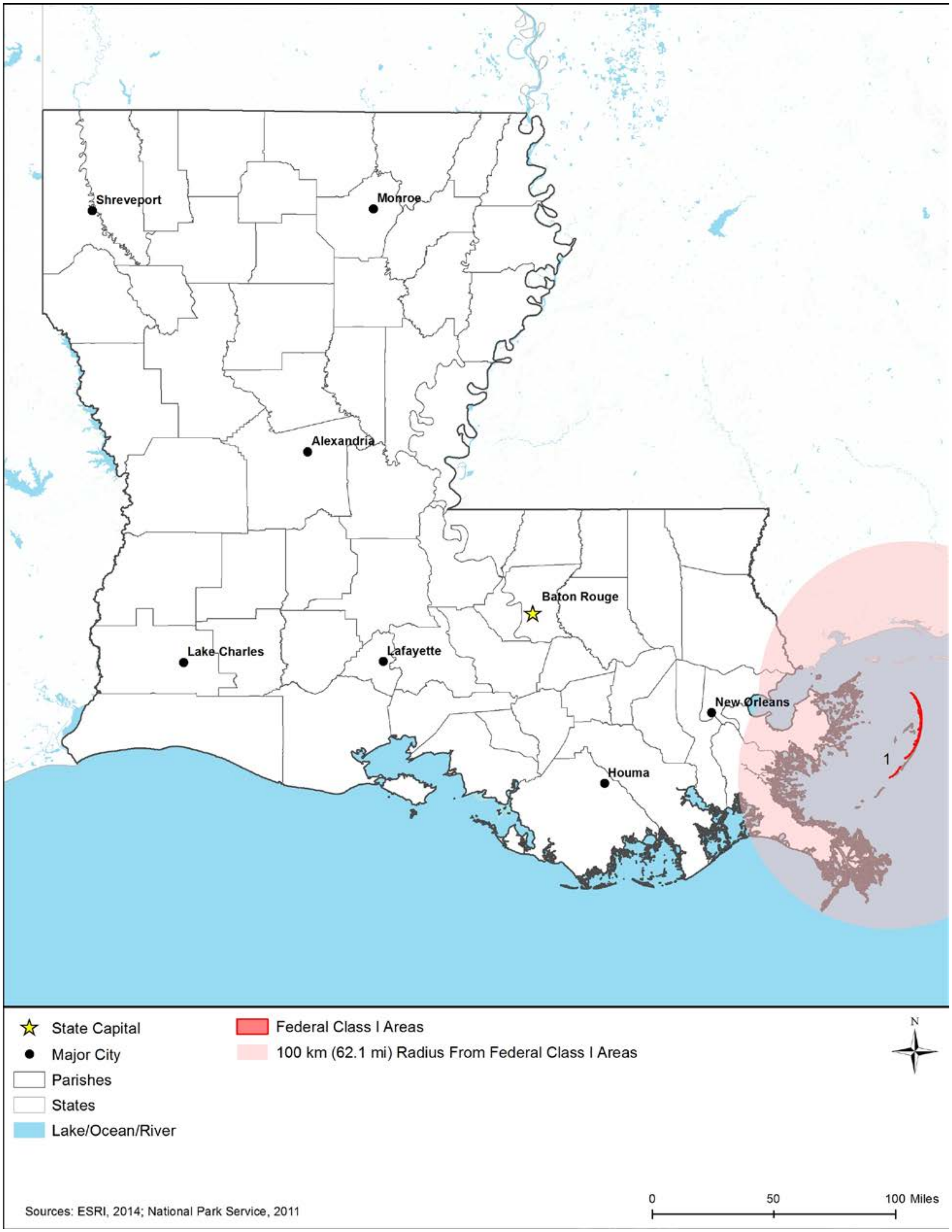

Figure 8.1.12-2: Federal Class I Areas with Implications for Louisiana

8.1.13 Noise

This section presents a discussion of a basic understanding of environmental noise, background/ambient noise levels, noise standards, and guidelines.

8.1.13.1 Definition of the Resource

Noise is a form of sound caused by pressure variations that the human ear can detect and is often defined as unwanted sound (USEPA, 2012e). Noise is one of the most common environmental issues that interferes with normal human activities and otherwise diminishes the quality of the human environment. Typical sources of noise that result in this type of interference in urban and suburban surroundings includes interstate and local roadway traffic, rail traffic, industrial activities, aircraft, and neighborhood sources like lawn mowers, leaf blowers, etc.

The effects of noise can be classified into three categories:

- Noise events that result in annoyance and nuisance;
- Interference with speech, sleep, and learning; and
- Physiological effects such as hearing loss and anxiety.

Fundamentals of Noise

For environmental noise analyses, a noise metric refers to the unit that quantitatively measures the effect of noise on the environment. The unit used to describe the intensity of sound is the decibel (dB). Audible sounds range from 0 dB ("threshold of hearing") to about 140 dB ("threshold of pain") (OSHA, 2016c). The vibration frequency characteristics of the sound, measured as sound wave cycles per second [Hertz (Hz)], determines the pitch of the sound (FTA, 2006). The normal audible frequency range is approximately 20 Hz to 20 kHz (FAA, 2015h). The A-weighted scale, denoted as dBA, approximates the range of human hearing by filtering out lower frequency noises, which are not as damaging as the higher frequencies. The dBA scale is used in most noise ordinances and standards (OSHA, 2016c).

Measurements and descriptions of noise (i.e., sounds) are based on various combinations of the following factors (FTA, 2006):

- The total sound energy radiated by a source, usually reported as a sound power level.
- The actual air pressure changes experienced at a particular location, usually measured as a sound pressure level (SPL) (the frequency characteristics and SPL combine to determine the loudness of a sound at a particular location).
- The duration of a sound.
- The changes in frequency characteristics or pressure levels through time.

Figure 8.1.13-1 presents the sound levels of typical events that occur on a daily basis in the environment. For example, conversational speech is measured at about 55 to 60 dBA, whereas a band playing loud music may be as high as 120 dBA.

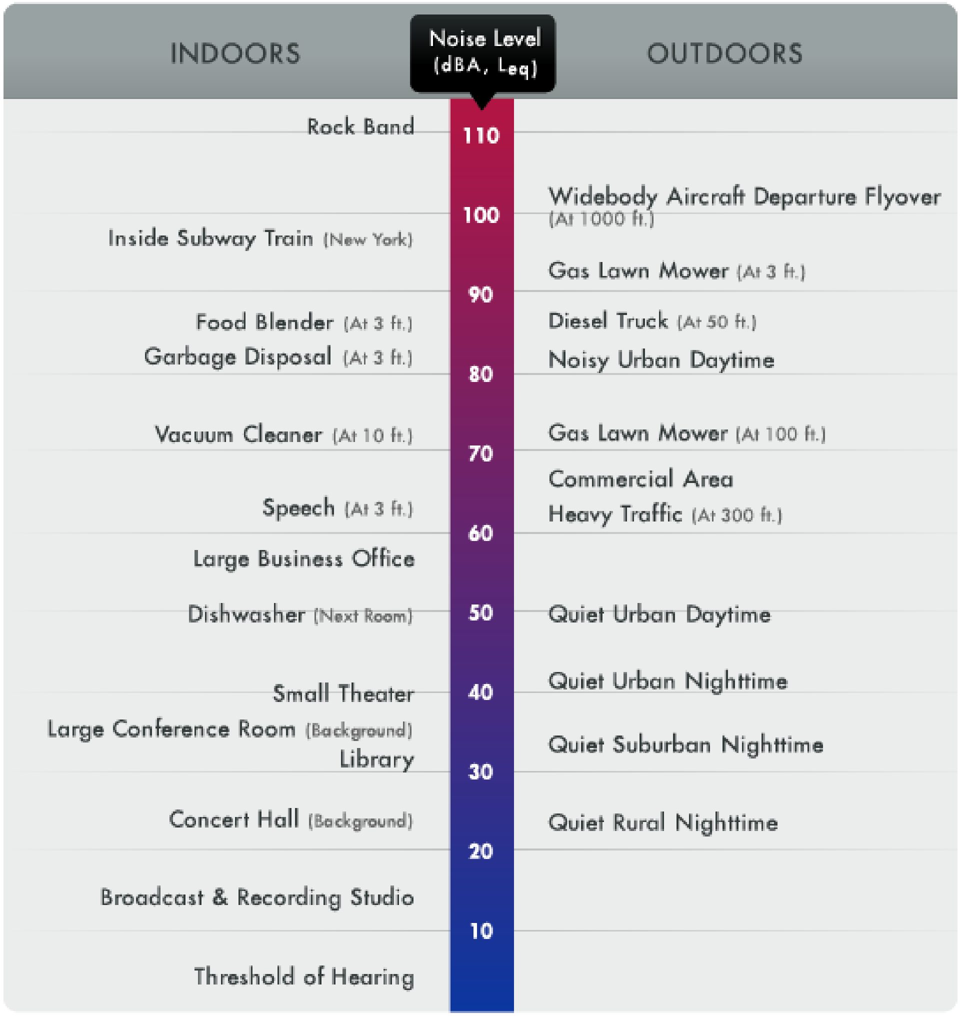

Figure 8.1.13-1: Sound Levels of Typical Sounds

LEQ: Equivalent Continuous Sound Level
Prepared by: Booz Allen Hamilton
Source: (Sacramento County Airport System, 2015)

Because of the logarithmic unit of measurement, sound levels cannot be added or subtracted linearly. However, several methods of estimating sound levels can be useful in determining approximate sound levels. First, if two sounds of the same level are added, the sound level increases by approximately 3 dB (for example, 60 dB + 60 dB = 63 dB). Secondly, the sum of two sounds of a different level is slightly higher than the louder level (for example, 60 dB + 70 dB = 70.4 dB).

Changes in human response to changes in dB levels are categorized as follows (FTA, 2006):

- A 3-dB change in sound level is considered a barely noticeable difference;
- A 5-dB change in sound level will typically result in a noticeable community response; and
- A 10-dB change, which is generally considered a doubling of the sound level, almost certainly causing an adverse community response.

In general, ambient noise levels are higher during the day than at night and typically this difference is about 10 dB (USEPA, 1973). Ambient noise levels can differ considerably if the environment is urban, suburban, or rural.

8.1.13.2 Specific Regulatory Considerations

As identified in Appendix C, Environmental Laws and Regulations, the Noise Control Act of 1972, along with its subsequent amendments (e.g., Quiet Communities Act of 1978 [42 U.S.C. Parts 4901−4918]), delegates authority to the states to regulate environmental noise and directs government agencies to comply with local community noise statutes and regulations. Although no federal noise regulations exist, the USEPA has promulgated noise guidelines (USEPA, 1974). Similarly, most states have no quantitative noise-limit regulations.

Louisiana does have statewide noise regulations. However, they deal with various restrictions on motor vehicle noise levels, such as horns and mufflers. All of the motor vehicles covered under the Proposed Action would fall under the emergency vehicle exemption of Title 32 Section 24 of the Louisiana State Code (Louisiana, 2015). However, many cities and towns may have local noise ordinances to manage community noise levels. The noise limits specified in such ordinances are typically applied to define noise sources and specify a maximum permissible noise level. Large cities and towns, such as New Orleans, Baton Rouge, or Shreveport, are likely to have different regulations than rural or suburban communities largely due to the population density and difference in ambient noise levels (FHWA, 2011).

8.1.13.3 Environmental Setting: Ambient Noise

The range and level of ambient noise in Louisiana varies widely based on the area and environment of the area. The population of Louisiana can choose to live and interact in areas that are large cities, rural communities, and national and state parks. Figure 8.1.13-1 illustrates noise values for typical community settings and events that are representative of what the population of Louisiana may experience on a day-to-day basis. These noise levels represent a wide range and are not specific to Louisiana. As such, this section describes the areas where the population of Louisiana can potentially be exposed to higher than average noise levels.

- **Urban Environments:** Urban areas are likely to have higher noise levels on a daily basis due to highway traffic (70 to 90 dBA), construction noise (90 to 120 dBA), and outdoor conversations (e.g., small/large groups of people) (60 to 90 dBA) (USDOI, 2008b). The areas that are likely to have the highest ambient noise levels in the state are New Orleans (and its neighboring boroughs and cities), Baton Rouge, and Shreveport.
- **Airports:** Areas surrounding airports tend to be more sensitive to noise due to aircraft operations that occur throughout the day. A jet engine aircraft can produce between 130 to 160 dBA in its direct proximity (FAA, 2007). However, commercial aircraft are most likely to emit noise levels between 70 to 100 dBA depending of the type of aircraft and associated engine (FAA, 2012). This noise will be perceived differently based on the altitude of the aircraft and its distance to the point of measurement. Airport operations are primarily arrivals and departures of commercial aircraft but, based on the type of airport, can include touch-and-go operations that are typical of general aviation airports and military airfields.

The location of most commercial airports are in the proximity of urban communities; therefore, aircraft operations (arrivals/departures) can result in noise exposure in the surrounding areas to be at higher levels with the potential for increased noise levels during peak operation times (early morning and evenings), when there is an increase in air traffic. The noise levels in areas surrounding commercial airports can have significantly higher ambient noise levels than in other areas. In Louisiana, Louis Armstrong New Orleans International Airport (MSY) and Baton Rouge Metropolitan Airport (BTR) have almost 380,000 annual operations combined (FAA, 2015i). These operations result in increased ambient noise levels in the surrounding communities. See Section 8.1.1.1, Public Safety Infrastructure, and Figure 8.1.1-1 for more information about airports in the state.

- **Highways:** Communities near major highways also experience higher than average noise levels when compared to areas that are not in close proximity to a highway (FHWA, 2015e). There are a number of major highways within the state that may contribute to higher ambient noise levels for residents living in those areas. The major highways in the state tend to have higher than average ambient noise levels on nearby receptors, ranging from 52 to 75 dBA (FHWA, 2015e). See Section 8.1.1., Public Safety Infrastructure, and Figure 8.1.1-1 for more information about the major highways in the state.
- **Railways:** Like highways, railways tend to have higher than average ambient noise levels for residents living in close proximity (FTA, 2006). Railroad operations can produce noise ranging from 70 dBA for an idling locomotive to 115 dBA when the locomotive engineer rings the horn while approaching a crossing (FRA, 2015). Louisiana has multiple rail corridors with high levels of commercial and commuter rail traffic. These major rail corridors include lines that extend mainly from New Orleans and Baton Rouge to other cities in Louisiana, Mississippi, and Texas, such as the Amtrak and Union Pacific Railways. There are also a number of other rail corridors that join these major rail lines and connect with other cities (DOTD, 2015b). See Section 8.1.1.1, Public Safety Infrastructure, and Figure 8.1.1-1 for more information about rail corridors in the state.
- **National and State Parks:** The majority of national and state parks are likely to have lower than average ambient noise levels given their size and location in wilderness areas. National and state parks, historic areas, and monuments are protected areas. These areas typically have lower noise levels, as low as 30 to 40 dBA (NPS, 2014d). Louisiana has five National Park Service units (NPS, 2015n). Visitors to these areas expect lower ambient noise conditions than the surrounding urban areas. See Section 8.1.7, Land Use, Recreation, and Airspace, and Figure 8.1.7-3 for more information about national and state parks for Louisiana.

8.1.13.4 Sensitive Noise Receptors

Noise-sensitive receptors include residences, schools, medical facilities, places of worship, libraries, churches, nursing homes, concert halls, playgrounds, and parks. Sensitive noise receptors are typically areas where the intrusion of noise can disrupt the use of the environment. A quiet urban area usually has a typical noise level in the daytime of 50 dBA, and 40 dBA during the evening. Noise levels in remote wilderness and rural nighttime areas are usually 30 dBA (BLM, 2014). Most cities, towns, and villages in Louisiana have at least one school, church, or park, in addition to likely having other noise-sensitive receptors. There are most likely thousands of sensitive receptors in Louisiana.

8.1.14 Climate Change

8.1.14.1 Definition of the Resource

Climate change, according to the Intergovernmental Panel on Climate Change (IPCC), is defined as "…a change in the state of the climate that can be identified (e.g., using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer. It refers to any change in climate over time, whether due to natural variability or human activity" (IPCC, 2007).

Accelerated rates of climate change are linked to an increase in atmospheric concentrations of greenhouse gas (GHG) caused by emissions from human activities such as burning fossil fuels to generate electricity (USEPA, 2012f). The IPCC is now 95 percent certain that humans are the main cause of current global warming (IPCC, 2013). Human activities result in emissions of four main GHGs: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and halocarbons (a group of gases containing fluorine, chlorine, or bromine) (IPCC, 2007). The common unit of measurement for GHGs is metric tons of CO_2-equivalent (MT CO_2e)[110], which equalizes for the different global warming potential of each type of GHG. Where this document references emissions of CO_2 only, the units are in million metric tons of carbon dioxide (MMT CO_2). Where the document references emissions of multiple GHGs, the units are in MMT CO_2e.

The IPCC reports that "global concentrations of these four GHGs have increased significantly since 1750" where "atmospheric concentrations of CO_2 increased from 280 parts per million (ppm) of carbon in 1750 to 379 ppm of carbon in 2005" (IPCC, 2007). The atmospheric concentration of CH_4 and N_2O have increased from pre-industrial values of about 715 and 270 parts per billion (ppb) to 1774 and 319 ppb, respectively, in 2005 (IPCC, 2007). In addition, the IPCC reports that human activities are causing an increase in various hydrocarbons from near-zero pre-industrial concentrations (IPCC, 2007).

Both the GHG emissions effects of the Proposed Action and Alternatives, and the relationships of climate change effects to the Proposed Action and Alternatives, are considered in this PEIS (see Section 8.2, Environmental Consequences). Existing climate conditions in the project area are described first by state and sub-region, where appropriate, and then by future projected climate scenarios. The discussion focuses on the following climate change impacts: 1) temperature; 2) precipitation; 3) sea level; and 4) severe weather events (including tropical storms, tropical cyclones, and hurricanes).

[110] CO_2e refers to Carbon Dioxide Equivalent, "A metric measure used to compare the emissions from various GHGs based upon their global warming potential (GWP). Carbon dioxide equivalents are commonly expressed as million metric tons of carbon dioxide equivalents (MMTCO_2e). The carbon dioxide equivalent for a gas is derived by multiplying the tons of the gas by the associated GWP. MMTCO_{2e} = (million metric tons of a gas) * (GWP of the gas)." (USEPA 2015)

8.1.14.2 Specific Regulatory Considerations

The pertinent federal laws relevant to the protection and management of climate change are summarized in Appendix C, Environmental Laws and Regulations. Louisiana has established goals and regulations to reduce GHG emissions to combat climate change. As shown in Table 8.1.14-1, these are the primary policy drivers on climate change preparedness and GHG emissions.

Table 8.1.14-1: Relevant Louisiana Climate Change Laws and Regulations

State Law/Regulation	Regulatory Agency	Applicability
HCR93: Establishes the Louisiana Climate Change Policy Commission	State of Louisiana	HCR93 Established the Louisiana Climate Change Policy Commission to address the effects of climate change.

8.1.14.3 Louisiana Greenhouse Gas Emissions

Estimates of Louisiana's total GHG emissions vary. The Department of Energy's (DOE) Energy Information Agency (EIA) collects and disseminates national-level emissions data on other GHGs such as CH_4 and nitrous oxide (NO_x), but not at the state level (EIA, 2011). The USEPA also collects and disseminates national-level GHG emissions data, but by economic sector, not by state (USEPA, 2015g). Individual states have developed their own GHG inventories, which are updated with different frequencies and trace GHG in a variety of ways.

For the purposes of this PEIS, the EIA data on CO_2 emissions are used as the baseline metric to ensure consistency and comparability across the 50 states. However, if additional data sources on GHG emissions are available for a given state, including other GHGs such as CH_4, they are described and cited.

According to the EIA, Louisiana emitted a total of 194.5 MMT of CO_2 in 2013 (Table 8.1.14-2) (EIA, 2015c). The emissions profile is dominated by petroleum products and natural gas, as Louisiana is a major center for the oil and gas industry, including the Henry Hub natural gas pipeline interconnection and nineteen operating oil refineries (EIA, 2016a). The industrial sector was the largest CO_2-emitting sector at 54 percent of total emissions, accounting for almost half of the petroleum products and 69 percent of the natural gas emissions in the state. Transportation is responsible for most of the remaining petroleum-related emissions, and the electric power sector is responsible for most of the remaining emissions from natural gas and almost all of the coal emissions (EIA, 2015c).

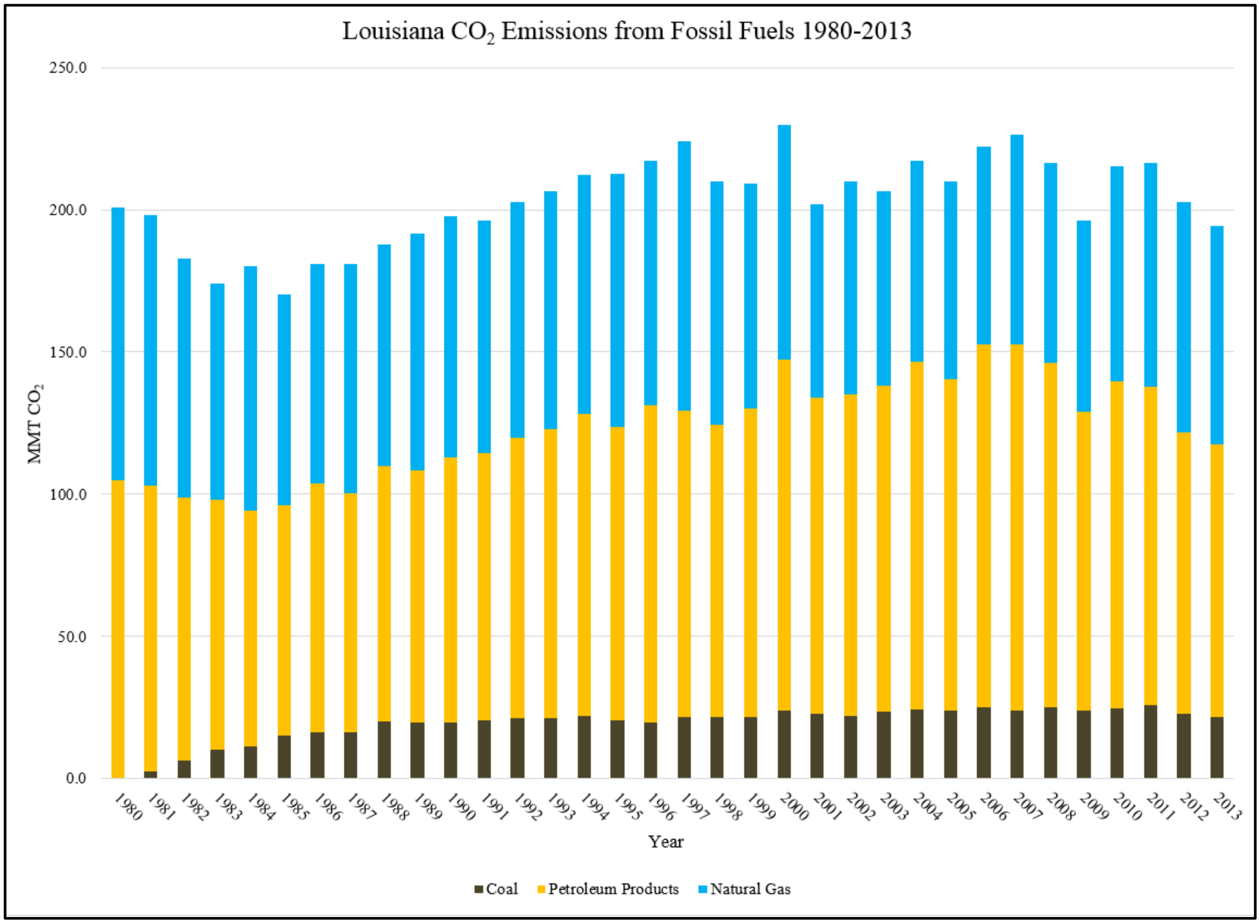

Figure 8.1.14-1: Louisiana CO_2 Emissions from Fossil Fuels by Fuel Type 1980-2013

Annual emissions between 1980 and 2013 are presented in Figure 8.1.14-1. Emissions declined between 1980 and 1985, then climbed to a high of 229.8 MMT in 2000. After 2000, emissions have varied from year to year, but have largely remained above 200 MMT/year until 2013. Louisiana was one of the few states in the United States whose CO_2 emissions declined in that year. In 2013, Louisiana was ranked 8th among the 50 states and the District of Columbia for total emissions, and 5th in the United States for per capita CO_2 emissions (EIA, 2015d).

Table 8.1.14-2: Louisiana CO_2 Emissions from Fossil Fuels by Fuel Type and Source, 2013

Fuel Type (MMT)		Source (MMT)	
Coal	21.5	Residential	2.2
Petroleum Products	95.9	Commercial	1.8
Natural Gas	77.0	Industrial	105.4
		Transportation	44.4
		Electric Power	40.8
TOTAL	**194.5**	**TOTAL**	**194.5**

Source: (EIA, 2015c)

The Louisiana Department of Natural Resources commissioned The Center for Energy Studies, Louisiana State University to prepare a 1990 – 1996 GHG emissions inventory for the state of Louisiana (DNR, 1998). This is the most recent inventory published by Louisiana. The majority of Louisiana's GHG emissions in 1996 (98.61 percent, or 214.3 MMT) were CO_2 from fossil fuel combustion, mostly petroleum products from electric power generating facilities and coal-fired power plants as well as industrial facilities (also engaged in the oil and gas industries). Other major GHGs emitted in Louisiana were CH_4 and N_2O, and much smaller quantities of trace GHGs such as hydrofluorocarbons (HFCs) and sulfur hexafluoride (SF_6) (DNR, 1998). For comparison, total U.S. GHGs in 1996 were 6,949.84 MMT, and were 6,673 MMT (14.7 trillion pounds) in 2013 (USEPA, 2014c).

Because Louisiana is a significant crude oil producer, the majority of GHG emissions are from the industrial sector. Some of the United States' most productive oil fields are in the Gulf of Mexico off the Louisiana coast (EIA, 2016a). Louisiana plays a major role in importing foreign crude oil, with Louisiana Offshore Oil Port (LOOP) importing one to two million barrels per day (DNR, 1998). The petroleum that Louisiana produces and refines is largely consumed within the industrial sector, hence the significant CO_2 emissions from that sector (EIA, 2016a).

Natural gas and coal are the main resources used to fuel Louisiana's electricity generation. About three-fifths of residents rely on electricity for heating their homes while the remaining homes are fueled by coal, two nuclear power plants, and small amounts produced from hydroelectricity. Although Louisiana does not produce or refine coal, the state is a major exporter of coal (EIA, 2016a).

8.1.14.4 Environmental Setting: Existing Climate

The National Weather Service defines climate as the "reoccurring average weather found in any particular place" (NWS, 2011a). The widely accepted division of the world into major climate categories is referred to as the Köppen-Geiger climate classification system. Climates within this system are classified based "upon general temperature profiles related to latitude" (NWS, 2011a). The first letter in each climate classification details the climate group. The Köppen-Geiger system further divides climates into smaller sub-categories based on precipitation and temperature patterns. The secondary level of classification details the seasonal precipitation, degree of aridity, and presence or absence of ice. The tertiary levels distinguish different monthly temperature characteristics (NWS, 2011b).

All of Louisiana falls into climate group C. Climates classified as C are generally warm, with humid summers and mild winters. During winter months, the mean climate feature is the mid-latitude cyclone. Louisiana has one sub-climate category, which is described in the following paragraphs. (NWS, 2011a) (NWS, 2011b)

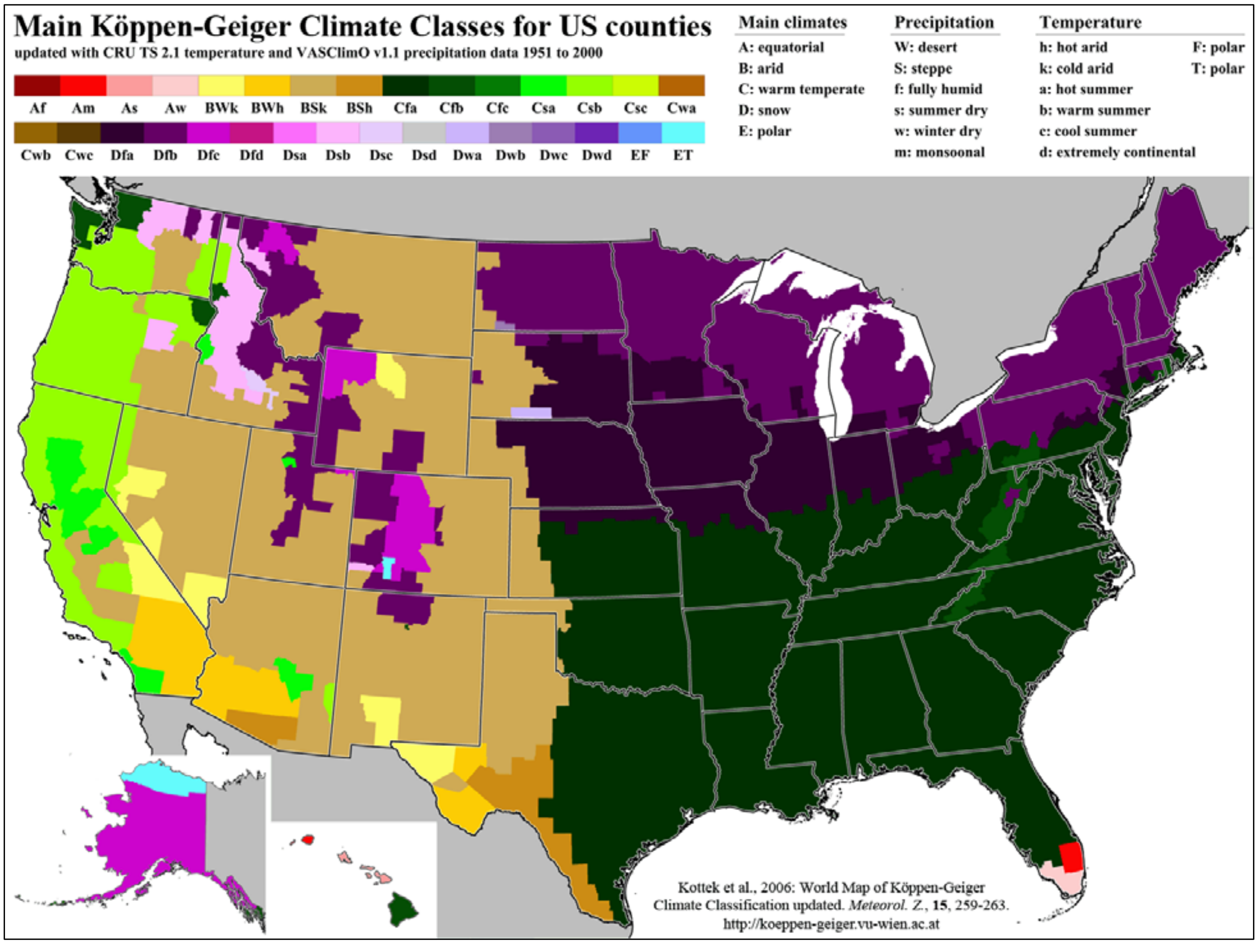

Figure 8.1.14-2: Köppen-Geiger Climate Classes for U.S. Counties

Source: (Kottek, 2006)

The Köppen-Geiger climate classification system classifies the entirety of Louisiana as Cfa. Cfa climates are generally warm, with humid summers and mild winters. In this climate classification zone, the secondary classification indicates year-round rainfall, but it is highly variable; thunderstorms are dominant during summer months. In this climate classification zone, the tertiary classification indicates mild, hot summers with average temperature of warm months over 72 °F. Average temperatures of the coldest months are under 64 °F. (NWS, 2011b)

This section discusses the current state of Louisiana's climate with regard to air temperature, precipitation, sea level, and extreme weather events (e.g., tropical storms, tropical cyclones, severe flooding, tornadoes, and hurricanes).

Air Temperature

Average temperature maximums in January range from approximately 53 °F in northern regions of the state, to approximately 64 °F in southern and southeastern regions of the state (Louisiana Office of State Climatology, 2015). Average temperature minimums in January range from approximately 32 °F in northern regions of the state, to approximately 50 °F in southeastern regions of the state (Louisiana Office of State Climatology, 2015). Average temperature maximums in July range from approximately 94 °F in northern regions of the state, to approximately 88 °F in southern regions of the state. Average temperature minimums in July range from approximately 70 °F in northern regions of the state, to approximately 76 °F in southern regions of the state. Statewide, average temperatures range from 75 °F in southern regions of the state, to 50 °F in northern regions of the state. (Louisiana Office of State Climatology, 2015)

The highest temperature to occur in Louisiana was on August 10, 1936 with a high of 114 °F in Plain Dealing (SCEC, 2015). The lowest temperature to occur in Louisiana was on February 13, 1899 with a record low of negative 16 °F. (SCEC, 2015)

The average annual temperature in Baton Rouge is approximately 68.5 °F; 53.4 °F during winter months, 82.4 °F during summer months, 68.4 °F during spring months, and 69.5 °F during autumn months (NOAA, 2015h). Shreveport, in far northwestern Louisiana, has an average annual temperature of approximately 64.7 °F; 46.8 °F during winter months, 81.6 °F during summer months, 64.3 °F during spring months, and 65.6 °F during autumn months. (NOAA, 2015i)

Precipitation

On average, Louisiana receives more rain than any other state, with an annual average of 59.3 inches. Rainfall throughout the state is well distributed, with little to no seasonality. When comparing regional totals, southern portions of the state receive “more afternoon convective showers in summer than the northern half of the state” (Keim, 2015). Statewide, average annual precipitation accumulations range from 50 inches in northern regions of the state, to 66 inches in southern regions of the state. (Keim, 2015) (Louisiana Office of State Climatology, 2015)

The greatest 24-hour precipitation accumulation to occur was on August 28, 1962 with a record of 22 inches in Hackberry (SCEC, 2015). The greatest 24-hour snowfall accumulation to occur was on February 13, 1960 with a record of 13 inches in Colfax. (SCEC, 2015)

The average annual precipitation accumulation in Baton Rouge is 60.65 inches; 16.36 inches during winter months; 17.19 inches during summer months; 13.76 inches during spring months; and 13.34 inches during autumn months (NOAA, 2015h). The average annual precipitation accumulation in Shreveport is 54.52 inches; 14.93 inches during winter months; 12.14 inches during summer months; 13.80 inches during spring months; and 13.65 inches during autumn months (NOAA, 2015h).

Sea Level

Louisiana has approximately 397 miles of coastline and 7,721 miles of tidal shoreline (CPRA, 2012). Since 1932, areas along coastal Louisiana have “experienced a net decrease of 1,883 square miles of land” (CPRA, 2012). Between 2004 and 2008, “hurricanes Katrina, Rita, Gustav, and Ike transformed approximately 328 square miles of marsh to open water” (CPRA, 2012). Much of Louisiana’s remaining shoreline is at risk for damage from strong winds, heavy rainfall, flooding, and hurricanes. Since 1900, global sea level has risen by an average of 0.07 inches per year (Union of Concerned Scientists, 2013). Coastline along the Gulf of Mexico has experienced some of the fastest rates of sea level rise, with an average of 0.38 inches per year (Union of Concerned Scientists, 2013). As sea level continues to rise, the risks associated with living along the coast also rise. Hurricane Katrina in 2005 highlighted the risks and vulnerabilities of living near unprotected tidal shoreline. In addition to sea level rise, coastal and tidal areas of Louisiana are experiencing land subsidence. Further land subsidence is putting already low-lying areas of Louisiana at an even greater rise for flooding, storm surges, and inundation. (CPRA, 2012) (Union of Concerned Scientists, 2013)

Severe Weather Events

Throughout the state, “tornadoes, damaging thunderstorm winds, large hail, and flash floods can occur at any time of the year” (NOAA, 2015j). Late winter and spring months (March, April, and May) typically see the greatest amount of severe weather in Louisiana. (NOAA, 2015j)

In 1927, the Mississippi River flood, the most destructive flood in U.S. history, extended across Mississippi, Louisiana, Arkansas, Tennessee, Kansas, Oklahoma, Texas, Illinois, Indiana, Missouri, and Kentucky. In Louisiana, the floodwaters and damager were “spread across over 20 parishes consisting of a total of 10,000 square miles” (NWS, 2015a). In New Orleans specifically, 11.16 inches of rain fell in February, increasing in accumulation through March and April. During the peak of the flooding in April, over 14 inches fell over the low-lying city. In total, property damage was estimated at approximately $5 billion dollars. Economic losses totaled approximately $1 billion, “which was equivalent to almost one-third of the federal budget at the time” (NWS, 2015a).

More recently in 2005, Hurricane Katrina made landfall in Louisiana, causing 1,577 deaths, over 6,000 injuries, 700 people still considered missing, and $81 billion in damages. The hurricane made landfall near Grand Isle, classified as a Category 3 storm with winds of approximately 127 miles per hour (mph). After the storm, more than one million people in the Gulf Region were displaced. At their peak, relief shelters provided aid to 273,000 people and FEMA provided living assistance to 114,000 people. In total, the federal government spent approximately $120.5 billion in the Gulf Region, with the majority ($75 billion) spent on emergency relief operations. (NWS, 2015a)

In 2011, another flood along the Mississippi River caused approximately $4 billion in damages and displaced nearly 3,500 people. The majority of losses from this flood “were suffered by farming and fishing sectors, the petrochemical industry, and the river boat/barge and shipping industry” (NWS, 2015a). “Environmental impacts included damage to coastal estuaries, displacement of native fauna, and ongoing impacts of reduced salinity in Lakes Maurepas and Pontchartrain” (NWS, 2015a). Several new flood records were also set along the Mississippi River at Natchez and Vicksburg, Knox Landing, Red River Landing and St. Francisville. (NWS, 2015a)

One of the worst tornado outbreaks to occur in Louisiana was on November 7, 1957. During this storm, 10 people were killed and hundreds were injured, when 14 tornadoes touch down during a

10-hour period. Total damages across the area totaled approximately $37 million. The deadliest tornado to occur in Louisiana was on April 24, 1908 with 85 deaths. (NWS, 2015b)

More recently, a tornado outbreak occurred on May 16, 2013 in northwestern Louisiana. Wind speeds during this storm reached 105 mph, and "produced a wide swath of straight-line wind damage across southern Caddo and northern De Soto Parishes" (NWS, 2015c). Hail the size of ping-pong balls was also reported in northern areas of the state, in Natchitoches Parish. (NWS, 2015c)

8.1.15 Human Health and Safety

8.1.15.1 Definition of the Resource

The existing environment for health and safety is defined by occupational and environmental hazards likely to be encountered during the deployment, operation, and maintenance of towers, antennas, cables, utilities, and other equipment and infrastructure at existing and potential FirstNet telecommunication sites. There are two human populations of interest within the existing environment of health and safety, (1) telecommunication occupational workers and (2) the general public near telecommunication sites. Each of these populations could experience different degrees of exposure to hazards as a result of their relative access to FirstNet telecommunication sites and their function throughout the deployment of the FirstNet telecommunication network infrastructure.

The health and safety issues reviewed in this section include occupational safety for telecommunications workers, contaminated sites, and manmade or natural disaster sites. This section does not evaluate the health and safety risks associated with radio frequency (RF) radiation or vehicle traffic. Vehicle traffic is evaluated in Section 8.1.1, Infrastructure.

8.1.15.2 Specific Regulatory Considerations

Federal organizations, such as the U.S. Department of Labor, Occupational Safety and Health Administration (OSHA), USEPA, the U.S. Department of Health and Human Services, and others protect human health and the environment. In Louisiana, this resource area is regulated by the DHH and the DEQ. Federal OSH regulations apply to workers through either OSHA, or stricter state-specific plans that must be approved by OSHA. Louisiana does not have an OSHA-approved "State Plan," therefore, private and OSHA enforces public sector occupational safety and health programs in the State of Louisiana. Occupational and public safety and health regulations are enforced at the state level by DHH. OSHA regulates occupational health and safety at the federal level.

Federal laws relevant to protecting occupational and public health and safety are summarized in Section 1.8, Overview of Relevant Federal Laws and Executive Orders, and Appendix C, Environmental Laws and Regulations. Table 8.1.15-1 below summarizes the major Louisiana laws relevant to the state's occupational health and safety, hazardous materials, and hazardous waste management programs.

Table 8.1.15-1: Relevant Louisiana Human Health and Safety Laws and Regulations

State Law/Regulation	Regulatory Agency	Applicability
Louisiana Administrative Code: Title 33, Part XI, Chapter 7	DEQ	Establishes occupational worker and public health safety requirements for release detection and reporting in the event of a spill, including response and corrective action measures.
Louisiana Administrative Code: Title 43, Part XV, Subpart 6	DNR	Establishes the Louisiana Abandoned Mine Lands Program and outlines requirements for the reclamation, disposition, and operation of abandoned mine lands (AMLs). Assigns responsibility for mitigating AML dangers or impairments that present a high risk for public health, safety, or general welfare.
Louisiana Administrative Code: Title 51, Part 1, Chapter 117	DHH	Establishes occupational worker health and safety requirements, including reporting requirements for violations that directly or indirectly affect public safety.

8.1.15.3 Environmental Setting: Existing Telecommunication Sites

There are many inherent health and safety hazards at telecommunication sites. Telecommunication site work is performed indoors, below ground level, on building roofs, over waterbodies, and on communication towers. Tasks may also be performed at dangerous heights or in confined spaces, while operating heavy equipment, on energized equipment near underground and overhead utilities, and while using hazardous materials, such as flammable gases and liquids. Because telecommunication workers are often required to perform work outside, heat and cold exposure, precipitation, and lightning strikes also present hazard and risks depending on the task, occupational competency, and work-site monitoring (OSHA, 2016a). A summary description of the health and safety hazards present in the telecommunication occupational work environment is listed below.

Working from height, overhead work, and slips, trips, or falls – At tower and building-mount sites, workers regularly climb structures using fixed ladders or step bolts to heights up to 2,000 feet above the ground's surface (U.S. Census Bureau, 2015m). In addition to tower climbing hazards, telecommunication workers have restricted workspace on rooftops or work from bucket trucks parked on uneven ground. Cumulatively, these conditions present fall and injury hazards to telecommunication workers, and the public who may be observing the work or transiting the area (International Finance Corporation, 2007).

Trenches and confined spaces – Installation of underground utilities, building foundations, and work in utility manholes[111] are examples of when confined space work is necessary. Installation of telecommunication activities involves laying conduit and in small trenches (generally 6 to 12 inches in width). Confined space work can involve poor atmospheric conditions, requiring ventilation and rescue equipment. Additionally, when inside a confined space, worker movement is restricted and may prevent a rapid escape or interfere with proper work posture and ergonomics. (OSHA, 2016b)

[111] Manholes may be used for telecommunications activities, especially in cities and urban areas, depending on the location of other utilities. In cities, power, water, and telecommunication lines are often co-located; if access is through a manhole in the street, that access will be used.

Heavy equipment and machinery – New and replacement facility deployment and maintenance can involve the use of heavy equipment and machinery. During the lifecycle of a telecommunication site, heavy equipment such as bulldozers, backhoes, dump trucks, cement trucks, and cranes are used to prepare the ground, transport materials and soil, and raise large sections of towers and antennas. Telecommunication workers may be exposed to the additional site traffic and often work near heavy equipment to direct the equipment drivers and to accomplish work objectives. Accessory machinery such as motorized pulley systems, hydraulic metal shears, and air driven tools present additional health and safety risks as telecommunication work sites. These pieces of machinery can potentially sever skin and bone, or cause other significant musculoskeletal injuries to the operator.

Energized equipment and existing utilities – Electrical shock from energized equipment and utilities is an elevated risk at telecommunication sites due to the amount of electrical energy required for powering communication equipment and broadcasting towers. Telecommunication cables are often co-located with underground and overhead utilities, which can further increase occupational risk during earth-breaking and aerial work.

Optical fiber safety – Optical fiber cable installation and repair presents additional risks to telecommunications workers, including potential eye or tissue damage, through ingestion, inhalation, or other contact with glass fiber shards. The shards are generated during termination and splicing activities, and can penetrate exposed skin (International Finance Corporation, 2007). Additionally, fusion splicing (to join optical fibers) in confined spaces or other environments with the potential for flammable gas accumulation presents risk of fire or explosion (Fiber Optic Association, 2010).

Noise – Sources of excess noise at telecommunication sites include heavy equipment operation, electrical power generators and other small engine equipment, air compressors, electrical and pneumatic power tools, and road vehicles, such a diesel engine work trucks. The cumulative noise environment has the potential to exceed the OSHA acceptable level of 85 decibels (dB) per 8-hour time weighted average (see Section 8.1.13, Noise) (U.S. Census Bureau, 2015o). Fugitive noise may emanate beyond the telecommunication work site and impact the public living in the vicinity, observing the work, or transiting through the area.

Hazardous materials and hazardous waste –Work at telecommunication sites may require the storage and use of hazardous materials such as fuel sources for backup power generators and compressed gases used for welding and metal cutting (new towers only). In some cases, telecommunication sites require treatments, such as pesticide application. Secondary hazardous materials, like exhaust fumes, may be a greater health risk than the primary hazardous material (i.e., diesel fuel). Furthermore, the use of hazardous materials creates down-stream potential to generate hazardous waste. While it is unlikely that any FirstNet activities would involve the generation or storage of hazardous waste, older existing telecommunication structures and sites could have hazardous materials present, such as lead-based (exterior and interior) paint at outdoor structures or asbestos tiles and insulation in equipment sheds. The public, unless a telecommunication work site allows unrestricted access, are typically shielded from hazardous materials and hazardous wastes that are components of telecommunication site work.

Aquatic environments – Installation of telecommunication lines may include laying, burying, or boring lines under wetlands and waterways, including lakes, rivers, ponds, and streams. Workers responsible for these activities operate heavy equipment from soft shorelines, boats, barges, and other unstable surfaces. There is potential for equipment and personnel falls, as well as drowning in waterbodies. Wet work conditions also increase risks of electric shock and hypothermia.

Outdoor elements – Weather conditions have the potential to quickly and drastically reduce safety, and increase hazards at telecommunication work sites. Excessive heat and cold conditions impact judgement, motor skills, hydration, and in extreme cases may lead to hyper- or hypothermia. Precipitation, such as rain, ice, and snow, create slippery climbing conditions and wet or muddy ground conditions. Lightning strikes are risks to telecommunication workers climbing towers or working on top of buildings.

Telecommunication Worker Occupational Health and Safety

The U.S. Department of Labor, Bureau of Labor Statistics (BLS) uses established industry and occupational codes to classify telecommunications workers. For industry classifications, the Bureau of Labor Statistics (BLS) uses the North American Industry Classification System (NAICS) codes, which identify the telecommunications industry (NAICS code 517XX) as being within the information industry (NAICS code 51). For occupational classifications, BLS uses the Standard Occupational Classification (SOC) system to identify workers as belonging to one of 840 occupations. Telecommunications occupations are identified as either telecommunication equipment installers and repairers, except line installers (SOC code 49-2022), or telecommunication line installers and repairers (SOC code 49-9052). Both occupations are reported under the installation, maintenance and repair occupations (SOC code 49-0000).

As of May 2014, there were 3,290 telecommunication equipment installers and repairers, and 820 telecommunication line installers and repairers (Figure 8.1.15-1) working in Louisiana (U.S. Census Bureau, 2015p). In 2012, the most recent year data are available, Louisiana had 2.2 cases of nonfatal occupational injuries or illnesses in the telecommunications industry per 100 full-time workers (U.S. Census Bureau, 2015q). By comparison, there were 1.9 nonfatal occupational injury cases nationwide in both 2012 and 2013 per 100 full-time workers in the telecommunications industry (BLS, 2013a).

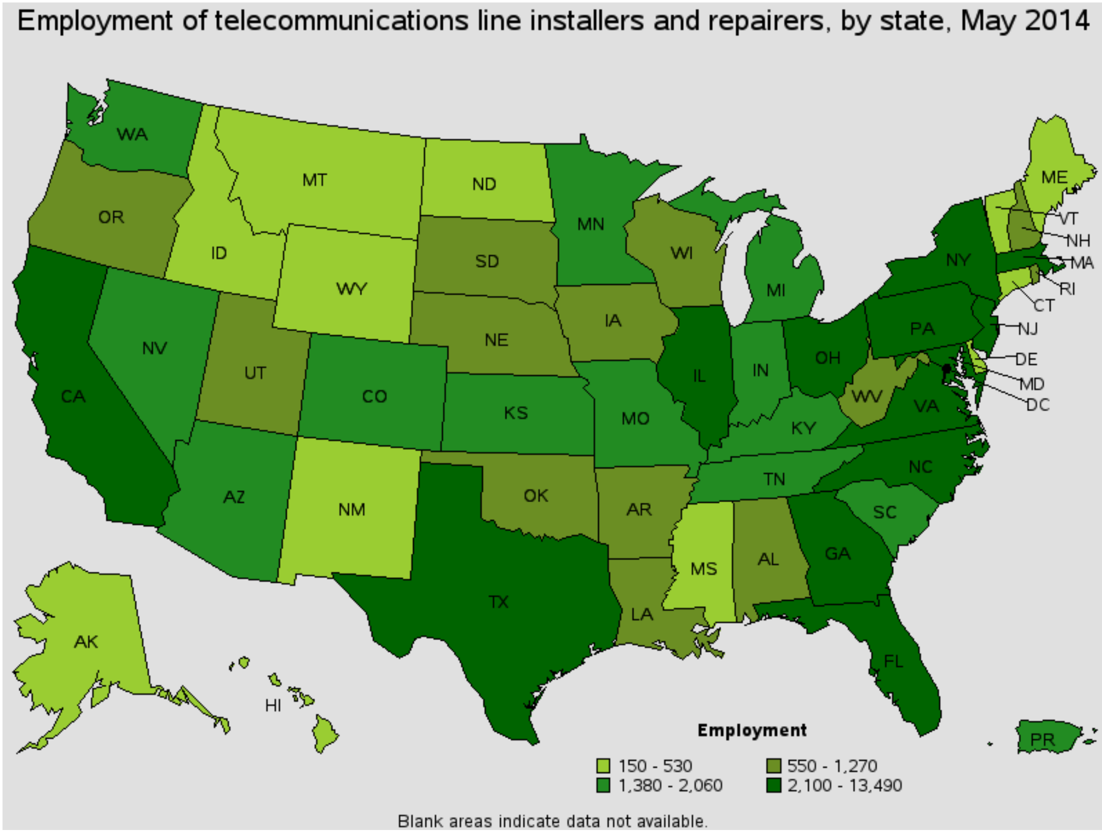

Figure 8.1.15-1: Number of Telecommunication Line Installers and Repairers Employed per State, May 2014

Source: (BLS, 2015c)

Nationwide in 2013, there were 18 fatalities reported across the telecommunications industry (5 due to violence and other injuries by persons or animals; 3 due to transportation incidents; and 7 due to slips, trips, or falls), with an hours-based fatal injury rate of 7.9 per 100,000 full-time equivalent workers (BLS, 2013b). This represents 45 percent of the broader information industry fatalities (40 total), and less than 1 percent of occupational fatalities (4,585 total). By comparison, Louisiana had three occupational fatalities in the telecommunications industry (NAICS code 517XX) in 2007, and one fatality in 2013. Within the telecommunications line installers and repairers occupation (SOC code 49-9052), Louisiana reported seven fatalities in 2007 and one fatality in 2013 (BLS, 2015f).

Public Health and Safety

The public is unlikely to encounter occupational hazards at telecommunication sites due to limited access. DHH collects environmental and public health data through the State Center for Health Statistics (Louisiana Department of Health & Hospitals, 2015a). The same data are reported with more specificity at the federal level through the Centers for Disease Control and Prevention (CDC) Wide-ranging Online Data for Epidemiologic Research (WONDER). While the WONDER database cannot be searched for cases specific to telecommunication sites, many available injury categories are consistent with risks present at telecommunication sites. For example, between 1999 and 2013, there were 145 fatalities due to a fall from, out of, or through a building or structure; 27 fatality due to being caught, crushed, jammed or pinched in or between objects; and 24 fatalities due to exposure to electric transmission lines (CDC, 2015a). Among the public, trespassers entering telecommunication sites would be at the greatest risk for exposure to health and safety hazards.

8.1.15.4 Contaminated Properties and Abandoned Mine Lands at or near Telecommunication Sites

Existing and surrounding land uses, including landfills or redeveloped brownfields, near telecommunication sites have the potential to impact human health and safety. Furthermore, undocumented environmental practices of telecommunication site occupants, including practices before current environmental laws, could result in environmental contamination, affecting the quality of soil, sediments, groundwater, surface water, and air.

Contaminated property is typically classified by the federal environmental remediation or cleanup programs that govern them, such as sites administered through the Superfund Program[112] or listed on the National Priorities List (NPL), as well as the Resource Conservation and Recovery Act (RCRA) Corrective Action sites and Brownfields. These regulated cleanup sites are known to contain environmental contaminants at concentrations exceeding acceptable human health exposure thresholds. Contact with high concentrations of contaminated media can result in adverse health effects, such as dermatitis, pulmonary and cardiovascular events, organ disease, central nervous system disruption, birth defects, and cancer. It generally requires extended periods of exposure over a lifetime for the most severe health effects to occur.

According to the DHH, "Louisiana ranks among the top states in the nation in per capita production of hazardous wastes and in the amount of chemicals released into its water, air, and soil" (DHH, 2015f). Louisiana's Underground Storage Tank and Remediation Division administers the Superfund Program and is managed under DEQ (DEQ, 2015m). As of November 2015, Louisiana had 64 RCRA Corrective Action sites,[113] 289 brownfield sites, and 12 proposed or final Superfund/NPL sites (USEPA, 2015h). Based on a November 2015 search of USEPA Cleanups in My Community (CIMC) database, there are no Superfund sites (USEPA, 2015i) and no RCRA Corrective Action sites (USEPA, 2015i) in Louisiana where contamination has been detected at an unsafe level, or a reasonable human exposure risk still exists.

Brownfield sites in Louisiana may enroll in a variety of programs managed by DEQ, including the Voluntary Remediation Program (VRP), to obtain financial assistance through the Brownfields Cleanup Revolving Loan Fund (BCRLF) or Louisiana Brownfields Investor Tax Credit (DEQ, 2015o). One example of a brownfield site is the historic American Can Company in New Orleans, LA. The 6.6-acre site operated as a manufacturing facility between 1907 and

[112] The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) enacted in 1980, commonly referred to as the Superfund Program, governs abandoned hazardous waste sites, and collects a tax on chemical and petroleum industries. CERCLA was amended by the Superfund Amendments and Reauthorization Act (SARA) in 1986; see Appendix C, Environmental Laws and Regulations (USEPA, 2011).
[113] Data gathered using USEPA's CIMC search on November 18, 2015, for all sites in Louisiana, where cleanup type equals 'RCRA Hazardous Waste – Corrective Action,' and excludes sites where cleanup phase equals 'Construction Complete' (i.e., no longer active) (USEPA, 2013b) .

1988, and was one of the first sites remediated under the VRP. In 2002, the developer completed asbestos, lead paint, and other soil contaminant remediation, transforming the site into apartment and retail space. (DEQ, 2015n)

In addition to contaminated properties, certain industrial facilities are permitted to release toxic chemicals into the air, water, or land. One such program is the TRI, administered by the USEPA under the Emergency Planning and Community Right to Know Act (EPCRA) of 1986. The Toxic Release Inventory database is a measure of the industrial nature of an area and the over-all chemical use, and can be used to track trends in releases over time. The "releases" do not necessarily equate to chemical exposure by humans or necessarily constitute to quantifiable health risks because the releases include all wastes generated by a facility – the majority of which are disposed of via managed, regulated processes that minimize human exposure and related health risks (e.g., in properly permitted landfills or through recycling facilities). As of October 2015, Louisiana had 390 TRI reporting facilities. The identification of a TRI facility does not necessarily indicate that the facility is actively releasing to the environment; the majority of TRI reports involve permitted disposal facilities. According to the USEPA, in 2013, the most recent data available, Louisiana released 142.7M pounds of toxic chemicals through onsite and offsite disposal, transfer, or other releases, largely from petroleum and chemicals industries. This accounted for 3.48 percent of nationwide TRI releases, ranking Louisiana 6 of 56 U.S. states and territories based on total releases per square mile. (USEPA, 2015k)

Another USEPA program is the NPDES, which regulates the quality of stormwater and sewer discharge from industrial and manufacturing facilities. Permitted discharge facilities are potential sources of toxic constituents that are harmful to human health or the environment. As of November 2, 2015, Louisiana had 348 permitted major discharge facilities registered with the USEPA Integrated Compliance Information System (USEPA, 2015l).

The National Institutes of Health, U.S. National Library of Medicine, provides an online mapping tool called TOXMAP, which allows users to "visually explore data from the USEPA's TRI and Superfund Program" (National Institutes of Health, 2015a). Figure 8.1.15-2 provides an overview of potentially hazardous sites in Louisiana.

In addition to hazardous waste contamination, another health and safety hazard includes surface and subterranean mines. Health and safety hazards at active mines and AMLs include falling into open shafts, cave-ins from unstable rock and decayed support, deadly gases and lack of oxygen inside the mine, unused explosives and toxic chemicals, horizontal and vertical openings, high walls, and open pits (Federal Mining Dialogue, 2015a). As of November 2015, Louisiana had 10 Priority 1 and 2 AMLs (sites posing health and safety hazards), with 24 unfunded problem areas (USDOI, Office of Surface Mining Reclamation and Enforcement, 2015). However, all AMLs in Louisiana are surface mineral mines (non-coal) and do not occur in potential areas of FirstNet deployment, operation, and maintenance activities.

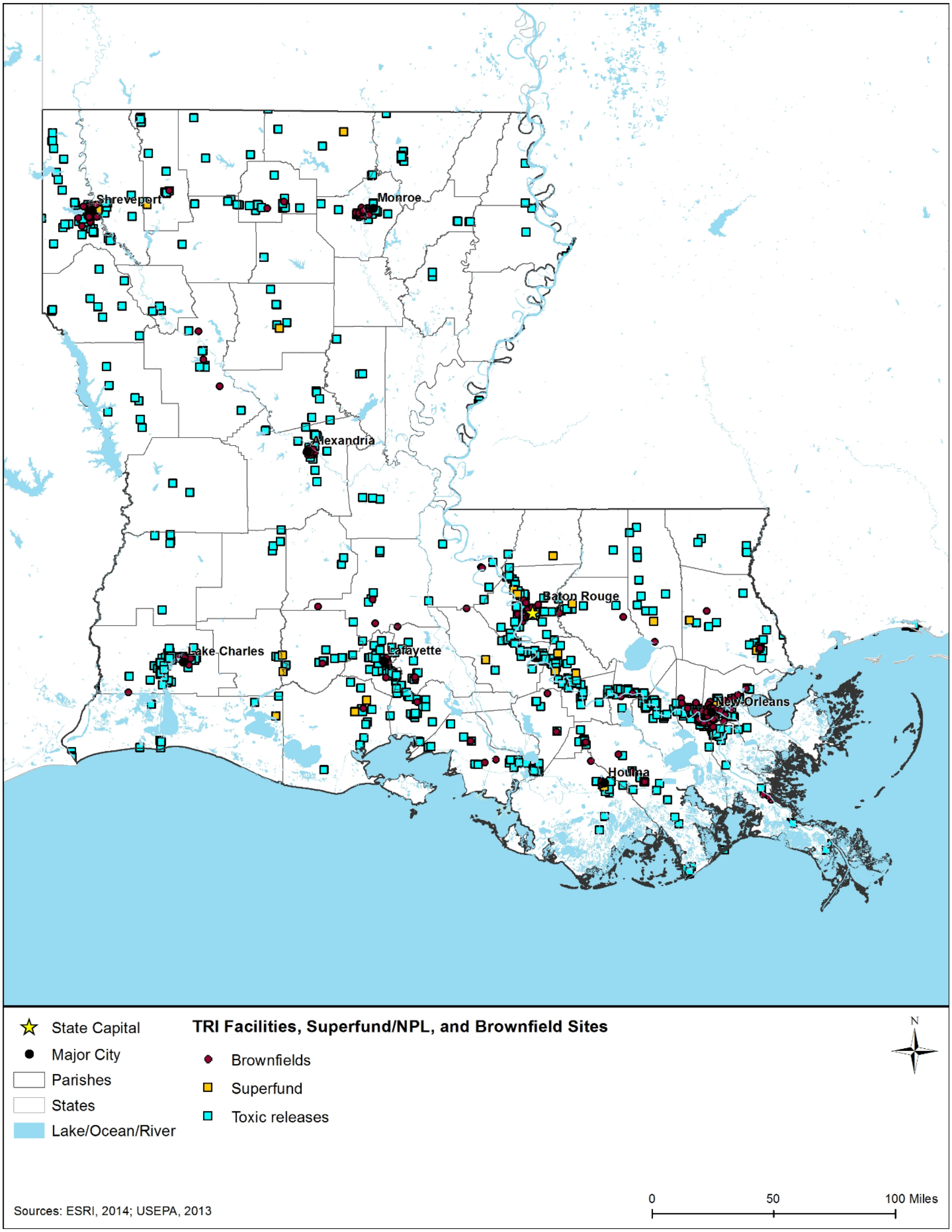

Figure 8.1.15-2: TOXMAP Superfund/NPL and TRI Facilities in Louisiana (2013)

Telecommunication Worker Occupational Health and Safety

Telecommunications sites may be on or near contaminated land, industrial discharge facilities, or sites presenting additional hazards. Occupational exposure to contaminated environmental media can occur during activities like soil excavating, trenching, other earthwork, and working over waterbodies. Indoor air quality may also be impacted from vapor intrusion infiltrating indoors from contaminated soil or groundwater that are present beneath a building's foundation. As of October 2015, there are six USEPA-regulated telecommunications sites in Louisiana (USEPA, 2015m). These sites are regulated under one or more environmental programs including NPDES compliance, Superfund/NPL status, and TRI releases.

According to BLS data, Louisiana had 30 fatalities between 2003 and 2014 within the installation, maintenance, and repair occupations (SOC code 49-0000) from exposure to "harmful substances or environments," although these were not specific to telecommunications (BLS, 2015f). By comparison, the BLS reported three fatalities in 2011 and three fatalities[114] in 2014 nationwide within the telecommunications industry (NAICS code 517), due to exposure to harmful substances or environments (BLS, 2015e). In 2014, BLS also reported four fatalities within the telecommunications line installers and repairers occupation (SOC code 49-9052), and no fatalities within the telecommunications equipment installers and repairers occupation (SOC code 49-2022) due to exposure to harmful substances or environments (BLS, 2014), therefore hazards relating to mines will not be discussed further.

Public Health and Safety

As described earlier, access to telecommunications sites is nearly always restricted to occupational workers. Although site access control is one of the major reasons telecommunications sites present an inherent low risk to non-occupational workers, the public could be potentially exposed to contaminants and other hazards in a variety of ways. One example would be if occupational workers disturb contaminated soil while digging, causing hazardous chemicals to mix with an underlying groundwater drinking water sources. If a contaminant enters a drinking water source, the surrounding community could inadvertently ingest or absorb the contaminant when using that source of water for drinking, cooking, bathing, and swimming. By trespassing on a restricted property, a trespasser may come in contact with contaminated soil or surface water, or by inhaling harmful vapors.

The DHH, Office of Public Health, Center for Environmental Health Services, Section of Environmental Epidemiology and Toxicology (SEET), partners with DEQ and the Agency for Toxic Substances and Disease Registry (ATSDR) as part of the Public Health Assessment Program to provide health assessments and consultations that identify and assess human exposure risks at contaminated sites. Public health assessments, consultations, and advisories for documented hazardous waste sites are publicly available through the DHH Center for Environmental Health website (Louisiana Department of Health & Hospitals, 2015b). At the federal level, the CDC, National Environmental Public Health Tracking Network, provides

[114] BLS Census of Fatal Occupational Injuries data for 2014 is for preliminary reporting only. Final data is expected to be released in spring 2016 (BLS, 2015d).

health, exposure, and hazard information, including known chemical contaminants, chronic diseases, and conditions based on geography. In 2011, the most recent data available, Louisiana reported a rate of two injuries and fatalities due to reported acute toxic substance release incidents per 100,000 population (CDC, 2015b).

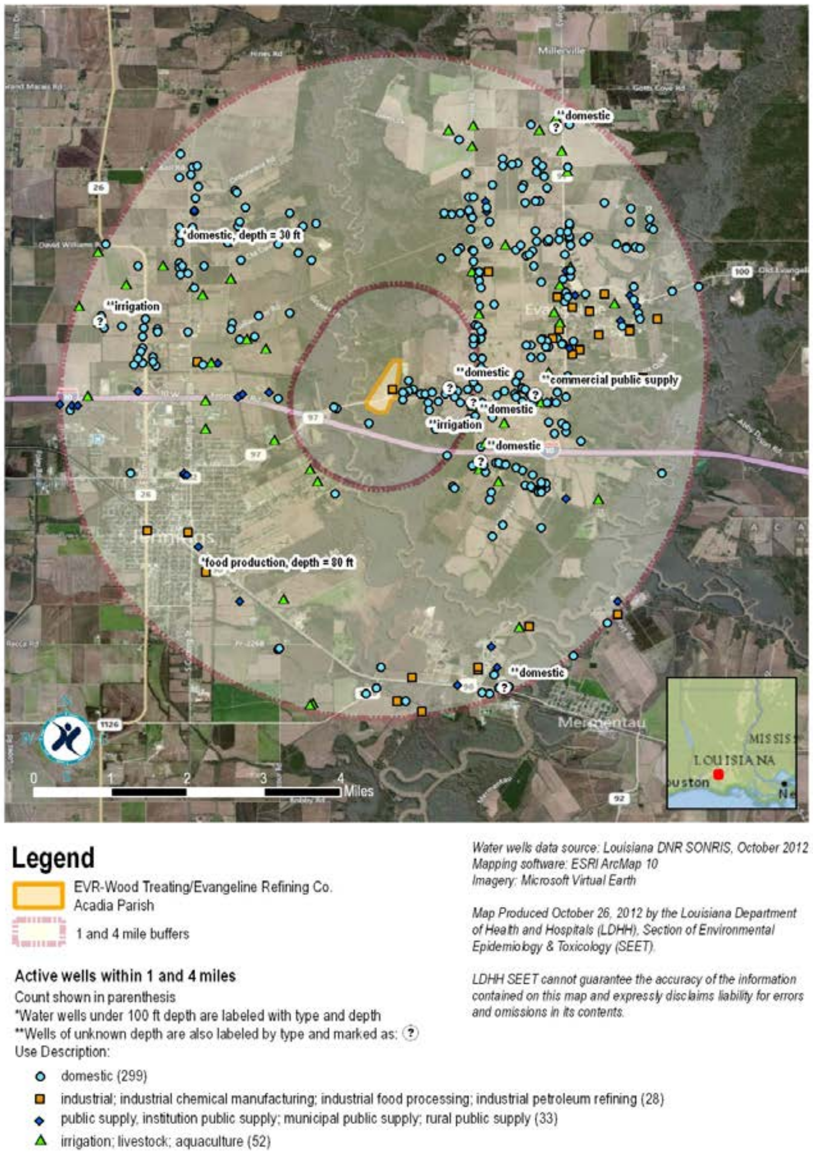

Figure 8.1.15-3: Active Wells within 1 and 4 Mile Buffer of EVR-Wood Treating/Evangeline Refining Company (Acadia Parish)

Source: (DHH, 2013)

8.1.15.5 Natural & Manmade Disaster Sites

Natural and manmade disaster events can create health and safety risks, as well as present unique hazards, to telecommunication workers and the public. Telecommunications, including public safety communications, can be unavailable (temporarily or permanently) during disaster events. Examples of manmade disasters are train derailments, refinery fires, or other incident involving the release of hazardous constituents. A common example of a natural disaster is flooding. Floodwaters damage transportation infrastructure (roads, railways, etc.) and utility lines (sewer, water, electric power, broadband, natural gas lines, etc.). Hazardous chemicals and sanitary wastes often contaminate floodwaters, which can cause headaches, skin rashes, dizziness, nausea, excitability, weakness, fatigue, and disease to exposed workers (OSHA, 2003).

Physical hazards may also be present at disaster sites, such as downed utility lines, debris blockage or road washout conditions, which increases exposure risks to telecommunication workers. Climbing and working from tower structures damaged by wind increases the risk of slips, trips, or falls. During natural and manmade disasters, access to the telecommunication sites can be obstructed by debris.

Telecommunication Worker Occupational Health and Safety

Telecommunication workers are often called upon to provide support to natural and manmade disaster response efforts because of the critical need to restore and maintain telecommunication capabilities. The need to enter disaster areas as part of the recovery effort exposes telecommunication workers to elevated risks because chemical, biological, and physical hazards might not have not been fully identified or assessed. Transportation infrastructure and utilities in the affected areas are often compromised and present unknown chemical and biologic hazards. Correspondingly, if telecommunication workers are injured during response and repair operations, their rescue and treatment might over-extend first responder staff and medical facilities that are delivering care to victims of the initial incident.

Currently, the Louisiana Occupational Health and Injury Surveillance Program (LOHIS), managed by DHH SEET and BLS do not report data specific to injuries or fatalities among telecommunication workers responding to natural or manmade disasters (Louisiana Department of Health & Hospitals, 2015c). However, the National Response Center (NRC), managed by the U.S. Coast Guard, compiles reports for oil spills, chemical releases, or other maritime security incidents and contains incident reports related to occupational health and safety. Of the 2,019 NRC-reported incidents for Louisiana in 2015 with known causes, 412 were attributed to natural disaster (flood, hurricane, tornado, and other natural phenomenon), while the majority (1,607) were attributed to manmade disasters (dumping, equipment failure, operator error, and over pressuring) (U.S. Coast Guard, 2015). For example, during a storm-related power outage on October 13, 2014, a fuel line leak was detected in the emergency backup generator at River Parish Hospital in Laplace, LA. The incident released 30 gallons of diesel onto the generator pad and surrounding soils (U.S. Coast Guard, 2015). Such incidents present unique, hazardous challenges to telecommunication workers responding during natural disasters.

Public Health and Safety

Hazards present during natural and manmade disasters are often far-reaching, affecting large geographic areas and affecting all populations living within the area. Similar to telecommunication workers, the public faces risks during these types of disasters, such as compromised transportation infrastructure and utilities, potential for exposure to unknown chemical and biologic hazards, and inadequate medical support. In 2014, Louisiana had six weather-related fatalities (two due to cold, two due to flooding, and two due to wind) and three non-fatal injuries. Nationwide, the same year, there were 384 weather-related fatalities and 2,203 injuries. By comparison, in 2005, Louisiana had 820 weather-related fatalities and 34 injuries due to Hurricane Katrina. (NWS, 2015d).

Spotlight on Louisiana Natural Disaster Sites: Hurricane Katrina

On August 29, 2005, Hurricane Katrina made landfall near New Orleans, LA, bringing a storm surge of 30 feet and wind damage extending 150 miles inland. Subsequent levy breaches flooded 80 percent of the city, severely damaging critical infrastructure, including oil refineries and chemical plants. According to the USEPA, 400 contaminated sites with potential human health risks existed in the affected area prior to Katrina. Following Katrina, 6 major, 4 medium, and 134 minor oil spills were identified, totaling 8 million gallons. The most significant of these spills occurred at a Murphy Oil Company plant, releasing 25,000 barrels into the cities of Meraux and Chalmette. Oil and chemical spills, mixed with sewage overflow from offline treatment facilities, added contamination to floodwaters, and left a residual toxic sludge after the floodwaters receded. (National Institutes of Health, 2006)

First responder teams were plagued with power and telecommunications outages for months following Katrina's landfall, with 38 enhanced 911 Public Safety Answering Points (PSAPs) and 1,000 cellular base stations offline (Figure 8.1.15-4). In New Orleans, LA, 2,000 first responders were forced to communicate radio-to-radio after experiencing a total loss of EMS and fire communications services. As a result, rescue efforts, hazardous release responses, and other health and safety services were severely overburdened. Response efforts were further disrupted by an inability to access impacted areas due to extensive debris and heightened perimeter security measures. (FCC, 2006)

Figure 8.1.15-48.1.15: Emergency 107-foot Trailer-Mounted Telecommunications Tower following Communications Tower Collapse at Jefferson Parrish Sheriff's Office, near Damaged Oil Storage Facility

Source: (FEMA, 2005)

8.2 ENVIRONMENTAL CONSEQUENCES

This section describes the potential environmental impacts, beneficial, or adverse, resulting from the Proposed Action and Alternatives. As this is a programmatic evaluation, site- and project-specific issues are not assessed. The specific deployment activity and where the deployment will take place will be determined based on location-specific conditions and the results of site-specific environmental reviews.

At the programmatic level, the categories of impacts have been defined as potentially significant, less than significant with mitigation incorporated, less than significant, or no impact. Each resource area identifies the range of possible impacts on resources for the Proposed Action and Alternatives and includes the No Action Alternative. The No Action Alternative provides a comparison to describe the effects of environmental resources of the existing conditions to the proposed Alternatives.

NEPA requires agencies to assess the potential direct and indirect impacts each alternative could have on the existing environment (as characterized earlier in this section). Direct impacts are those impacts that are caused by the Proposed Action and occur at the same time and place, such as soil disturbance. Indirect impacts are those impacts related to the Proposed Action but result from an intermediate step or process, such as changes in surface water quality because of soil erosion.

For each resource, the potential impact is assessed in terms of context of the action and the intensity of the potential impact, per CEQ regulations (40 CFR §1508.27). *Context* refers to the timing, duration, and where the impact could potentially occur (i.e., local vs. national; pristine vs. disturbed; common species vs. protected species). In terms of duration of potential impact, context is described as short or long term. *Intensity* refers to the magnitude or severity of the effect as either beneficial or adverse. Resource-specific significance rating criteria are provided at the beginning of each resource area section.

8.2.1 Infrastructure

8.1.5.1. Introduction

This section describes potential impacts to infrastructure in Louisiana associated with construction, deployment, and operation of the Proposed Action and alternatives. Chapter 16, Best Management Practices (BMPs) and Mitigation Measures for a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

8.2.1.1 Impact Assessment Methodology and Significance Criteria

The impacts of the Proposed Action on infrastructure were evaluated using the significance criteria presented in Table 8.2.1-1. As described in Section 8.2 , Environmental Consequences, the categories of impacts are defined as potentially significant, less than significant with mitigation incorporated, less than significant, or no impact. Characteristics of each impact type, including magnitude or intensity, geographic extent, and duration or frequency, were used to determine the impact significance rating associated with each potential impact.

Given the nature of this programmatic evaluation, and because the Proposed Action could potentially cover a wide variety of actions that would take place in various landscapes, the potential impacts to infrastructure addressed in this section are presented as a range of possible impacts.

Table 8.2.1-1: Impact Significance Rating Criteria for Infrastructure

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
Transportation system capacity and safety	Magnitude or Intensity	Creation of substantial traffic congestion/delay and/or a substantial increase in transportation incidents (e.g., crashes, derailments).	Effect that is potentially significant, but with mitigation is less than significant.	Minimal change in traffic congestion/delay and/or transportation incidents (e.g., crashes, derailments).	No effect on traffic congestion or delay, or transportation incidents.
	Geographic Extent	Regional impacts observed throughout the state/territory.		Effects realized at one or multiple isolated locations.	NA
	Duration or Frequency	Permanent: Persisting indefinitely.		Short-term effects will be noticeable for up to the entire construction phase or a portion of the operational phase.	NA
Capacity of local health, public safety, and emergency response services	Magnitude or Intensity	Impacted individuals or communities cannot access health care and/or emergency services, or access is delayed, due to the project activities.	Effect is potentially significant, but with mitigation is less than significant.	Minor delays to access to care and emergency services that do not impact health outcomes.	No impacts on access to care or emergency services.
	Geographic Extent	Regional impacts observed ("regional" assumed to be at least a parish or parish-equivalent geographical extent, could extend to state).		Impacts only at a local/neighborhood level.	NA
	Duration or Frequency	Duration is constant during construction and deployment phase.		Rare event during construction and deployment phase.	NA

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
Modifies existing public safety response, physical infrastructure, telecommunication practices, or level of service in a manner that directly affects public safety communication capabilities and response times	Magnitude or Intensity	Substantial changes in public safety response times and the ability to communicate effectively with and between public safety entities.	Effect that is potentially significant, but with mitigation is less than significant.	Minimal change in the ability to communicate with and between public safety entities.	No perceptible change in existing response times or the ability to communicate with and between public safety entities.
	Geographic Extent	Local/City, Parish/Region, or State/Territory.		Local/City, Parish/Region, or State/Territory	Local/City, Parish/Region, or State/Territory.
	Duration or Frequency	Permanent or perpetual change in emergency response times and level of service.		Change in communication and/or the level of service is perceptible but reasonable to maintaining effectiveness and quality of service.	NA
Effects to commercial telecommunication systems, communications, or level of service	Magnitude or Intensity	Substantial changes in level service and communications capabilities.	Effect that is potentially significant, but with mitigation is less than significant.	Minor changes in level of service and communications while transitioning to the new system.	No perceptible effect to level of service or communications while transitioning to the new system.
	Geographic Extent	Local/City, Parish/Region, or State/Territory.		Local/City, Parish/Region, or State/Territory.	Local/City, Parish/Region, or State/Territory.
	Duration or Frequency	Persistent, long-term, or permanent effects to communications and level of service.		Minimal effects to level of service or communications lasting no more than a short period (minutes to hours) during the construction and deployment phase.	NA

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
Effects to utilities, including electric power transmission facilities and water and sewer facilities	Magnitude or Intensity	Substantial disruptions in the delivery of electric power or to physical infrastructure that results in disruptions, including frequent power outages or drops in voltage in the electrical power supply system ("brownouts"). Disruption in water delivery or sewer capacity, or damage to or interference with physical plant facilities that impact delivery of water or sewer systems.	Effect that is potentially significant, but with mitigation is less than significant.	Minor disruptions to the delivery of electric power, water, and sewer services, or minor modifications to physical infrastructure that result in minor disruptions to delivery of power, water, and sewer services.	There would be no perceptible impacts to delivery of other utilities and no service disruptions.
	Geographic Extent	Local/City, Parish/Region, or State/Territory.		Local/City, Parish/Region, or State/Territory.	Local/City, Parish/Region, or State/Territory.
	Duration or Frequency	Effects to other utilities would be seen throughout the entire construction phase.		Effects to other utilities would be of short duration (minutes to hours) and would occur sporadically during the entire construction phase.	NA

NA = Not Applicable

8.2.1.2 Description of Environmental Concerns

Transportation System Capacity and Safety

The primary concerns for transportation system capacity and safety related to FirstNet activities would primarily occur during the construction phases of deployment. Depending on the exact site locations and placement of new assets in the field, temporary impacts on traffic congestion, railway use, airport or harbor operations, or use of other transportation corridors could occur if site locations were near or adjacent to roadways and other transportation corridors, requiring temporary closures (lane closures on roadways, for example). Coordination would be necessary with the relevant transportation authority (i.e., departments of transportation, airport authorities, railway companies, and harbormasters) to ensure proper coordination during deployment. Based on the impact significance criteria presented in Table 8.2.1-1, such impacts would be less than significant at the programmatic level due to the temporary nature of the deployment activities, even if impacts would be realized at one or more isolated locations. These impacts would be noticeable during the deployment phase, but would be short-term, with no anticipated impacts continuing into the operational phase, unless any large-scale maintenance would become necessary during operations.

Capacity of Local Health, Public Safety, and Emergency Response Services

The capacity of local health, public safety, and emergency response services would experience less than significant impacts at the programmatic level during construction or operation phases. During deployment and system optimization, existing services would likely remain operational in a redundant manner ensuring continued operations and availability of services to the public. The only potential impact would be extremely rare, if emergency response services were using transportation infrastructure to respond to an emergency at the exact time that deployment activities were taking place. This type of impact would be isolated at the local or neighborhood level, and the likelihood of such an impact would be extremely low. Once operational, the new network would provide beneficial impacts to the capacity of local health, public safety, and emergency response services through enhanced communications infrastructure, thereby increasing capacity for and enhancing the ability of first responders to communicate during emergency response situations. Based on the impact significance criteria presented in Table 8.2.1-1, potential negative impacts would be less than significant at the programmatic level. Substantial beneficial impacts are likely to result from implementation.

Modifies Existing Public Safety Response Telecommunication Practices, Physical Infrastructure, or Level of Service in a manner that directly affects Public Safety Communication Capabilities and Response Times

The Proposed Action and alternatives contemplated by FirstNet would not cause negative impacts to existing public safety response telecommunication practices, physical infrastructure, or level of service in a manner that directly affects public safety communication capabilities and response times. Based on the impact significance criteria presented in Table 8.2.1-1, at the programmatic level, any potential impacts would be less than significant during deployment. As described above, during deployment and system optimization, existing services would likely remain operational in a redundant manner ensuring continued operations and availability of services to the public. Once operational, state and local public safety organizations would need to evaluate telecommunication practices and standard operating procedures (SOPs). FirstNet's mission is to complement such practices and SOPs in a positive manner; therefore, only beneficial or complementary impacts would be anticipated. Public safety communication capabilities and response times would be expected also to experience such beneficial impacts through enhanced communications abilities. It is possible that FirstNet would be upgrading physical telecommunications infrastructure, thus such infrastructure would also experience a positive and beneficial impact. Disposal or reuse of old public safety communications infrastructure would also likely need to be considered once the specifics are known. Any negative impacts would be expected to be less than significant at the programmatic level given the short-term nature of deployment activities.

Effects to Commercial Telecommunication Systems, Communications, or Level of Service

Commercial assets would be using a different spectrum for communications; as such, commercial telecommunication systems, communications, or level of service would experience no impacts. FirstNet has exclusive rights to use of the assigned spectrum, and only designated public safety organizations would be authorized to connect to FirstNet's network. Depending on the use patterns of FirstNet's spectrum, such spectrum use may be over-built or under-utilized.[115] Anticipated impacts would be less than significant at the programmatic level due to the limited extent and temporary nature of deployment.

Effects to Utilities, including Electric Power Transmission Facilities, and Water and Sewer Facilities

The activities proposed by FirstNet would have less than significant impacts on utilities at the programmatic level, including electric power transmission facilities, and water and sewer facilities. Depending on the specific project contemplated, installation of new equipment could require connection with local electric sources, and use of site-specific local generators, on a temporary or permanent basis. Also, depending on the specific project contemplated, the draw or use of power from the transmission facilities may need to be examined; however, it is not anticipated that such use of power would have negative impacts, due to the local nature of the proposed activities and the widespread availability and use of the power grid in the United States.

[115] Telecommunications equipment for specific spectrum use can be built where other equipment for other spectrum use already exists. If the new equipment and spectrum is not fully utilized, the geographic region may experience "over-build," where an abundance of under-utilized equipment may exist in that geographic location. This situation can be caused by a variety of factors including changes in current and future use patterns, changes in spectrum allocation, changes in laws and regulations, and other factors.

8.2.1.3 Potential Impacts of the Preferred Alternative

The following section assesses potential impacts associated with implementation of the Preferred Alternative, including deployment and operation activities.

Deployment Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, implementation of the Preferred Alternative could result in the deployment of various types of facilities or infrastructure. Depending on the physical nature and location of the facility/infrastructure and the specific deployment requirements, some activities would result in potential impacts to infrastructure and others would not. In addition, and as explained in this section, the same type of Proposed Action Infrastructure could result in a range of no impacts to less than significant impacts at the programmatic level, depending on the deployment scenario or site-specific conditions.

Activities Likely to Have No Impacts

Of the types of facilities or infrastructure deployment scenarios described in Section 2.1.2, Proposed Action Infrastructure, the following are likely to have no impacts to infrastructure under the conditions described below:

- Wired Projects
    - Use of Existing Conduit – New Buried Fiber Optic Plant: Disturbance associated with the installation of fiber optic cable in existing conduit would be limited to entry and exit points of the existing conduit in previously disturbed areas. It is anticipated that there would be no impacts to infrastructure resources since the activities that would be conducted at these small entry and exit points are not likely to produce perceptible changes or disruption of transportation, telecommunications, or utility services.
    - Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting of dark fiber would have no impacts to infrastructure resources because there would be no ground disturbance and no interference with existing utility, transportation, or communication systems.
- Satellites and Other Technologies
    - Satellite-Enabled Devices and Equipment: It is anticipated that the use of portable devices that use satellite technology would not impact infrastructure resources because there would be no change to the built or natural environment from the use of portable equipment. Installation of satellite-enabled equipment would not be expected to have any impacts to infrastructure resources, given that construction activities would occur on existing structures, would not be expected to interfere with existing equipment, and transportation capacity and safety, and access to emergency services would not be impacted.
    - Deployment of Satellites: FirstNet does not anticipate launching satellites as part of the deployment of the Nationwide Public Safety Broadband Network (NPSBN); however, it may include equipment on satellites that are already being launched for other

purposes. As adding equipment to an existing launch vehicle would be very unlikely to impact infrastructure resources, it is anticipated that this activity would have no impact on infrastructure resources.

Activities with the Potential to Have Impacts

Potential deployment-related impacts to infrastructure as a result of implementation of the Preferred Alternative would encompass a range of impacts that could occur as a result of direct interface with existing infrastructure, most notably existing telecommunication infrastructure. The types of infrastructure deployment activities that could be part of the Preferred Alternative and result in potential impacts to infrastructure include the following:

- Wired Projects
  - New Build – Buried Fiber Optic Plant: Plowing (including vibratory plowing), trenching, or directional boring and the construction of points of presence (POP),[116] huts, or other associated facilities or hand-holes to access fiber could result in potential impacts to infrastructure resources, depending on the specific assets connected on either end of the buried fiber. If a fiber optic plant is being used to tie into existing telecommunications assets, then localized impacts to telecommunications sites could occur during the deployment phase; however, at the programmatic level, it is anticipated that this tie-in would cause less than significant impacts as the activity would be temporary and minor.
  - New Build – Aerial Fiber Optic Plant: Installation of a new aerial fiber optic plant could impact new telecommunications infrastructure through the installation of new or replacement of existing telecommunications poles.
  - Collocation on Existing Aerial Fiber Optic Plant: Similar to new build activities (above), collocation on existing aerial fiber optic plant could include installation of new or replacement towers requiring ground disturbance.
  - New Build – Submarine Fiber Optic Plant: The installation of cables in or near bodies of water would not impact infrastructure resources because there would be no local infrastructure to impact, other than harbor operations. However, impacts to infrastructure resources could potentially occur as result of the construction of landings and/or facilities on shores or the banks of water bodies that accept the submarine cable, depending on the exact site location and proximity to existing infrastructure.
  - Installation of Optical Transmission or Centralized Transmission Equipment: Installation of transmission equipment such as small boxes or huts, or access roads, could potentially impact infrastructure. Impacts could include disruption of service in transportation corridors, disruption of service to telecommunications infrastructure, or other temporary impacts.

[116] Points of Presence are connections or access points between two different networks, or different components of one network.

- Wireless Projects
    - New Wireless Communication Towers: Installation of new wireless towers and associated structures (generators, equipment sheds, fencing, security and aviation lighting, electrical feeds, and concrete foundations and pads) or access roads might result in temporary or unintended impacts to current utility services during installation or interconnection activities. Generally, however, these deployment activities would be independent and would not be expected to interfere with other existing towers and structures. In addition, installation activities would have beneficial impacts due to expansion of infrastructure at a local level. Such activities could enhance public safety infrastructure, and other telecommunications as the site could potentially be available for subsequent collocation.
    - Collocation on Existing Wireless Tower, Structure, or Building: Collocation would involve mounting or installing equipment (such as antennas or microwave dishes) on an existing tower, which would result in localized impacts to that tower and tower site such as minor disruptions in services. As a result of collocation of equipment, the potential addition of power units, structural hardening, and physical security measures could potentially have beneficial impacts on existing infrastructure assets, depending on the site-specific plans.
    - Deployable Technologies: Deployable technologies such as Cells on Wheels (COWs,), Cells on Light Trucks (COLTs), and Sites on Wheels (SOWs) are composed of cellular base stations, sometimes with expandable antenna masts, and generators that connect to utility power cables. Connecting the generators to utility power cables has the potential to disrupt electric power utility systems or cause power outages; however, this is expected to be temporary and minor. Some staging or landing areas (depending on the type of technology) could require minor construction and maintenance within public road right-of ways (ROWs) and utility corridors, heavy equipment movement, and minor excavation and paving near public roads, which have the potential to impact transportation capacity and safety as these activities could increase transportation congestion and delays. Implementation of deployable technologies could result in potential impacts to infrastructure resources in terms of infrastructure expansion, if deployment requires paving of previously unpaved surfaces or other new infrastructure build to accommodate the deployable technology. Also, beneficial impacts could be realized, as deployable technologies are used when other infrastructure is impaired in some way; so deployable technologies could provide continuity of service during emergency events. Where deployable technologies would be implemented on existing paved surfaces and the acceptable load on those paved surfaces is not exceeded, or where aerial deployable technologies may be utilized but launched from existing paved surfaces, it is anticipated that there would be no impacts to infrastructure resources because there would be no disturbance of the natural or built environment.

In general, the abovementioned activities could potentially impact infrastructure resources in different ways, resulting in both potentially negative and potentially positive impacts. Potential negative impacts to infrastructure associated with deployment could include temporary disruption of various types of transportation corridors, temporary impacts on existing or new telecommunications sites, and more permanent impacts on utilities, if new infrastructure required tie-in to the electric grid. These impacts are expected to be less than significant at the programmatic level as the deployment activities will likely be of short duration (generally a few hours to a few months depending on the activity), would be regionally based around the on-going phase of deployment and minor. Chapter 16, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Positive impacts to infrastructure resources may result from the expansion of public safety and commercial telecommunications capacity and an improvement in public safety telecommunications coverage, system resiliency, response times, and system redundancy.

Operation Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, operation activities associated with the Preferred Alternative would consist of routine maintenance and inspection of the facilities. Any major infrastructure replacement as part of ongoing system maintenance would result in potential impacts similar to the abovementioned deployment impacts. It is anticipated that there would be no impacts to infrastructure associated with routine inspections of the Preferred Alternative, assuming that the same access roads used for deployment are also used for inspections. If usage of heavy equipment as part of routine maintenance or inspections occurs off established access roads or corridors, or if further construction related activities are required along public road and utility ROWs, increased traffic congestion, current telecommunication system interruption, and utility interruptions could occur. These potential impacts would be expected to be minor and temporary as explained above.

Numerous beneficial impacts would be associated with operation of the NPSBN. The new system is intended to result in substantial improvements in public safety response times and the ability to communicate effectively with and between public safety entities, and would likely result in substantial improvements in level of service and communications capabilities. Operation of the NPSBN is intended to involve high-speed data capabilities, location information, images, and eventually streaming video, which would likely significantly improve communications and the ability of the public safety community to effectively engage and respond. The NPSBN is also intended to have a higher level of redundancy and resiliency than current commercial networks to support the public safety community effectively, even in events of extreme demand. This improvement in the level of resiliency and redundancy is intended to increase the reliability of systems, communications, and level of service, and minimize disruptions and misinformation resulting from limited or disrupted service. Chapter 16, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

8.2.1.4 Alternatives Impact Assessment

The following section assesses potential impacts to infrastructure associated with the Deployable Technologies Alternative and the No Action Alternative.

Deployable Technologies Alternative

Under the Deployable Technologies Alternative option, a nationwide fleet of mobile communications systems would provide temporary coverage in areas not covered by the existing, usable infrastructure. There would be no collocation of equipment and minimal new construction associated with wired or wireless projects discussed above under the Preferred Alternative. Some limited construction could be associated with implementation such as land clearing or paving for parking or staging areas. The specific infrastructure associated with the Deployable Technologies Alternative would be the same as the deployable technologies implemented as part of the Preferred Alternative but would likely be implemented in greater numbers, over a larger geographic extent, and used with greater frequency and duration. Therefore, potential impacts to infrastructure as a result of implementation of this Alternative could be as described below.

Deployment Impacts

As explained above, implementation of deployable technologies could result in less than significant impacts to infrastructure at the programmatic level, even if deployment requires expansion of infrastructure, such as paving of previously unpaved surfaces or other new infrastructure built to support deployment. This is primarily due to the small amount of paving or new infrastructure that might have to be construction to accommodate the deployables. The site-specific location of deployment would need to be considered, and any local infrastructure assets (transportation, telecommunications, or utilities) would need to be considered, planned for, and managed accordingly to try to avoid any negative impacts to such resources. Beneficial impacts could be realized, as deployable technologies are used when other infrastructure is impaired in some way; so deployable technologies could provide continuity of service during emergency events. Chapter 16, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

As explained above, operation activities would consist of implementation/running of the deployable technology and routine maintenance and inspections. As with the Preferred Alternative, it is anticipated that there would be no impacts to infrastructure resources associated with routine inspections of the Preferred Alternative, assuming that the same access roads used for deployment are also used for inspections. If usage of heavy equipment, as part of routine maintenance or inspection occurs off an established access road or utility ROW, or if additional maintenance-related construction activities occur within public road and utility ROWs, less than significant impacts would likely still occur to transportation systems or utility services at the programmatic level, due to the limited amount of new infrastructure needed to accommodate the deployables. Chapter 16, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

No Action Alternative

Under the No Action Alternative, the NPSBN would not be deployed; therefore, there would be no associated deployment or installation of wired, wireless, deployable infrastructure or satellites and other technologies. As a result, there would be no impacts to infrastructure as a result of deployment and operation of the Proposed Action. Environmental conditions would therefore be the same as those described in Section 8.1.1, Infrastructure. The state also would not realize positive, beneficial impacts to infrastructure resources described above.

8.2.2 Soils

8.2.2.1 Introduction

This section describes potential impacts to soil resources in Louisiana associated with deployment and operation of the Proposed Action and Alternatives. Chapter 16, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

8.2.2.2 Impact Assessment Methodology and Significance Criteria

The impacts of the Proposed Action on soil resources were evaluated using the significance criteria presented in Table 8.2.2-1. As described in Section 8.1.2, Environmental Consequences, the categories of impacts are defined as potentially significant, less than significant with mitigation incorporated, less than significant, or no impact. Characteristics of each impact type, including magnitude or intensity, geographic extent, and duration or frequency, were used to determine the impact significance rating associated with each potential impact.

Given the nature of this programmatic evaluation, and because the Proposed Action could potentially cover a wide variety of actions that would take place in various landscapes, the potential impacts to soil resources addressed in this section are presented as a range of possible impacts.

Table 8.2.2-1: Impact Significance Rating Criteria for Soils

Type of Effect	Effect Characteristic	Impact Level			
		Potentially Significant	Less than Significant with BMPs and Mitigation Measures Incorporated	Less than Significant	No Impact
Soil erosion	Magnitude or Intensity	Severe, widespread, and observable erosion in comparison to baseline, high likelihood of encountering erosion-prone soils.	Effect that is potentially significant, but with mitigation is less than significant.	Perceptible erosion in comparison to baseline conditions; low likelihood of encountering erosion-prone soil types.	No perceptible change in baseline conditions.
	Geographic Extent	State or territory.		Region or parish.	NA
	Duration or Frequency	Chronic or long-term erosion not likely to be reversed over several years.		Isolated, temporary, or short-term erosion that that is reversed over few months or less.	NA
Topsoil mixing	Magnitude or Intensity	Clear and widespread mixing of the topsoil and subsoil layers.	Effect that is potentially significant, but with mitigation is less than significant.	Minimal mixing of the topsoil and subsoil layers has occurred.	No perceptible evidence that the topsoil and subsoil layers have been mixed.
	Geographic Extent	State or territory.		Region or parish.	NA
	Duration or Frequency	NA		NA	NA
Soil compaction and rutting	Magnitude or Intensity	Severe and widespread, observable compaction and rutting in comparison to baseline.	Effect that is potentially significant, but with mitigation is less than significant.	Perceptible compaction and rutting in comparison to baseline conditions.	No perceptible change in baseline conditions.
	Geographic Extent	State or territory.		Region or parish	NA
	Duration or Frequency	Chronic or long-term compaction and rutting not likely to be reversed over several years.		Isolated, temporary, or short term compaction and rutting that is reversed over a few months or less.	No perceptible change in baseline conditions.

NA = Not Applicable

8.2.2.3 Description of Environmental Concerns

Soil Erosion

Soil erosion is an environmental concern for nearly every construction activity that involves ground disturbance. Construction erosion typically only occurs in a small area of land with the actual removal of vegetative cover from construction equipment or by wind and water erosion. Of concern in Louisiana and other states with similar geography and weather patterns is the erosion of construction site soils to natural waterways, where the sediment could impair water and habitat quality, and potentially affect aquatic plants and animals (NRCS, 2000). About 57 percent[117] of Louisiana contains soil types that occur on steep slopes and, therefore, have a medium to high potential for erosion. Those soil types include Cryods, Orthents, Orthods, Psamments, Udalfs, Udepts, and Udults (see Section 8.1.2.4, Soil Suborders and Figure 8.1.2-2).

Based on the impact significance criteria presented in Table 8.2.2-1, building of some of FirstNet's network deployment sites could cause potentially significant erosion at locations with highly erodible soil and steep grades. For the majority of projects, impacts to soils would be expected to be less than significant at the programmatic level given the short-term and temporary duration of the activities.

To the extent practicable, FirstNet would attempt to minimize ground-disturbing construction in areas with high erosion potential due to steep slopes or soil type. Where construction is required in areas with a high erosion potential, FirstNet would implement BMPs and mitigation measures, where practicable and feasible, to avoid or minimize impacts, and minimize the periods when exposed soil is open to precipitation and wind (see Chapter 16).

Topsoil Mixing

The loss of topsoil (i.e., organic and mineral topsoil layers) by mixing is a potential impact at all ground disturbing construction sites, including actions requiring clearing, excavation, grading, trenching, backfilling, or site restoration/remediation work.

Based on impact significance criteria presented in Table 8.2.2-1, and due to the relatively small-scale (less than 1 acre) of most FirstNet project sites, as well as the implementation of BMPs and mitigation measures (Chapter 16), minimal topsoil mixing is anticipated.

Soil Compaction and Rutting

Soil compaction and rutting at construction sites could involve heavy land clearing equipment such as bulldozers and backhoes, trenchers and directional drill rigs to install buried fiber, and cranes to install towers and aerial infrastructure. Soils with the highest potential for compaction or rutting were identified by using the STATSGO2 database (see Section 8.1.2.4, Soil Suborders). The most compaction susceptible soils in Louisiana are Aqualfs, Aquents, Aquepts,

[117] This percentage was calculated by dividing the acres of soils that fall within the suborders listed above by the total soil land cover for the state.

Aquerts, Aquults, Arents, Fluvents, Saprists, Udepts, Uderts, Udolls, because they are hydric soils with poor drainage conditions. These soils constitute about 64.31 percent of Louisiana's land area[118], found in the southwestern and northeastern portions of the state (see Figure 8.1.2-2). The potential for compaction or rutting impact would be generally low at FirstNet network deployment sites where other soil types predominate.

Based on impact significance criteria presented in Table 8.2.2-1, the risk of soil compaction and rutting resulting from FirstNet deployment activities would be less than significant at the programmatic level, due to the extent of susceptible soils in the state.

8.2.2.4 Potential Impacts of the Preferred Alternative

The following section assesses potential impacts associated with implementation of the Preferred Alternative, including deployment and operation activities.

Deployment Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, implementation of the Preferred Alternative could deploy various types of facilities or infrastructure. Depending on the physical nature and location of FirstNet facilities or infrastructure and the specific action, some activities would result in potential impacts to soil resources and others would not. In addition, and as explained in this section, at the programmatic level, the same type of proposed action infrastructure could result in a range of no impacts to less than significant impacts depending on the deployment scenario or site-specific conditions.

Activities Likely to Have No Impacts

Of the types of facilities or infrastructure deployment scenarios described in Section 2.1.2, Proposed Action Infrastructure, the following are likely to have no impacts to soil resources under the conditions described below:

- Wired Projects
  - Use of Existing Conduit – New Buried Fiber Optic Plant: Installation of fiber optic cable in existing conduit through existing hand holes, pulling vaults, junction boxes, huts, and POP, structures, and would not impact soil resources because it would not produce perceptible changes to soil resources.
  - Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting of dark fiber would be conducted electronically through existing infrastructure, with no impacts to soil resources. If physical access is required to light dark fiber, it would be through existing hand holes, pulling vaults, junction boxes, huts, and similar existing structures.
- Satellites and Other Technologies

[118] This percentage was calculated by dividing the acres of soils that fall within the suborders listed above by the total soil land cover for the state.

- Satellite-Enabled Devices and Equipment: Deployment of temporary or portable equipment that use satellite technology, including COWs, COLTs, SOWs, satellite phones, and video cameras, would not impact soil resources because those activities would not require ground disturbance.
- Deployment of Satellites: FirstNet does not anticipate launching satellites as part of the deployment of the NPSBN; however, it could include equipment on satellites that are already being launched for other purposes. As adding equipment to an existing launch vehicle would be very unlikely to impact soil resources, it is anticipated that this activity would have no impact on soil resources.

Activities with the Potential to Have Impacts

Implementation of the Preferred Alternatives could include potential deployment-related impacts to soil resources resulting from ground disturbance activities, including soil erosion, topsoil mixing, and soil compaction and rutting. The types of deployment activities that could be part of the Preferred Alternative and result in potential impacts to soil resources include the following:

- Wired Projects
  - New Build – Buried Fiber Optic Plant: New fiber optic cable installation usually requires trenching, plowing (including vibratory plowing), or directional boring, as well as construction of hand holes, pulling vaults, junction boxes, huts, and POP structures that require ground disturbance. Impacts from fiber optic plant installation and structure construction, as well as associated grading and restoration of the disturbed ground when construction is completed, could result in soil erosion, topsoil mixing, or soil compaction and rutting.
  - New Build – Aerial Fiber Optic Plant: Installation of new utility poles, and replacement/upgrading of existing poles and structures could potentially impact soil resources resulting from ground disturbance for pole/structure installation (soil erosion and topsoil mixing), and heavy equipment use from bucket trucks operating on existing gravel or dirt roads (soil compaction and rutting). Potential impacts to soils are anticipated to be small-scale and short-term.
  - Collocation on Existing Aerial Fiber Optic Plant: Topsoil removal, soil excavation, and excavated material placement during the replacement of poles and structural hardening could result in soil erosion and topsoil mixing. Heavy equipment use associated with these activities as well as with installing new fiber on existing poles could result in soil compaction and rutting.
  - New Build – Submarine Fiber Optic Plant: Installation of fiber optic plants in limited nearshore and inland bodies of water could potentially impact soil resources at and near the landings or facilities on shore to accept submarine cable. Soil erosion and topsoil mixing could potentially occur as result of grading, foundation excavation, or other ground disturbance activities. Perceptible soil compaction and rutting could potentially occur due to heavy equipment use during these activities depending on the duration of the construction activity.

- Installation of Optical Transmission or Centralized Transmission Equipment: Installation of optical transmission equipment or centralized transmission equipment, including associated new utility poles, hand holes, pulling vault, junction box, hut, and POP structure installation, would require ground disturbance that could potentially impact soil resources. Potential impacts to soils resulting from soil erosion, topsoil mixing, soil compaction, and rutting are anticipated to be small-scale and short-term.

- Wireless Projects
  - New Wireless Communication Towers: Installation of new wireless towers and associated structures, such as generators, equipment sheds, fencing, security and aviation lighting, electrical feeds, and concrete foundations and pads, or access roads could result in impacts to soil resources. Land/vegetation clearing, excavation activities, landscape grading, and other ground disturbance activities during the installation of new wireless towers and associated structures or access roads could result in soil erosion or topsoil mixing, and heavy equipment use during these activities could result in soil compaction and rutting.
  - Collocation on Existing Wireless Tower, Structure, or Building: Collocation would involve mounting or installing equipment (such as antennas or microwave dishes) on an existing tower, which would not result in impacts to soils. However, if additional power units, structural hardening, and physical security measures required ground disturbance, such as grading, or excavation activities, impacts to soil resources could occur, including soil erosion and topsoil mixing, as well as soil compaction and rutting associated with heavy equipment use.
  - Deployable Technologies: Implementation of deployable technologies could result in potential impacts to soil resources depending on the technology and location for deployment. Potential impacts may result if deployment of vehicles (i.e., SOWs, COWs, COLTs, or UAVs) occurs in unpaved areas, or if the implementation results in paving of previously unpaved surfaces Some staging or landing areas (depending on the type of technology) may require land/vegetation clearing, excavation, and paving. These activities could result in soil erosion and topsoil mixing. Heavy equipment use associated with these activities may result in soil compaction and rutting. In addition, implementation of deployable technologies themselves could result in soil compaction and rutting if deployed in unpaved areas. Where technologies such as COWs, COLTs, and SOWs are deployed on existing paved surfaces, there would be no impacts to soil resources because there would be no ground disturbance.

In general, the abovementioned activities could potentially involve land/vegetation clearing, topsoil removal, excavation, excavated material placement, trenching or directional boring, construction of access roads and other impervious surfaces, landscape grading, and heavy equipment movement. Potential impacts to soil resources associated with deployment of this infrastructure could include soil erosion, topsoil mixing, or soil compaction and rutting. These impacts are expected to be less than significant at the programmatic level, as the activity would likely be short-term, localized to the deployment locations, and would return to normal conditions as soon as revegetation occurs, often by the next growing season. It is expected that heavy equipment would utilize existing roadways and utility ROWs for deployment activities. Chapter 16, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

As described earlier, operation activities associated with the Preferred Alternative would consist of routine maintenance and inspection of the facilities. Any major infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the abovementioned construction impacts. It is anticipated that there would be no impacts to soil resources associated with routine inspections of the Preferred Alternative, assuming that the same access roads used for deployment are also used for inspections because there would be no ground disturbance. If usage of heavy equipment as part of routine maintenance or inspections occurs off established access roads or corridors, or if the acceptable load of the surface is exceeded, soil compaction and rutting impacts could result as explained above. The impacts are expected to be less than significant at the programmatic level, due to the temporary nature and small scale of operations activities with the potential to create impacts. Chapter 16, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

8.2.2.5 Alternatives Impact Assessment

The following section assesses potential impacts to soils associated with the Deployable Technologies Alternative and the No Action Alternative.

Deployable Technologies Alternative

Under the Deployable Technologies Alternative option, a nationwide fleet of mobile communications systems would provide temporary coverage in areas not covered by the existing, usable infrastructure. There would be no collocation of equipment and minimal new construction associated with wired or wireless projects discussed above under the Preferred Alternative. Some limited construction could be associated with implementation such as land clearing or paving for parking or staging areas. The specific infrastructure associated with the Deployable Technologies Alternative would be the same as the deployable technologies implemented as part of the Preferred Alternative but would likely be implemented in greater numbers, over a larger geographic extent, and used with greater frequency and duration. Therefore, potential impacts to soil resources as a result of implementation of this alternative could be as described below.

Deployment Impacts

As explained above, implementation of deployable technologies could result in less than significant impacts to soil resources at the programmatic level, regardless of whether the deployment occurs in unpaved areas, or if the implementation results in paving of previously unpaved surfaces. In addition, impacts to soils could occur on paved surfaces if the acceptable load of the surface is exceeded. Some staging or landing areas (depending on the type of technology) may require land/vegetation clearing, excavation, and paving. These activities could result in soil erosion and topsoil mixing. Heavy equipment use associated with these activities may result in soil compaction and rutting. In addition, implementation of deployable technologies themselves could also result in soil compaction and rutting if deployed in unpaved areas. However, these potential impacts are expected to be less than significant at the programmatic level, due to the small-scale and short-term nature of the deployment. Chapter 16, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

As explained above, operation activities would consist of implementation/running of the deployable technology and routine maintenance and inspections. As with the Preferred Alternative, it is anticipated that there would be no impacts to soil resources associated with routine inspections of deployable assets, assuming that the same access roads used for deployment are also used for inspections because there would be no ground disturbance. If usage of heavy equipment as part of routine maintenance or inspections occurs off established access roads or corridors, or if the acceptable load of the surface is exceeded, less than significant soil compaction and rutting impacts could result at the programmatic level, as previously explained above. Finally, if deployable technologies are parked and operated with air conditioning for extended periods, the condensation water from the air conditioner could result in minimal soil erosion. However, it is anticipated that the potential soil erosion would result in less than significant impacts at the programmatic level, as described above. Chapter 16, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

No Action Alternative

Under the No Action Alternative, the NPSBN would not be deployed. Therefore, there would be no associated construction or installation of wired, wireless, deployable infrastructure or satellites and other technologies. As a result, there would be no impacts to soil resources as a result of construction and operation of the Proposed Action. Environmental conditions would therefore be the same as those described in Section 8.1.2, Soils.

8.2.3 Geology

8.2.3.1 Introduction

This section describes potential impacts to Louisiana geology resources associated with deployment and operation of the Proposed Action and Alternatives. Chapter 16, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

8.2.3.2 Impact Assessment Methodology and Significance Criteria

The impacts of the Proposed Action on geology resources were evaluated using the significance criteria presented in Table 8.2.3-1. As described in Section 8.2, Environmental Consequences, the categories of impacts are defined as potentially significant, less than significant with mitigation incorporated, less than significant, or no impact. Characteristics of each impact type, including magnitude or intensity, geographic extent, and duration or frequency, were used to determine the impact significance rating associated with each potential impact.

Given the nature of this programmatic evaluation, and because the Proposed Action could potentially cover a wide variety of actions that would take place in various landscapes, the potential impacts to geology addressed in this section are presented as a range of possible impacts.

Table 8.2.3-1: Impact Significance Rating Criteria for Geology

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMP and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
Seismic Hazard	Magnitude or Intensity	High likelihood that a project activity could be located within a high-risk earthquake hazard zone or active fault.	Effect that is potentially significant, but with mitigation is less than significant.	Low likelihood that a project activity could be located within an earthquake hazard zone or active fault.	No likelihood of a project activity being located in an earthquake hazard zone or active fault.
	Geographic Extent	Hazard zones or active faults are highly prevalent within the state/territory.		Earthquake hazard zones or active faults occur within the state/territory, but may be avoidable.	Earthquake hazard zones or active faults do not occur within the state/territory.
	Duration or Frequency	NA		NA	NA
Landslide	Magnitude or Intensity	High likelihood that a project activity could be located within a landslide area.	Effect that is potentially significant, but with mitigation is less than significant.	Low likelihood that a project activity could be located within a landslide area.	No likelihood of a project activity located within a landslide hazard area.
	Geographic Extent	Landslide areas are highly prevalent within the state/territory.		Landslide areas occur within the state/territory, but may be avoidable.	Landslide hazard areas do not occur within the state/territory.
	Duration or Frequency	NA		NA	NA
Land Subsidence	Magnitude or Intensity	High likelihood that a project activity could be located within an area with a hazard for subsidence (e.g., karst terrain).	Effect that is potentially significant, but with mitigation is less than significant.	Low likelihood that a project activity could be located within an area with a hazard for subsidence.	Project activity located outside an area with a hazard for subsidence.
	Geographic Extent	Areas with a high hazard for subsidence (e.g., karst terrain) are highly prevalent within the state/territory.		Areas with a high hazard for subsidence occur within the state/territory, but may be avoidable.	Areas with a high hazard for subsidence do not occur within the state/territory.

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMP and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
	Duration or Frequency	NA		NA	NA
Potential Mineral and Fossil Fuel Resource impacts	Magnitude or Intensity	Severe, widespread, observable impacts to mineral and/or fossil fuel resources.	Effect that is potentially significant, but with mitigation is less than significant.	Limited impacts to mineral and/or fossil resources.	No perceptible change in mineral and/or fossil fuel resources.
	Geographic Extent	Regions of mineral or fossil fuel extraction areas are highly prevalent within the state/territory.		Mineral or fossil fuel extraction areas occur within the state/territory, but may be avoidable.	Mineral or fossil fuel extraction areas do not occur within the state/territory.
	Duration or Frequency	Long-term or permanent degradation or depletion of mineral and fossil fuel resources.		Temporary degradation or depletion of mineral and fossil fuel resources.	NA
Potential Paleontological Resources impacts	Magnitude or Intensity	Severe, widespread, observable impacts to paleontological resources.	Effect that is potentially significant, but with mitigation is less than significant.	Limited impacts to paleontological and/or fossil resources.	No perceptible change in paleontological resources.
	Geographic Extent	Areas with known paleontological resources are highly prevalent within the state/territory.		Areas with known paleontological resources occur within the state/territory, but may be avoidable.	Areas with known paleontological resources do not occur within the state/territory.
	Duration or Frequency	NA		NA	NA

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMP and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
Surface Geology, Bedrock, Topography, Physiography, and Geomorphology	Magnitude or Intensity	Substantial and measurable degradation or alteration of surface geology, bedrock, topography, physiographic characteristics, or geomorphological processes.	Effect that is potentially significant, but with mitigation is less than significant.	Minor degradation or alteration of surface geology, bedrock, topography that do not result in measurable changes in physiographic characteristics or geomorphological processes.	No degradation or alteration of surface geology, bedrock, topography, physiographic characteristics, or geomorphologic processes.
	Geographic Extent	State/territory.		State/territory.	NA
	Duration or Frequency	Permanent or long-term changes to characteristics and processes.		Temporary degradation or alteration of resources that is limited to the construction and deployment phase.	NA

NA = Not Applicable

8.2.3.3 Description of Environmental Concerns

Environmental concerns regarding geology can be viewed as two distinct types, those that would potentially provide impacts to the project, such as seismic hazards, landslides, and volcanic activity, and those that would be impacts from the project, such as land subsidence and effects on mineral and fossil fuel resources, paleontological resources, surface geology, bedrock, topography, physiography, and geomorphology. These concerns and their impacts on geology are discussed below.

Seismic Hazard

As discussed in Section 8.1.3.8, Louisiana is not at risk to significant earthquake events. As shown in Figure 8.1.3-5, while a series of normal faults[119] exists in southern Louisiana, these are associated with "gradual creep as opposed to the sudden breaking of rock associated with earthquakes. No detected earthquakes have definitely been attributed to any of the specific mapped fault systems" (Louisiana Geological Survey, 2001). Based on the impact significance criteria presented in Table 8.2.3-1 seismic impacts from deployment or operation of the Proposed Action would have no impact on seismic activity. BMPs and mitigation measures could help avoid or minimize the potential impacts if an earthquake were to occur in Louisiana. Chapter 16, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Volcanic Activity

Volcanoes were considered but not analyzed for Louisiana, as they do not occur in Louisiana; therefore, volcanoes do not present a hazard to the state.

Landslides

Similar to seismic hazards, another concern would be placement of equipment in areas that are highly susceptible to landslides. Equipment that is exposed to landslides is subject to misalignment, alteration, or, in extreme cases, destruction; all of these activities could result in connectivity loss.

As discussed in Section 8.1.3, the majority of Louisiana is at low to moderate risk of experiencing landslide events. Based on the impact significance criteria presented in Table 8.2.3-1, at the programmatic level, potential impacts to landslides from deployment or operation of the Proposed Action would have less than significant impacts as it is likely that the project would attempt to avoid areas that are prone to landslides; however, landslide impacts to the Proposed Action could be potentially significant if FirstNet's deployment locations were within areas in which landslides are highly prevalent. Within Louisiana, landslides are common along the Mississippi River north of Baton Rouge. This area "is more susceptible to failure than the lower delta area because fine-grained deposits in the upper valley are underlain by coarse, easily

[119] Normal Fault: "A fault that drops rock on one side of the fault down relative to the other side." (USGS, 2015i)

eroded sand at depths to which the river can scour; this scour causes slumps and earth flows on exposed banks and in deposits below the river level" (Radbruch-Hall, et al., 1982). Figure 8.1.3-6 displays landslide susceptibility throughout Louisiana.

To the extent practicable, FirstNet would avoid deployment in areas that are susceptible to landslide events. In the case of landslides, BMPs and mitigation measures could help avoid or minimize the potential impacts. Chapter 16, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Land Subsidence

Equipment that is exposed to land subsidence, such as sinkholes created by karst topography or mine collapse, is subject to misalignment, alteration, or, in extreme cases, destruction. Significant long-term land subsidence, due to factors such as aquifer compaction, in coastal areas could lead to relative sea level rise[120] and inundation of equipment. All of these activities could result in connectivity loss.

As discussed in Section 8.1.3.8, in Louisiana, land subsidence is a problem within the Mississippi River delta, which includes the city of New Orleans and areas further to the south within the state. It is possible that New Orleans could be up to 4.0 meters (or more) below sea level by the end of this century (Burkett, Zilkowski, & Hart, 2001). Based on the impact significance criteria presented in Table 8.2.3-1, potential impacts to soil subsidence from deployment or operation of the Proposed Action would have less than significant impacts at the programmatic level; however, subsidence impacts to the Proposed Action could be potentially significant if FirstNet's deployment locations were within areas at high risk to inundation due to long-term land subsidence. Equipment that is exposed to land subsidence, such as sinkholes created by karst topography is subject to misalignment, alteration, or, in extreme cases, destruction. Significant long-term land subsidence, due to factors such as aquifer compaction, in coastal areas could lead to relative sea level rise and inundation of equipment. All of these activities could result in connectivity loss. To the extent practicable, FirstNet would avoid deployment in known areas of karst topography or in areas that are subject to sea level rise. However, where infrastructure is subject to subsidence hazards, BMPs and mitigation measures could help avoid or minimize the potential impacts. Chapter 16, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Potential Mineral and Fossil Fuel Resource Impacts

Equipment deployment near mineral and fossil fuel resources is not likely to affect these resources. Rather the new construction is only likely to limit access to extraction of these resources. Based on the impact significance criteria presented in Table 8.2.2-1, impacts to mineral and fossil fuel resources are unlikely as the Proposed Action could only be potentially

[120] Relative Sea Level Rise: "[Sea level rise that] includes the combined movement of both water and land. Even if sea level was constant, there could be changes in relative sea level. For example, a rising land surface would produce a relative fall in sea level, whereas a sinking land surface would produce a relative rise in sea level" (U.S. Geological Survey, 2015).

significant if the FirstNet's deployment locations were to cause severe, widespread, observable impacts to mineral and/or fossil fuel resources. To the extent practicable, FirstNet would avoid construction in areas where these resources exist. Chapter 16, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Potential Paleontological Resource Impacts

Equipment installation and construction activities that require ground disturbance could damage existing paleontological resources, which are both fragile and irreplaceable. As discussed in Section 8.1.3.7, fossils are abundant throughout parts of Louisiana. Based on the impact significance criteria presented in Table 8.2.3-1, impacts to paleontological resources could be potentially significant if FirstNet's buildout/deployment locations uncovered paleontological resources during construction activities. It is anticipated that potential impacts to specific areas known to contain paleontological resources would be avoided, minimized, or mitigated, and any potential impacts would be limited and localized. Potential impacts to paleontological resources should be considered on a site-by-site basis, and BMPs and mitigation measures could further help avoid or minimize the potential impacts. Chapter 16, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Surface Geology, Bedrock, Topography, Physiography, and Geomorphology

Equipment installation and construction activities that degrade or alter surface geology, bedrock, or topography could cause measurable changes in physiographic characteristics of an area's geology, topography, physiography, or geomorphology. Based on the impact significance criteria presented in Table 8.2.3-1, impacts could be potentially significant if FirstNet's deployment were to cause substantial and measurable degradation or alteration of surface geology, bedrock, topography, physiographic characteristics, or geomorphological processes. Construction activities related to the Proposed Action and Alternatives are likely to be minor and less than significant at the programmatic level, as the proposed activities are not likely to require removal of significant volumes of terrain and any rock ripping would likely occur in discrete locations and would be unlikely to result in large-scale changes to the geologic, topographic, or physiographic characteristics. When ground disturbance is required, BMPs and mitigation measures could be implemented to help avoid or minimize the potential impacts. Chapter 16, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

8.2.3.4 Potential Impacts of the Preferred Alternative

The following section assesses potential impacts associated with implementation of the Preferred Alternative, including deployment and operation activities.

Deployment Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, implementation of the Preferred Alternative could result in the deployment of various types of facilities or infrastructure. Depending on the physical nature and location of the facility/infrastructure and the specific deployment requirements, some activities have the potential to be impacted by geologic hazards, some activities could result in potential impacts to geology, and other activities would have no impacts. In addition, and as explained in this section, at the programmatic level, the same type of Proposed Action Infrastructure could result in a range of no impacts to less than significant impacts depending on the deployment scenario or site-specific conditions.

Activities Likely to Have No Impacts

Of the types of facilities or infrastructure deployment scenarios described in Section 2.1.2, Proposed Action Infrastructure, the following are likely to have no impacts to geology under the conditions described below:

- Wired Projects
  - Use of Existing Conduit – New Buried Fiber Optic Plant: Disturbance associated with the installation of fiber optic cable in existing conduit would be limited to entry and exit points of the existing conduit in previously disturbed areas. In most cases, there would be no impacts to geologic resources since the activities that would be conducted at these small entry and exit points are not likely to produce perceptible changes.
  - Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting up of dark fiber would have no impacts to geologic resources because there would be no ground disturbance.
- Satellites and Other Technologies
  - Deployment of Satellites: FirstNet does not anticipate launching satellites as part of the deployment of the NPSBN; however, it may include equipment on satellites that are already being launched for other purposes. As adding equipment to an existing launch vehicle would be very unlikely to impact geologic resources, it is anticipated that this activity would have no impact on geologic resources.

Activities with the Potential to Have Impacts

Potential deployment-related impacts to geologic resources, or resulting from geologic hazards due to implementation of the Preferred Alternative, would encompass a range of impacts that could occur as a result of ground disturbance activities, including loss of mineral and fuel resources and paleontological resources. The types of infrastructure development scenarios or deployment activities that could be part of the Preferred Alternative and result in potential impacts to geologic resources, or impacts from geologic hazards, include the following:

- Wired Projects
  - New Build – Buried Fiber Optic Plant: Plowing (including vibratory plowing), trenching, or directional boring and the construction of points of presence POPs, huts, or other

associated facilities or hand-holes to access fiber could result in potential impacts to geologic resources due to associated ground disturbance, such as impacts to fuel and mineral resources or paleontological resources. Where equipment is installed in locations that are susceptible to landslides, earthquakes, and other geologic hazards, it is possible that equipment could be affected by that hazard.

- New Build – Aerial Fiber Optic Plant: Installation of new utility poles, and associated use of heavy equipment during construction, could result in potential impacts to geologic resources due to associated ground disturbance. Where equipment is installed in locations that are susceptible to landslides, earthquakes, and other geologic hazards, it is possible that equipment could be affected by that hazard.
- Collocation on Existing Aerial Fiber Optic Plant: Replacement of utility poles and structural hardening, and associated use of heavy equipment during construction, could result in potential impacts to geologic resources due to associated ground disturbance. Where equipment is installed in locations that are susceptible to landslides, earthquakes, and other geologic hazards, it is possible that equipment could be affected by that hazard.
- New Build – Submarine Fiber Optic Plant: The installation of cables in limited nearshore or inland bodies of water is not expected to impact geologic resources. However, where landings and/or facilities for submarine cable are installed at locations that are susceptible to landslides, earthquakes, and other geologic hazards, it is possible that equipment could be affected by that hazard.
- Installation of Optical Transmission or Centralized Transmission Equipment: If installation of transmission equipment would occur in existing boxes or huts and require ground disturbance in locations that are susceptible to geologic hazards (e.g., land subsidence, landslides, or earthquakes), it is possible that they could be affected by that hazard.

- Wireless Projects
  - New Wireless Communication Towers: Installation of new wireless towers and associated structures (generators, equipment sheds, fencing, security and aviation lighting, electrical feeds, and concrete foundations and pads) or access roads could result in impacts to geologic resources. Land/vegetation clearing, excavation activities, landscape grading, and other ground disturbance activities during the installation of new wireless towers and associated structures or access roads could result in erosion or disturbance of geologic resources. Where equipment is installed in locations that are susceptible to landslides, earthquakes, and other geologic hazards, it is possible that equipment could be affected by that hazard.
  - Collocation on Existing Wireless Tower, Structure, or Building: Collocation would involve mounting or installing equipment (such as antennas or microwave dishes) on an existing tower, which would not result in ground disturbance. However, if additional power units, structural hardening, and physical security measures required ground disturbance, such as grading, or excavation activities, impacts to geologic resources could

occur due to ground disturbance. Where equipment is installed in locations that are susceptible to landslides, earthquakes, and other geologic hazards, it is possible that equipment could be affected by that hazard.

- Deployable Technologies: Implementation of deployable technologies could result in potential impacts to geologic resources depending on the technology and location proposed for deployment. Potential impacts may result if deployment of vehicles (i.e., SOWs, COWs, COLTs, or UAVs) occurs in unpaved areas, or if the implementation results in paving of previously unpaved surfaces. Some staging or landing areas (depending on the type of technology) may require land/vegetation clearing, excavation, and paving. Where deployable technologies would be implemented on existing paved surfaces, there would be no impacts to/from geologic resources because there would be no ground disturbance and mobile technologies could be moved to avoid geologic hazards.

- Satellites and Other Technologies
  - Satellite-Enabled Devices and Equipment: In most cases, the installation of permanent equipment on existing structures, adding equipment to satellites launched for other purposes, or the use of portable devices that use satellite technology would not impact geologic resources because those activities would not require ground disturbance. Where equipment is permanently installed in locations that are susceptible to landslides, earthquakes, and other geologic hazards, it is possible that they could be affected by that hazard. The use of portable satellite-enabled devices would not impact geologic resources nor would it be affected by geologic hazards because there would be no ground disturbance nor any impact to the built or natural environment.

In general, the abovementioned activities could potentially involve ground disturbance resulting from land/vegetation clearing, topsoil removal, excavation, excavated material placement, trenching or directional boring, construction of access roads and other impervious surfaces, landscape grading, and heavy equipment movement. Potential impacts to geological resources associated with deployment could result in incidental removal of bedrock or mineral, or adverse impacts to installed equipment resulting from geologic hazards (e.g., seismic hazards, landslides, and land subsidence). Specific FirstNet projects are likely to be small-scale; correspondingly, disturbance to geologic resources for those types of projects with the potential to impact geologic resources is also expected to be small-scale, as a result, these potential impacts are expected to be less than significant at the programmatic level. For the same reason, impacts to deployment from geologic hazards are likely to be less than significant at the programmatic level as well. Chapter 16, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, operation activities associated with the Preferred Alternative would consist of routine maintenance and inspection of the facilities. Any major infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the abovementioned deployment impacts. It is anticipated that there would be no impacts to geology associated with routine inspections of the Preferred Alternative, assuming that the same access roads used for deployment are also used for inspections because there would be no ground disturbance.

The operation of the Preferred Alternative could be affected by to geologic hazards including seismic activity, volcanic activity, landslides, and land subsidence. However, potential impacts would be anticipated to be less than significant at the programmatic level, as it is anticipated that deployment locations would avoid, as practicable and feasible, locations that are more likely to be affected by potential seismic activity, landslides, or land subsidence. Chapter 16, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

8.2.3.5 Alternatives Impact Assessment

The following section assesses potential impacts to geology associated with the Deployable Technologies Alternative and the No Action Alternative.

Deployable Technologies Alternative

Under the Deployable Technologies Alternative option, a nationwide fleet of mobile communications systems would provide temporary coverage in areas not covered by the existing, usable infrastructure. There would be no collocation of equipment and minimal new construction associated with wired or wireless projects discussed above under the Preferred Alternative. Some limited construction could be associated with implementation such as land clearing or paving for parking or staging areas. The specific infrastructure associated with the Deployable Technologies Alternative would be the same as the deployable technologies implemented as part of the Preferred Alternative but would likely be implemented in greater numbers, over a larger geographic extent, and used with greater frequency and duration. Therefore, potential impacts to geology as a result of implementation of this Alternative could be as described below.

8.2.3.6 Deployment Impacts

Implementation of deployable technologies on existing paved surfaces would not result in impacts to geologic resources (or from geologic hazards) as there would be no ground disturbance and mobile technologies could be moved to avoid geologic hazards. Potential impacts may result if deployment of vehicles (i.e., SOWs, COWs, COLTs, or UAVs) occurs in unpaved areas, or if the implementation results in paving of previously unpaved surfaces. Some staging or landing areas (depending on the type of technology) may require land/vegetation clearing, excavation, and paving. These impacts are expected to be less than significant at the programmatic level, due to the minor amount of paving or new infrastructure needed to accommodate the deployables. Chapter 16, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

As explained above, operation activities would consist of implementation/running of the deployable technology and routine maintenance and inspections. As with the Preferred Alternative, it is anticipated that there would be no impacts to geologic resources (or from geologic hazards) associated with routine inspections of the Preferred Alternative because there would be no ground disturbance.

The operation of the Deployable Technologies Alternative could be affected by to geologic hazards including seismic activity, volcanic activity, landslides, and land subsidence. However, potential impacts would be anticipated to be less than significant at the programmatic level, as the deployment would be temporary and likely would attempt to avoid locations that were subject to increased seismic activities, landslides, and land subsidence. Chapter 16, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

No Action Alternative

Under the No Action Alternative, the NPSBN would not be deployed; therefore, there would be no associated construction or installation of wired, wireless, deployable infrastructure, or satellites and other technologies. As a result, there would be no impacts to geologic resources (or from geologic hazards) as a result of construction and operation of the Proposed Action. Environmental conditions would therefore be the same as those described in Section 8.1.3, Geology.

8.2.4 Water Resources

8.2.4.1 Introduction

This section describes potential impacts to water resources in Louisiana associated with deployment and operation of the Proposed Action and alternatives. Chapter 16, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

8.2.4.2 Impact Assessment Methodology and Significance Criteria

The impacts of the Proposed Action on water resources were evaluated using the significance criteria presented in Table 8.2.4-1. As described in Section 8.2, Environmental Consequences, the categories of impacts are defined as potentially significant, less than significant with mitigation incorporated, less than significant, or no impact. Characteristics of each impact type, including magnitude or intensity, geographic extent, and duration or frequency, were used to determine the impact significance rating associated with each potential impact.

Given the nature of this programmatic evaluation, and because the Proposed Action could potentially cover a wide variety of actions that would take place in various landscapes, the potential impacts to water resources addressed in this section are presented as a range of possible impacts.

Table 8.2.4-1: Impact Significance Rating Criteria for Water Resources

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
Water Quality (groundwater and surface water) – sedimentation, pollutants, nutrients, water temperature	Magnitude or Intensity	Groundwater contamination creating a drinking quality violation, or otherwise substantially degrade groundwater quality or aquifer; local construction sediment water quality violation, or otherwise substantially degrade water quality; water degradation poses a threat to the human environment, biodiversity, or ecological integrity. Violation of various regulations including: CWA, Safe Drinking Water Act (SDWA).	Effect that is potentially significant, but with mitigation is less than significant.	Potential impacts to water quality, but potential effects to water quality would be below regulatory limits and would naturally balance back to baseline conditions.	No changes to water quality; no change in sedimentation or water temperature, or the presence of water pollutants or nutrients.
	Geographic Extent/Context	Watershed level, and/or within multiple watersheds.		Watershed or subwatershed level.	NA
	Duration or Frequency	Chronic and long-term changes not likely to be reversed over several years or seasons.		Impact is temporary, lasting no more than six months.	NA

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
Floodplain degradation[a]	Magnitude or Intensity	The use of floodplain fill, substantial increases in impervious surfaces, or placement of structures within a 500-year flood area that will impede or redirect flood flows or impact floodplain hydrology. High likelihood of encountering a 500-year floodplain within a state or territory.	Effect that is potentially significant, but with mitigation is less than significant.	Activities occur inside the 500-year floodplain, but do not use fill, do not substantially increase impervious surfaces, or place structures that will impede or redirect flood flows or impact floodplain hydrology, and do not occur during flood events. Low likelihood of encountering a 500-year floodplain within a state or territory.	Activities occur outside of floodplains and therefore do not increase fill or impervious surfaces, nor do they impact flood flows or hydrology within a floodplain.
	Geographic Extent	Watershed level, and/or within multiple watersheds.		Watershed or subwatershed level.	NA
	Duration or Frequency	Chronic and long-term changes not likely to be reversed over several years or seasons.		Impact is temporary, lasting no more than one season or water year,[b] or occurring only during an emergency.	NA
Drainage pattern alteration	Magnitude or Intensity	Alteration of the course of a stream of a river, including stream geomorphological conditions, or a substantial and measurable increase in the rate or amount of surface water or changes to the hydrologic regime.	Effect that is potentially significant, but with mitigation is less than significant.	Any alterations to the drainage pattern are minor and mimic natural processes or variations.	Activities do not impact drainage patterns.
	Geographic Extent	Watershed level, and/or within multiple watersheds.		Watershed or subwatershed level.	NA
	Duration or Frequency	Impact occurs in perennial streams, and is ongoing and permanent.		Impact is temporary, lasting no more than six months.	NA

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
Flow alteration	Magnitude or Intensity	Consumptive use of surface water flows or diversion of surface water flows such that there is a measurable reduction in discharge.	Effect that is potentially significant, but with mitigation is less than significant.	Minor or no consumptive use with negligible impact on discharge.	Activities do not impact discharge or stage of waterbody (stream height).
	Geographic Extent	Watershed level, and/or within multiple watersheds.		Watershed or subwatershed level.	NA
	Duration or Frequency	Impact occurs in perennial streams, and is ongoing and permanent.		Impact is temporary, not lasting more than six months.	NA
Changes in groundwater or aquifer characteristics	Magnitude or Intensity	Substantial and measurable changes in groundwater or aquifer characteristics, including volume, timing, duration, and frequency of groundwater flow, and other changes to the groundwater hydrologic regime.	Effect that is potentially significant, but with mitigation is less than significant.	Any potential impacts to groundwater or aquifers are temporary, lasting no more than a few days, with no residual impacts.	Activities do not impact groundwater or aquifers.
	Geographic Extent	Watershed level, and/or within multiple watersheds.		Watershed or subwatershed level.	NA
	Duration or Frequency	Impact is ongoing and permanent.		Impact is temporary, not lasting more than six months.	NA

[a] Since public safety infrastructure is considered a critical facility, project activities should avoid the 500-year floodplain wherever practicable, per the Executive Orders on Floodplain Management (EO 11988 and EO 13690). (See http://www.archives.gov/federal-register/codification/executive-order/11988.html and https://www.federalregister.gov/articles/2015/02/04/2015-02379/establishing-a-federal-flood-risk-management-standard-and-a-process-for-further-soliciting-and).
[b] A water year is defined as “the 12-month period October 1, for any given year through September 30, of the following year. The water year is designated by the calendar year in which it ends and which includes 9 of the 12 months” (USGS, 2016a).
NA = Not Applicable

8.2.4.3 Description of Environmental Concerns

Potential Water Quality Impacts

Water quality impaired waterbodies are those waters that have been identified as not supporting their appropriate uses. Projects in watersheds of impaired waters may be subject to heightened permitting requirements. For example, the CWA requires states to assess and report on the quality of waters in their state. Section 303(d) of the CWA requires states to identify impaired waters. For these impaired waters, states must consider the development of a Total Maximum Daily Load (TMDL) or other strategy to reduce the input of the specific pollutant(s) restricting waterbody uses, in order to restore and protect such uses.

As shown in Table 8.1.4-2, various sources affect Louisiana's waterbodies, causing impairments. For example, the presence of mercury or organic chemicals have resulted in fish consumption advisories in waterbodies throughout the state. Almost all of the assessed lakes, reservoirs, and ponds are impaired due to pollutants, such as mercury, nuisance exotic species, and sediments. Designated uses of the impaired waters include agriculture, drinking water supply, fish and aquatic life, and recreation. (USEPA, 2012b) Generally, the water quality of Louisiana's aquifers is suitable for drinking and daily water needs (DEQ, 2015f).

Deployment activities could contribute pollutants in a number of ways but the primary likely manner is increased sediment in surface waters. Vegetation removal on site exposes soils to rain and wind that could increase erosion. Impacts to water quality may occur from post construction vegetation management, such as herbicides, that may leach into groundwater or move to surface waters through soil erosion or runoff, spray drift, or inadvertent direct overspray. Fuel, oil, and other lubricants from equipment could contaminate groundwater and surface waters if carried in runoff. Other water quality impacts could include changes in temperature, pH or dissolved oxygen levels, water odor, color, or taste, or addition of suspended solids.

Soil erosion or the introduction of suspended solids into waterways from implementation of the Preferred Alternative could contribute to degradation of water quality. If the Proposed Action and Alternatives would disturb more than 1 acre of soil, an LPDES or USEPA NPDES Construction General Permit (CGP) would be required. As part of the permit application for the CGP, a Storm Water Pollution Prevention Plan (SWPPP) would need to be prepared containing BMPs that would be implemented to prevent, or minimize the potential for, sedimentation and erosion. Adherence to the CGP and the BMPs would help prevent sediment and suspended solids from entering the waterways and ensure that effects on water quality during construction would not be adverse.

Deployment activities associated with the Proposed Action have the potential to increase erosion and sedimentation around construction and staging areas. Grading activities associated with construction would potentially result in a temporary increase in the amount of suspended solids running off construction sites. If a storm event were to occur, construction site runoff could result in sheet erosion of exposed soil. If not adequately controlled, water runoff from these areas would have the potential to degrade surface water quality. Implementing BMPs could reduce potential impacts to surface water quality.

Expected deployment activities would not violate applicable state, federal (e.g., CWA, SDWA), and local regulations, cause a threat to the human environment, biodiversity, or ecological integrity through water degradation, or cause a sediment water quality violation from local construction, or otherwise substantially degrade water quality. Therefore, based on the impact significance criteria presented in Table 8.2.4-1, at the programmatic level, water quality impacts would likely be less than significant and could be further reduced if BMPs and mitigation measures were to be incorporated where practicable and feasible.

During implementation of the Proposed Action and Alternatives, there is the potential to encounter shallow groundwater due to clearing and grading activities, shallow excavation, or relocation of utility lines. This is unlikely, as trenching is not expected to exceed a 48-inch depth. However, groundwater contamination may exist in areas directly within or near the project area. If trenching[121] or tower construction were to occur near or below the existing water table (depth to water), then dewatering would be anticipated at the location. Residual contaminated groundwater could be encountered during dewatering activities. Construction activities would need to comply with Louisiana dewatering requirements. Any groundwater extracted during dewatering activities, or subject to the terms of a dewatering permit, may be required to be treated prior to discharge or disposed of at a wastewater treatment facility.

Louisiana’s principal aquifers consist of sands, silts, and clays with some gravel (DEQ, 2015f). Due to average thickness of most Louisiana aquifers, there is potential for groundwater contamination within a watershed or multiple watersheds, especially along the coast. Thus, it is unlikely that the majority of FirstNet’s deployable locations would result in a drinking quality violation or otherwise substantially degrade groundwater quality or aquifer, and based on the impact significance criteria presented in Table 8.2.4-1, at the programmatic level, there would likely be less than significant impacts on groundwater quality within most of the state. In areas where groundwater is close to the surface, such as along the coast, site-specific analysis, BMPs, and mitigation measures could be implemented to reduce further potential impacts.

Floodplain Degradation

Floodplains are low-lying lands next to rivers and streams. When left in a natural state, floodplain systems store and dissipate floods without adverse impacts on human beings, buildings, roads and other infrastructure. The 500-year floodplain is the area of minimal flood hazard, where there is a 0.2-percent-annual-chance flood. Some projects may be outside of a floodplain, but still be in an area with known flooding history. Louisiana is highly susceptible to flood events due to the state’s geographic location along the Gulf Coast and with areas below sea level.

[121] Telecommunications activities involve laying conduit, with minimal trenching. Trenching activities would likely be at a minimal depth (less than 36 inches) and width (6 to 12 inches).

Based on the impact significance criteria presented in Table 8.2.4-1, floodplain degradation impacts would be potentially less than significant at the programmatic level since the majority of FirstNet's likely deployment activities, on the watershed or subwatershed level, would use minimal fill, would not substantially increase impervious surfaces, structures would not impede or redirect flood flows or impact floodplain hydrology, and would not occur during flood events with the exception of deployable technologies which may be deployed in response to an emergency. Additionally, any effects would be temporary, lasting no more than one season or water year, [122] or occur only during an emergency.

Examples of activities that would have less than significant impacts at the programmatic level include:

- Construction of any structure in the 500-year floodplain but is built above base flood elevation pursuant to floodplain management regulations;
- Land uses that include pervious surfaces such as gravel parking lots;
- Land uses that do not change the flow of water or drainage patterns; and
- Limited clearing or grading activities.

Implementation of BMPs and mitigation measures could reduce the risk of additional impacts to floodplain degradation (see Chapter 16).

Drainage Pattern Alteration

Flooding and erosion from land disturbance could changes drainage patterns. Stormwater runoff causes erosion while construction activities and land clearing could change drainage patterns. Clearing or grading activities or the creation of walls or berms could alter water flow in an area or cause changes to drainage patterns. Drainage could be directed to stormwater drains, storage, and retention areas designed to slow water and allow sediments to settle out. Improperly handled drainage could cause increased erosion, changes in stormwater runoff, flooding, and damage to water quality. Existing drainage patterns could be modified by channeling (straightening or restructuring natural watercourses); creation of impoundments (detention basins, retention basins, and dams); stormwater increases; or altered flow patterns.

According to the significance criteria in Table 8.2.4-1, any temporary (lasting less than six months) alterations to drainage patterns that are minor and mimic natural processes or variations within the watershed or subwatershed level would be considered less than significant at the programmatic level.

Example of projects that could have minor changes to the drainage patterns include:

- Land uses with pervious surfaces that create limited stormwater runoff;
- Where stormwater is contained on site and does not flow to or impact surface waterbodies offsite on other properties;

- Activities designed so that the amount of stormwater generated before construction is the same as afterwards; and
- Activities designed using low impact development (LID) techniques for stormwater.

Since the proposed activities would not substantially alter drainage patterns in ways that alter the course of a stream or river, create a substantial and measurable increase in the rate and amount of surface water, or change the hydrologic regime, and any effects would be short-term, impacts to drainage patterns would be less than significant at the programmatic level. BMPs and mitigation measures could be implemented to reduce further any potentially significant impacts.

Flow Alteration

Flow alteration refers to the modification of flow characteristics, relative to natural conditions. Human activities may change the amount of water reaching a stream, divert flow through artificial channels, or alter the shape and location of streams. Surface water and groundwater withdrawals could alter flow by reducing water volumes in streams. Withdrawals may return to the surface/groundwater system at a point further downstream, be removed from the watershed through transpiration by crops, lawns or pastures, or be transferred to another watershed altogether (e.g., water transferred to a different watershed for drinking supply). Altered flow could increase flooding and introduce more erosion and potential for pollution. Alternatively, if water is diverted from its normal flow, the opposite may occur; wetlands and streams may not receive as much water as necessary to maintain the ecology and previous functions.

Activities that do not impact discharge or stage of waterbody (stream height) are not anticipated to have an impact on flow, according to Table 8.2.4-1. Projects that include minor consumptive use of surface water with less than significant impacts on discharge (do not direct large volumes of water into different locations) on temporary (no more than six months) are likely to have less than significant impacts on flow alteration, on a watershed or subwatershed level, at the programmatic level. Examples of projects likely to have less than significant impacts at the programmatic level include:

- Construction of any structure in a 100-year or 500-year floodplain that is built above base flood elevation pursuant to floodplain management regulations;
- Land uses that are maintaining or increasing pervious surfaces;
- Land uses that do not change the flow of water or drainage patterns offsite or into surface waterbodies that have not received that volume of stormwater previously; and
- Minor clearing or grading activities.

Since the proposed activities would not likely alter flow characteristics or change the hydrologic regime, impacts would be less than significant impacts at the programmatic level to flow alteration. BMPs, mitigation measures, and avoidance could be implemented to reduce any further impacts.

Changes in Groundwater or Aquifer Characteristics

As described in Section 8.1.4.7, approximately two-thirds of residents draw drinking water from Louisiana's groundwater resources. Groundwater is an important natural resource used by industrial, commercial, agricultural, and residential uses for manufacturing, irrigation, and drinking water purposes. Generally, the water quality of Louisiana's aquifers is suitable for drinking and daily water needs. (DEQ, 2015f) Once a groundwater supply is exhausted or contaminated, it is very expensive, and sometimes impossible, to replace. Water supply demand from the deployment activities is unlikely to exceed safe and sustainable withdrawal capacity rate of the local supply or aquifer.

Storage of generator fuel over groundwater or an aquifer would be unlikely to cause significant impacts to water quality due to the expected small volume of these materials. Activities that may cause changes is groundwater or aquifer characteristics include:

- Excavation, mining, or dredging during or after construction;
- Any liquid waste, including but not limited to wastewater, generation; and
- Storage of petroleum or chemical products.

Private and public water supplies often use groundwater as a water source. To maintain a sustainable system, the amount of water withdrawn from these groundwater sources must be balanced with the amount of water returned to the groundwater source (groundwater recharge).

Deployment activities should be less than significant at the programmatic level since they would not substantially deplete supplies of potable groundwater, as any construction dewatering would be short-term. It is likely that areas that utilize groundwater for potable water purposes would be avoided. According to Table 8.2.4-1, potentially significant impacts to groundwater or aquifer characteristics would only occur if actions resulted in substantial and measurable changes in groundwater or aquifer characteristics, including volume, timing, duration, and frequency of groundwater flow, and other changes to the groundwater hydrologic regime on a watershed or within multiple watersheds that is ongoing and permanent. Chapter 16, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

8.2.4.4 Potential Impacts of the Preferred Alternative

The following section assesses potential impacts associated with implementation of the Preferred Alternative, including deployment and operation activities.

Deployment Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, implementation of the Preferred Alternative could result in the deployment of various types of facilities or infrastructure. Depending on the physical nature and location of the facility/infrastructure and the specific deployment requirements, some activities would result in potential impacts to water resources and others would not. In addition, and as explained in this section, the same type of Proposed Action Infrastructure could result in a range of no impacts to potentially significant impacts depending on the deployment scenario or site-specific conditions. The impact on the water resources that could be affected would depend on the watershed, duration (chronic or short-term) and frequency (many years or a few months) the resource would be used, and the water resource's current use (sole source for drinking water, considered exceptional value for recreation, or provides critical habitat for a species).

Activities Likely to Have No Impacts

Of the types of facilities or infrastructure deployment scenarios described in Section 2.1.2, Proposed Action Infrastructure, the following are likely to have no impacts to water resources under the conditions described below:

- Wired Projects
  - Use of Existing Conduit – New Buried Fiber Optic Plant: Disturbance associated with the installation of fiber optic cable in existing conduit would be limited to entry and exit points of the existing conduit in previously disturbed areas. It is anticipated that there would be no impacts to water resources since the activities that would be conducted at these small entry and exit points are not likely to produce perceptible changes.
  - Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting up of dark fiber would have no impacts to water resources because there would be no ground disturbance.
- Satellites and Other Technologies
  - Satellite-Enabled Devices and Equipment: It is anticipated that the installation of permanent equipment on existing structures and the use of portable devices that use satellite technology would not impact water resources because those activities would not require ground disturbance.
  - Deployment of Satellites: FirstNet does not anticipate launching satellites as part of the deployment of the NPSBN; however, it could include equipment on satellites that are already being launched for other purposes. As adding equipment to an existing launch vehicle would be very unlikely to impact water resources, it is anticipated that this activity would have no impact on water resources.

Activities with the Potential to Have Impacts

Potential deployment-related impacts to water resources because of implementation of the Preferred Alternative would encompass a range of impacts that could occur, including impaired water quality. The types of deployment activities that could be part of the Preferred Alternative and result in potential impacts to water resources include the following:

- Wired Projects
  - New Build – Buried Fiber Optic Plant: Plowing (including vibratory plowing), trenching, or directional boring and the construction of POPs, huts, or other associated facilities or hand-holes to access fiber could result in potential impacts to water resources. Land/vegetation clearing and excavation activities, associated with construction of POPs,

huts, or other associated facilities could result in direct and indirect impacts to water quality from a temporary increase in the amount of suspended solids running off construction sites. The amount of impact depends on the land area affected, installation technique, and location. Trenching would not be expected to occur near or below the existing water table (depth to water). Implementing BMPs and mitigation measures could reduce impact intensity.

- New Build – Submarine Fiber Optic Plant: The installation of cables in or near bodies of water would impact water resources from a short-term increase in suspended solids in the water. Site-specific impact assessment could be required to marine and shoreline environments prior to installation to assess fully the potential impacts to lake or river coastal and marine environments.
- New Build – Aerial Fiber Optic Plant: Potential impacts would be similar to Buried Fiber Optic Plant. Ground disturbance activities could cause impacts to water quality from increased suspended solids groundwater impacts from trenching activities are not expected. If a new roadway were built, additional impervious surface would not be expected to impact water resources or the overall amount of runoff and nonpoint pollution.
- Collocation on Existing Aerial Fiber Optic Plant: Replacement of poles or structural hardening could result in ground disturbance that could cause impacts to water quality from increased suspended solids.
- Installation of Optical Transmission or Centralized Transmission Equipment: If installation of transmission equipment required grading or other ground disturbance to install small boxes or huts, or access roads, there could potentially be direct and indirect impacts to water quality from a temporary increase in the amount of suspended solids running off construction sites. The amount of impact depends on the land area affected, installation technique, and location. Trenching would not be expected to occur near or below the existing water table (depth to water). If installation of transmission equipment would occur in existing boxes or huts and require no ground disturbance, there would be no impacts to water resources.

- Wireless Projects
  - New Wireless Communication Towers: Installation of new wireless towers and associated structures (generators, equipment sheds, fencing, security lighting, electrical feeds, and concrete foundations and pads) or access roads could result in potential direct and indirect impacts to water quality from a temporary increase in the amount of suspended solids running off construction sites. The amount of impact depends on the land area affected, installation technique, and location. Trenching would not be expected to occur near or below the existing water table (depth to water. Implementing BMPs and mitigation measures could reduce impact intensity. If a new roadway were built, additional impervious surface would not be expected to impact water resources the overall amount of runoff and nonpoint pollution.

- Deployable Technologies: Implementation of land-based deployable technologies could result in potential impacts to water resources if deployment involves movement of equipment through streams, occurs in riparian or floodplain areas, occurs in unpaved areas, or if the implementation results in paving of previously unpaved surfaces. Some staging or landing areas (depending on the type of technology) may require land/vegetation clearing, excavation, and paving. These activities could result in direct and indirect impacts to water quality from a temporary increase in the amount of suspended solids running off construction sites or deployment in unpaved areas. The amount of impact depends on the land area affected, installation technique, and location. Implementing BMPs and mitigation measures could reduce impact intensity. The activities could also result in indirect impacts on water quality if fuels leak into surface or groundwater. Where deployable technologies would be implemented on existing paved surfaces, or where aerial and vehicular deployable technologies may be used on existing paved surfaces, it is anticipated that there would be no impacts to water resources because there would be no ground disturbance.
- Deployment of drones, balloons, blimps, or piloted aircraft could have indirect impacts on water quality if fuels spill or other chemicals seep into ground or surface waters. In general, the abovementioned activities could potentially involve land/vegetation clearing; excavation and trenching; installation of security/safety lighting and fencing; and deployment of aerial platforms. Potential impacts to water resources associated with deployment of this infrastructure could include water quality impacts, but are expected to be less than significant at the programmatic level, due to the small scale of individual activities. Chapter 16, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

In general, the abovementioned activities could potentially involve land/vegetation clearing; excavation and trenching; construction of access roads; installation or restructuring of towers or poles, installation of security/safety lighting and fencing; and deployment of aerial platforms. Potential impacts to water resources associated with deployment of this infrastructure would likely be less than significant at the programmatic level, due to the limited geographic scale of individual activities and would likely return to baseline conditions once revegetation of disturbed areas is complete. Chapter 16, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, operation activities associated with the Preferred Alternative would consist of routine maintenance and inspection of the facilities, and are expected to have no impacts as there would be no ground disturbing activity and it is likely routine maintenance activities would be conducted along existing roads and utility ROWs. Any major infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the abovementioned construction impacts. Impacts to surface and groundwater quality from routine operations and maintenance, such as herbicide application to control vegetation, are not expected. Chapter 16, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

8.2.4.5 Alternatives Impact Assessment

The following section assesses potential impacts to water resources associated with the Deployable Technologies Alternative and the No Action Alternative.

Deployable Technologies Alternative

Under the Deployable Technologies Alternative option, a nationwide fleet of mobile communications systems would provide temporary coverage in areas not covered by the existing, usable infrastructure. There would be no collocation of equipment and minimal new construction associated with wired or wireless projects discussed above under the Preferred Alternative. Some limited construction could be associated with implementation such as land clearing or paving for parking or staging areas. The specific infrastructure associated with the Deployable Technologies Alternative would be the same as the deployable technologies implemented as part of the Preferred Alternative but would likely be implemented in greater numbers, over a larger geographic extent, and used with greater frequency and duration. Therefore, potential impacts to water resources as a result of implementation of this Alternative could be as described below.

Deployment Impacts

As explained above, at the programmatic level, implementation of deployable technologies could result in less than significant impacts to water resources if those activities occurred on paved surfaces. Some staging or launching/landing areas (depending on the type of technology) may require land/vegetation clearing, excavation, and paving; however, these activities would be isolated and short term, and would likely return to baseline conditions once revegetation was complete. Additionally, project activities could result in direct and indirect impacts to water quality from a temporary increase in the amount of suspended solids running off construction sites and from fuels leaking into surface or groundwater. However, spills from vehicles or machinery used during deployment tend to be associated with re-fueling operations, and as such, would likely be a few gallons or less in volume and would likely be easily contained or cleaned up, and therefore would have less than significant impacts at the programmatic level. Chapter 16, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, operation activities associated with the Deployable Technologies Alternative would consist of routine maintenance and inspection of the deployable technologies. Any major infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the abovementioned deployment impacts. The water resources impacts would depend on the watershed, duration (chronic or short-term) and frequency (many years or a few months) the resource would be used, and the water resource's current use (sole source for drinking water, considered exceptional value for recreation, or provides critical habitat for a species).

It is anticipated that there would be no impacts to water resources associated with routine inspections of the Deployable Technologies Alternative, assuming that the same access roads used for deployment are also used for inspections. If usage of heavy equipment as part of routine maintenance or inspections occurs off established access roads or corridors and near waterbodies, the resulting ground disturbance could increase sedimentation in waterbodies, potentially impacting water quality. It is assumed that routine maintenance would not include operation of vehicles or equipment in waterbodies. Finally, if ground-based deployable technologies are parked and operated with air conditioning for extended periods of time, the condensation water from the air conditioner could result in soil erosion that could potentially impact waterbodies if the deployables are located adjacent to waterbodies; however, due to the limited and temporary nature of the deployable activities, at the programmatic level, it is anticipated that these potential impacts would be less than significant. Site maintenance, including mowing or herbicides, may result in less than significant effects to water quality at the programmatic level, due to the small-scale of expected FirstNet activities in any particular location. In addition, the presence of new access roads could increase the overall amount of impervious surface in the area, and increase runoff effects on water resources, as explained above. Chapter 16, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

No Action Alternative

Under the No Action Alternative, the NPSBN would not be deployed; therefore, there would be no associated construction or installation of wired, wireless, deployable infrastructure or satellites and other technologies. As a result, there would be no impacts to water resources as a result of construction and operation of the Proposed Action. Environmental conditions would therefore be the same as those described in Section 8.1.4, Water Resources.

8.2.5 Wetlands

8.2.5.1 Introduction

This section describes potential impacts to wetlands in Louisiana associated with deployment and operation of the Proposed Action and Alternatives. Chapter 16, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

8.2.5.2 Impact Assessment Methodology and Significance Criteria

The impacts of the Proposed Action on wetlands were evaluated using the significance criteria presented in Table 8.2.4-1. As described in Section 8.2, Environmental Consequences, the categories of impacts are defined as potentially significant, less than significant with mitigation incorporated, less than significant, or no impact. Characteristics of each impact type, including magnitude or intensity, geographic extent, and duration or frequency, were used to determine the impact significance rating associated with each potential impact.

Given the nature of this programmatic evaluation, and because the Proposed Action could potentially cover a wide variety of actions that would take place in various landscapes, the potential impacts to wetlands addressed in this section are presented as a range of possible impacts.

Table 8.2.5-1: Impact Significance Rating Criteria for Wetlands

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	Less than Significant with BMPs and Mitigation Measures Incorporated	Less than Significant	No Impact
Direct wetland loss (fill or conversion to non-wetland)	Magnitude[a] or Intensity	Substantial loss of high-quality wetlands (e.g., those that provide critical habitat for sensitive or listed species, are rare or a high-quality example of a wetland type, are not fragmented, support a wide variety of species, etc.); violations of Section 404 of the CWA.	Effect that is potentially significant, but with mitigation is less than significant.	Impacts to lower quality wetlands (e.g., not rare or unique, that have low productivity and species diversity, and those that are already impaired or impacted by human activity).	No direct loss of wetlands.
	Geographic Extent/Context	Watershed level, and/or within multiple watersheds.		Watershed or subwatershed level.	NA
	Duration or Frequency	Chronic and long-term changes not likely to be reversed over several years or seasons.		Periodic and/or temporary loss reversed over 1-2 growing seasons with or without active restoration.	NA
Other direct effects: vegetation clearing; ground disturbance; direct hydrologic changes (flooding or draining); direct soil changes; water quality degradation	Magnitude or Intensity	Substantial and measurable changes to hydrological regime of the wetland impacting salinity, pollutants, nutrients, biodiversity, ecological integrity, or water quality; introduction and establishment of invasive species to high quality wetlands.	Effect that is potentially significant, but with mitigation is less than significant.	Impacts to lower quality wetlands affecting the hydrological regime including salinity, pollutants, nutrients, biodiversity, ecological integrity, or water quality; introduction and establishment of invasive species to high quality wetlands.	No direct impacts to wetlands affecting vegetation, hydrology, soils, or water quality.
	Geographic Extent	Watershed level, and/or within multiple watersheds.		Watershed or subwatershed level.	NA

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
(spills or sedimentation)	Duration or Frequency	Long-term or permanent alteration that is not restored within 2 growing seasons, or ever.		Periodic and/or temporary loss reversed over 1-2 growing seasons with or without active restoration.	NA
Indirect Effects: [b] Change in Function(s)[c] or Change in Wetland Type	Magnitude or Intensity	Changes to the functions or type of high quality wetlands (e.g., those that provide critical habitat for sensitive or listed species, are rare or a high-quality example of a wetland type, are not fragmented, support a wide variety of species, etc.).	Effect that is potentially significant, but with mitigation is less than significant.	Impacts to lower quality wetlands (e.g., not rare or unique, that have low productivity and species diversity, and those that are already impaired or impacted by human activity).	No changes in wetland function or type.
	Geographic Extent	Watershed level, and/or within multiple watersheds.		Watershed or subwatershed level.	NA
	Duration or Frequency	Long-term or permanent.		Periodic and/or temporary loss reversed over 1-2 growing seasons with or without active restoration.	NA

[a] "Magnitude" is defined based on the type of wetland impacted, using USACE wetland categories (USACE 2014). Category 1 are the highest quality, highest functioning wetlands.
[b] Indirect Effects are those resulting from direct effects, but they occur elsewhere in space and/or time. Includes indirect hydrologic effects (wetting or drying) that in turn alters wetland function or type.
[c] Wetland functions include hydrologic, ecological, geomorphic, and social functions typically assessed for wetlands as part of USACE compensatory mitigation planning. Typical functions assessed may include flood attenuation, bank stabilization, water quality, organic matter input/transport, nutrient processing, wildlife habitat, T/E species habitat, biodiversity, recreational/social value.
NA = Not Applicable

8.2.5.3 Description of Environmental Concerns

Potential Direct Wetland Loss (Fill or Conversion to Non-Wetland)

Construction-related impacts from several of the deployment activities have the potential for direct wetland impacts such as filling, draining, or conversion to a non-wetland. Examples include placement of fill in a wetland to construct a new tower, trenching through a wetland or directly connected waterway to install a cable, and placement of a structure (tower, building) within the wetland.

Wetlands regulate the quality and quantity of surface and groundwater supplies, reduce flood hazards by serving as retention basins for surface runoff, and maintain water supplies after floodwaters subside. If wetlands were filled, the entire area may be at risk for increased flooding. There could be a loss of open space to be enjoyed by the community, and decreased wildlife populations may be observed due to displacement and increased noise, light, and other human disturbance. To the extent practicable or feasible, FirstNet and/or their partners would avoid filling wetlands or altering the hydrologic regime so that wetlands would not be lost or converted to non-wetlands. Loss of high and low-quality wetlands would be less than significant at the programmatic level given the amount of land disturbance associated with the project locations (generally less than an acre) and the short time-frame of deployment activities. Additionally, all site-specific locations will be subject to an environmental review to help ensure environmental concerns are addressed. To minimize any potential impacts to wetlands, BMPs and mitigation measures would be implemented in compliance with any issued federal, state, and local permits. Potential wetlands impacts could be further reduced by implementing BMPs and mitigation measures (see Chapter 16).

There are more than 8,317,000 million acres of palustrine and estuarine wetlands throughout Louisiana (USFWS, 2014a). As shown in Section 8.1.5, Figure 8.1.5-2, western and northern Louisiana respectively, are predominately palustrine wetlands, while estuarine/marine wetlands are found in the southern portion of the state along the Gulf Coast.

Based on the impact significance criteria presented in Table 8.2.5-1, at the programmatic level, the deployment activities would most likely have less than significant direct impacts on wetlands. Additionally, most of the deployment activities would be unlikely to violate applicable federal, state, and local regulations.

In Louisiana, as discussed in Wetlands, Section 8.1.5.4, because of the ongoing significant coastal wetland losses in Louisiana, Congress established the CWPPRA in 1990. If any of the proposed deployment activities were to occur in these high quality wetlands, potentially significant impacts could occur. High quality wetlands occur along the coast, and are not always included on state maps; therefore, site-specific analysis would be required, in addition to BMPs and mitigation measures to avoid potentially significant impacts to wetlands. To minimize any potential impacts to wetlands, BMPs and mitigation measures would be implemented in compliance with any issued federal, state, and local permits. Chapter 16, BMPs and Mitigation

Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Potential Other Direct Effects

Other direct impacts consist of altering the chemical, physical, or biological components of a wetland to the extent that changes to the wetland functions occur. However, other direct impacts would not result in a loss of total wetland acreage. Changes, for example, could include conversion of a forested wetland system to a non-forested state through chemical, mechanical, or hydrologic manipulation; altered hydrologic conditions (increases or decreases) such as stormwater discharges or water withdrawals that alter the functions of the wetlands.

Based on the impact significance criteria presented in Table 8.2.4-1, construction-related deployment activities that result in long-term or permanent, substantial, and measurable changes to hydrological regime of the wetland (i.e., changes in salinity, pollutants, nutrients, biodiversity, ecological integrity, or water quality) may cause potentially significant impacts. In addition, introduction and establishment of invasive species to high quality wetlands within a watershed or multiple watersheds are potentially significant. Other direct effects to high- and low-quality wetlands would be less than significant at the programmatic level, given the amount of land disturbance associated with the project locations (generally less than an acre) and the short time-frame of deployment activities and the application of federal, state, and local wetlands regulations. Additionally, all site-specific locations will be subject to an environmental review to help ensure environmental concerns are addressed. To minimize any potential impacts to wetlands, BMPs and mitigation measures would be implemented in compliance with any issued federal, state, and local permits. Chapter 16, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Examples activities that could have other direct effects to wetlands in Louisiana include:

- *Vegetation Clearing:* removing existing vegetation by clearing forest and herbaceous vegetation during construction activities, grading, seeding, and mulching. Clearing and grading may include increased soil erosion and a decrease in the available habitat for wildlife.
- *Ground Disturbance:* Increased amounts of stormwater runoff in wetlands could alter water level response times, depths, and duration of water detention. Reduction of watershed infiltration capacity could cause wetland water depths to rise more rapidly following storm events.
- *Direct Hydrologic Changes (flooding or draining):* Greater frequency and duration of flooding could destroy native plant communities, as could depriving them of their water supply. Hydrologic changes could make a wetland more vulnerable to pollution. Increased water depths or flooding frequency could distribute pollutants more widely through a wetland. Sediment retention in wetlands is directly related to flow characteristics, including degree and pattern of channelization, flow velocities, and storm surges.

- *Direct Soil Changes:* Changes in soil chemistry could lead to degradation of wetlands that have a specific pH range and/or other parameter, such as the acidic conditions of bogs and alkaline conditions of fens.
- *Water Quality Degradation (spills or sedimentation):* The loss of wetlands results in a depletion of water quality both in the wetland and downstream. Filtering of pollutants by wetlands is an important function and benefit. High levels of suspended solids (sedimentation) could reduce light penetration, dissolved oxygen, and overall wetland productivity. Toxic materials in runoff could interfere with the biological processes of wetland plants, resulting in impaired growth, mortality, and changes in plant communities.

Indirect Effects:[123] Change in Function(s)[124] or Change in Wetland Type

Indirect effects to wetlands could include change in wetland function or conversion of a resource to another type (i.e., wetland to an open body of water). The construction of curb and gutter systems diverts surface runoff and could cause flooding or wetlands to dry out, depending on the direction of diversion. Indirect effects to high- and low-quality wetlands would be less than significant at the programmatic level, given the amount of land disturbance associated with the project locations (generally less than an acre) and the short time-frame of deployment activities and the application of federal, state, and local wetlands regulations. Additionally, all site-specific locations will be subject to an environmental review to help ensure environmental concerns are addressed. To minimize any potential impacts to wetlands, BMPs and mitigation measures would be implemented in compliance with any issued federal, state, and local permits. Potential wetlands impacts could be further reduced by implementing BMPs and mitigation measures, as practicable and feasible (see Chapter 16).
Examples of functions related to wetlands in Louisiana that could potentially be impacted from construction-related deployment activities include:

- *Flood Attenuation:* Wetlands provide flood protection by holding excess runoff after storms, before slowly releasing it to surface waters. While wetlands may not prevent flooding, they could lower flood peaks by providing detention of storm flows. Correspondingly, disturbance of the wetlands (e.g., dredging or filling) could proportionately reduce water storage function.
- *Bank Stabilization:* By reducing the velocity and volume of flow, wetlands provide erosion control, floodwater retention, and reduce stream sedimentation.
- *Water Quality:* Water quality impacts on wetland soils could eventually threaten a wetland's existence. Where sediment inputs exceed rates of sediment export and soil consolidation, a wetland would gradually become filled.

[123] Indirect effects are those resulting from direct effects, but they occur elsewhere in space and/or time. Includes indirect hydrologic effects (wetting or drying) that in turn alters wetland function or type
[124] Wetland functions include hydrologic, ecological, geomorphic, and social functions typically assessed for wetlands as part of USACE compensatory mitigation planning. Typical functions assessed may include flood attenuation, bank stabilization, water quality, organic matter input/transport, nutrient processing, wildlife habitat, T/E species habitat, biodiversity, recreational/social value.

- *Nutrient Processing:* Wetland forests retain ammonia during seasonal flooding. Wetlands absorb metals in the soils and by plant uptake via the roots. They also allow metabolism of oxygen-demanding materials and reduce fecal coliform populations. These pollutants are often then buried by newer plant material, isolating them in the sediments.
- *Wildlife Habitat:* Impacts on wetland hydrology and water quality affect wetland vegetation. While flooding could harm some wetland plant species, it promotes others. Shifts in plant communities because of hydrologic changes could have impacts on the preferred food supply and animal cover.
- *Recreational Value:* Wetlands provide recreation opportunities for people, such as hiking, bird watching, and photography.
- *Groundwater Recharge:* Wetlands retain water, allowing time for surface waters to infiltrate into soils and replenish groundwater.

According to the significance criteria defined in Table 8.2.4-1, at the programmatic level, impacts to lower quality wetlands (e.g., not rare or unique, that have low productivity and species diversity, and those that are already impaired or impacted by human activity), would be considered potentially less than significant. Since the majority of wetlands in Louisiana are not considered high quality, deployment activities at the programmatic level could have less than significant indirect impacts on wetlands in the state. In coastal areas, where all wetlands are considered high quality, there could be potentially significant impacts at the project level that would be analyzed on a case-by-case basis. If avoidance were not possible, BMPs and mitigation measures would help to mitigate impacts. To minimize any potential impacts to wetlands, BMPs and mitigation measures would be implemented in compliance with any issued federal, state, and local permits. Chapter 16, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

8.2.5.4 Potential Impacts of the Preferred Alternative

The following section assesses potential impacts associated with implementation of the Preferred Alternative, including deployment and operation activities. To determine the magnitude of potential impacts of site-specific activities, wetland delineations could be required to determine the exact location of all wetlands, including high quality wetlands, as well as a functional assessment by an experienced wetland delineator.

Deployment Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, implementation of the Preferred Alternative could result in the deployment of various types of facilities or infrastructure. Depending on the physical nature and location of the facility/infrastructure and the specific deployment requirements, some activities would result in potential impacts to wetlands and others would not. In addition, and as explained in this section, the same type of Proposed Action Infrastructure could result in a range of no impacts to potentially significant impacts depending on the deployment scenario or site-specific conditions.

Activities Likely to Have No Impacts

Of the types of facilities or infrastructure deployment scenarios described in Section 2.1.2, Proposed Action Infrastructure, the following are likely to have no impacts to wetlands under the conditions described below:

- Wired Projects
  - Use of Existing Conduit – New Buried Fiber Optic Plant: Disturbance associated with the installation of fiber optic cable in existing conduit would be limited to entry and exit points of the existing conduit in previously disturbed areas. It is anticipated that there would be no impacts to wetlands since the activities that would be conducted at these small entry and exit points are not likely to produce perceptible changes.
  - Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting up of dark fiber would have no impacts on wetlands because there would be no ground disturbance.
- Satellites and Other Technologies
  - Satellite-Enabled Devices and Equipment: It is anticipated that the installation of permanent equipment on existing structures, adding equipment to satellites being launched for other purposes and the use of portable devices that use satellite technology is not likely to impact wetlands since there would be no ground disturbance.
  - Deployment of Satellites: FirstNet does not anticipate launching satellites as part of the deployment of the NPSBN; however, it may include equipment on satellites that are already being launched for other purposes. As adding equipment to an existing launch vehicle would be very unlikely to impact wetlands, it is anticipated that this activity would have no impact on wetlands.

Activities with the Potential to Have Impacts

Potential deployment-related impacts to wetlands because of implementation of the Preferred Alternative would encompass a range of impacts that could occur, including direct effects, other direct effects, and indirect effects on wetlands. The types of deployment activities that could be part of the Preferred Alternative and result in potential impacts to wetlands include the following:

- Wired Projects
  - New Build – Buried Fiber Optic Plant: Plowing (including vibratory plowing), trenching, or directional boring and the construction of POPs, huts, or other associated facilities or hand-holes to access fiber could result in potential impacts to wetlands. Land/vegetation clearing and excavation activities, associated with construction of POPs, huts, or other associated facilities could result in direct and indirect impacts to wetlands. The amount of impact depends on the land area affected, installation technique, proximity to wetlands, and type of wetland that could be affected (e.g., high quality). Any ground disturbance could cause direct and indirect impacts wetlands, depending on the proximity

to wetlands and type of wetlands that could be affected. Implementing BMPs and mitigation measures could reduce impact intensity.

  - New Build – Submarine Fiber Optic Plant: The installation of cables in limited nearshore and inland bodies of water would potentially impact wetlands found along shorelines. Additional project-specific environmental reviews would be required to assess potential impacts to wetland environments, including coastal and marine environments.
  - New Build – Aerial Fiber Optic Plant: Potential impacts would be similar to Buried Fiber Optic Plant. Any ground disturbance could cause direct and indirect impacts wetlands, depending on the proximity to wetlands and type of wetlands that could be affected.
  - Collocation on Existing Aerial Fiber Optic Plant: Any ground disturbance could cause direct and indirect impacts to wetlands from increased suspended solids and runoff from activities, depending on the proximity to wetlands and type of wetlands that could be affected.
  - Installation of Optical Transmission or Centralized Transmission Equipment: If installation of transmission equipment required grading or other ground disturbance to install small boxes or hunts, or access roads, there could potentially be direct and indirect impacts to wetlands. The amount of impact from a temporary increase in the amount of suspended solids running off construction sites and into wetlands depends on the land area affected, installation technique, and location. If trenching were to occur near wetlands, it could cause impacts on wetlands. Implementing BMPs and mitigation measures could reduce impact intensity.
- Wireless Projects
  - New Wireless Communication Towers: Installation of new wireless towers and associated structures (generators, equipment sheds, fencing, security and aviation lighting, electrical feeds, and concrete foundations and pads) or access roads could potentially cause direct and indirect impacts to wetlands. The activities could cause a temporary increase in the amount of suspended solids running off construction sites and into wetlands, depending on their proximity. The amount of impact depends on the land area affected, installation technique, and proximity to wetlands, and wetland type. If trenching were to occur near wetlands, it could cause impacts on wetlands. Implementing BMPs and mitigation measures could reduce impact intensity.
  - Collocation on Existing Wireless Tower, Structure, or Building: Collocation would involve mounting or installing equipment (such as antennas or microwave dishes) on an existing tower, which would not result in impacts to wetlands. However, if additional power units, structural hardening, and physical security measures required ground disturbance, such as grading, or excavation activities, impacts to wetlands could occur near wetlands, it could cause impacts on wetlands. Implementing BMPs and mitigation measures could reduce impact intensity.
  - Deployable Technologies: Implementation of deployable technologies could result in potential impacts to wetlands if deployment occurs in unpaved areas, or if the

implementation results in paving of previously unpaved surfaces. Some staging or landing areas (depending on the type of technology) may require land/vegetation clearing, excavation, and paving. The amount of impact depends on the land area affected, installation technique, and location. Implementing BMPs and mitigation measures could reduce impact intensity. The activities could also result in other direct impacts on wetlands if fuels leak into nearby waterbodies or wetlands. Deployment of drones, balloons, blimps, or piloted aircraft could have other direct impacts on wetlands if fuels spill or other chemicals seep into nearby waterbodies or wetlands.

In general, the abovementioned activities could potentially involve land/vegetation clearing; excavation and trenching; construction of access roads; installation or restructuring of towers, poles, or underwater cables; installation of security/safety lighting and fencing; and deployment of aerial platforms. Depending on the deployment activity for this infrastructure, potential impacts to wetlands may occur. The amount of impact depends on the land area affected, installation technique, proximity to wetlands, and type of wetland that could be affected (e.g., high quality). Any ground disturbance could cause direct and indirect impacts wetlands, depending on the proximity to wetlands and type of wetlands that could be affected. These impacts are expected to be less than significant at the programmatic level, due to the small amount of land disturbance (generally less than one acre) and the short timeframe of deployment activities. To minimize any potential impacts to wetlands, BMPs and mitigation measures would be implemented in compliance with any issued federal, state, and local permits. Chapter 16, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, operation activities associated with the Preferred Alternative would consist of routine maintenance and inspection of the facilities. Any major infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the abovementioned construction impacts. It is anticipated that there could be ongoing potential other direct impacts to wetlands if heavy equipment is used for routine operations and maintenance application of herbicides occurs to control vegetation along all ROWs and near structures, depending on the proximity to wetlands. The intensity of the impact depends on the amount of herbicides used, frequency, and location of nearby sensitive wetlands. These impacts are expected to be less than significant at the programmatic level, due to the limited nature of deployment activities. It is also anticipated that routine maintenance activities would be conducted on existing roads and utility ROWs. Chapter 16, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

8.2.5.5 Alternatives Impact Assessment

The following section assesses potential impacts to water resources associated with the Deployable Technologies Alternative and the No Action Alternative.

Deployable Technologies Alternative

Under the Deployable Technologies Alternative option, a nationwide fleet of mobile communications systems would provide temporary coverage in areas not covered by the existing, usable infrastructure. There would be no collocation of equipment and minimal new construction associated with wired or wireless projects discussed above under the Preferred Alternative. Some limited construction could be associated with implementation such as land clearing or paving for parking or staging areas. The specific infrastructure associated with the Deployable Technologies Alternative would be the same as the deployable technologies implemented as part of the Preferred Alternative but would likely be implemented in greater numbers, over a larger geographic extent, and used with greater frequency and duration. Therefore, potential impacts to wetlands because of implementation of this alternative could be as described below.

Deployment Impacts

As explained above, implementation of deployable technologies could result in less than significant impacts to wetlands at the programmatic level. Some staging or launching/landing areas (depending on the type of technology) may require land/vegetation clearing, excavation, and paving. These activities could result in direct and indirect impacts to wetlands from a temporary increase in the amount of suspended solids running off construction sites to nearby surface waters. The amount of impact depends on the land area affected, installation technique, and proximity to wetlands, and wetland type; however, impacts are expected to be less than significant at the programmatic level, due to the small-scale and temporary duration of expected FirstNet deployment activities in any one location. To minimize any potential impacts to wetlands, BMPs and mitigation measures would be implemented in compliance with any issued federal, state, and local permits. Chapter 16, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, operation activities associated with the Deployable Technologies Alternative would consist of routine maintenance and inspection of the deployable technologies. Any major infrastructure replacement as part of ongoing system maintenance could result in impacts similar to the abovementioned deployment impacts. The wetlands impacts would depend on the watershed, duration (chronic or short-term) and frequency (many years or a few months) the resource would be used, and the wetland's quality and function.

It is anticipated that there would be less than significant impacts to wetlands associated with routine inspections of the Deployable Technologies Alternative at the programmatic level, as it is likely existing roads and utility rights-of-way would be utilized for maintenance and inspection activities. Site maintenance, including mowing or herbicides, is anticipated to result in less than significant effects to wetlands at the programmatic level, due to the limited nature of site maintenance activities, including mowing and application of herbicides. To minimize any potential impacts to wetlands, BMPs and mitigation measures would be implemented in compliance with any issued federal, state, and local permits. Chapter 16, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

No Action Alternative

Under the No Action Alternative, the NPSBN would not be deployed; therefore, there would be no associated construction or installation of wired, wireless, deployable infrastructure or satellites and other technologies. As a result, there would be no impacts to wetlands from construction and operation of the Proposed Action. Environmental conditions would therefore be the same as those described in Section 8.1.5, Wetlands.

8.2.6 Biological Resources

8.2.6.1 Introduction

This Chapter describes potential impacts to terrestrial vegetation, wildlife, fisheries and aquatic habitat, and threatened and endangered species in Louisiana associated with deployment and operation of the Proposed Action and its Alternatives. Chapter 16, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

8.2.6.2 Impact Assessment Methodology and Significance Criteria

The impacts of the Proposed Action on terrestrial vegetation, wildlife, fisheries, and aquatic habitats were evaluated using the significance criteria presented in Table 8.2.6-1. As described in Section 8.2, Environmental Consequences, the categories of impacts are defined as potentially significant, less than significant with mitigation incorporated, less than significant, or no impact. Characteristics of each impact type, including magnitude or intensity, geographic extent, and duration or frequency, were used to determine the impact significance rating associated with each potential impact.

Given the nature of this programmatic evaluation, and because the Proposed Action could potentially cover a wide variety of actions that would take place in various landscapes, the potential impacts to terrestrial vegetation, wildlife, and fisheries and aquatic habitat addressed in Sections 8.2.6.3, 8.2.6.4, and 8.2.6.5, respectively, are presented as a range of possible impacts.

Refer to Section 8.2.6.6 for impact assessment methodology and significance criterial associated with threatened and endangered species in Louisiana.

Table 8.2.6-1: Impact Significance Rating Criteria for Terrestrial Vegetation, Wildlife, Fisheries, and Aquatic Habitats

Type of Effect	Effect Characteristic	Impact Level			
		Potentially Significant	Less than Significant with BMPs and Mitigation Measures Incorporated	Less than Significant	No Impact
Direct Injury/Mortality	Magnitude or Intensity	Population-level or sub-population injury /mortality effects observed for at least one species depending on the distribution and the management of said species. Events that may impact endemics, or concentrations during breeding or migratory periods. Violation of various regulations including: Marine Mammal Protection Act (MMPA), Magnuson Stevens Fishery Conservation And Management Act (MSFCMA), Migratory Bird Treaty Act (MBTA), and Bald and Golden Eagle Protection Act (BGEPA).	Effect that is potentially significant, but with BMPs and mitigation measures is less than significant	Individual mortality observed but not sufficient to affect population or sub-population survival.	No direct individual injury or mortality would be observed.
	Geographic Extent	Regional effects observed within Louisiana for at least one species. Anthropogenic[a] disturbances that lead to exclusion from nutritional or habitat resources, or direct injury or mortality of endemics or a significant portion of the population or sub-population located in a small area during a specific season.		Effects realized at one location when population is widely distributed, and not concentrated in affected area.	NA
	Duration or Frequency	Chronic and long-term effects not likely to be reversed over several years for at least one species.		Temporary, isolated, or short-term effects that are reversed within one to three years.	NA

Type of Effect	Effect Characteristic	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
Vegetation and Habitat Loss, Alteration, or Fragmentation	Magnitude or Intensity	Population-level or sub-population effects observed for at least one species or vegetation cover type, depending on the distribution and the management of the subject species. Impacts to terrestrial, aquatic, or riparian habitat or other sensitive natural community vital for feeding, spawning/breeding, foraging, migratory rest stops, refugia, or cover from weather or predators. Violation of various regulations including MMPA, MSFCMA, MBTA, and BGEPA.	Effect that is potentially significant, but with BMPs and mitigation measures is less than significant.	Habitat alteration in locations not designated as vital or critical for any period. Temporary losses to individual plants within cover types, or small habitat alterations take place in important habitat that is widely distributed and there are no cover type losses or cumulative effects from additional projects.	Sufficient habitat would remain functional to maintain viability of all species. No damage or loss of terrestrial, aquatic, or riparian habitat from project would occur.
	Geographic Extent	Regional effects observed within Louisiana for at least one species. Anthropogenic disturbances that lead to the loss or alteration of nutritional or habitat resources for endemics or a significant portion of the population or sub-population located in a small area during a specific season.		Effects realized at one location.	NA
	Duration or Frequency	Chronic and long-term effects not likely to be reversed over several years for at least one species.		Temporary, isolated, or short-term effects that are reversed within one to three years.	NA

Type of Effect	Effect Characteristic	Impact Level: Potentially Significant	Impact Level: Less than Significant with BMPs and Mitigation Measures Incorporated	Impact Level: Less than Significant	Impact Level: No Impact
Indirect Injury/Mortality	Magnitude or Intensity	Population-level or sub-population effects observed for at least one species depending on the distribution and the management of said species. Exclusion from resources necessary for the survival of one or more species and one or more life stages. Anthropogenic disturbances that lead to mortality, disorientation, the avoidance or exclusion from nutritional or habitat resources for endemics or a significant portion of the population or sub-population located in a small area during a specific season. Violation of various regulations including MMPA, MSFCMA, MBTA, and BGEPA.	Effect that is potentially significant, but with BMPs and mitigation measures is less than significant.	Individual injury/mortality observed but not sufficient to affect population or sub-population survival. Partial exclusion from resources in locations not designated as vital or critical for any given species or life stage, or exclusion from resources that takes place in important habitat that is widely distributed. Anthropogenic disturbances are measurable but minimal as determined by individual behavior and propagation, and the potential for habituation or adaptability is high given time.	No stress or avoidance of feeding or important habitat areas. No reduced population resulting from habitat abandonment.
	Geographic Extent	Regional or site-specific effects observed within Louisiana for at least one species. Behavioral reactions to anthropogenic disturbances depend on the context, the time of year age, previous experience and activity. Anthropogenic disturbances that lead to startle responses of large groupings of individuals during haulouts, resulting in injury or mortality.		Effects realized at one location.	NA
	Duration or Frequency	Chronic and long-term effects not likely to be reversed over several years for at least one species.		Temporary, isolated, or short-term effects that are reversed within one to three years.	NA

Type of Effect	Effect Characteristic	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
Effects to Migration or Migratory Patterns	Magnitude or Intensity	Population-level or sub-population effects observed for at least one species depending on the distribution and the management of said species. Temporary or long-term loss of migratory pattern/path or rest stops due to anthropogenic activities. Violation of various regulations including MMPA, MSFCMA, MBTA, and BGEPA.	Effect that is potentially significant, but with BMPs and mitigation measures is less than significant.	Temporary loss of migratory rest stops due to anthropogenic activities take place in important habitat that is widely distributed and there are no cumulative effects from additional projects.	No alteration of migratory pathways, no stress or avoidance of migratory paths/patterns due to project.
	Geographic Extent	Regional effects observed within Louisiana for at least one species. Anthropogenic disturbances that lead to exclusion from nutritional or habitat resources during migration, or lead to changes of migratory routes for endemics or a significant portion of the population or sub-population located in a small area during a specific season.		Effects realized at one location when population is widely distributed, and not concentrated in affected area.	NA
	Duration or Frequency	Chronic and long-term effects not likely to be reversed over several years for at least one species.		Temporary, isolated, or short-term effects that are reversed within one to three years.	NA

Type of Effect	Effect Characteristic	Impact Level			
		Potentially Significant	Less than Significant with BMPs and Mitigation Measures Incorporated	Less than Significant	No Impact
Reproductive Effects	Magnitude or Intensity	Population or sub-population level effects in reproduction and productivity over several breeding/spawning seasons for at least one species depending on the distribution and the management of said species. Violation of various regulations including MMPA, MSFCMA, MBTA, and BGEPA.	Effect that is potentially significant, but with BMPs and mitigation measures is less than significant.	Effects to productivity are at the individual rather than population level. Effects are within annual variances and not sufficient to affect population or sub-population survival.	No reduced breeding or spawning success.
	Geographic Extent	Regional effects observed within Louisiana for at least one species. Anthropogenic disturbances that lead to exclusion from prey or habitat resources required for breeding/spawning or stress, abandonment and loss of productivity for endemics or a significant portion of the population or sub-population located in a small area during the breeding/spawning season.		Effects realized at one location.	NA
	Duration or Frequency	Chronic and long-term effects not likely to be reversed over several breeding/spawning seasons for at least one species.		Temporary, isolated, or short-term effects that are reversed within one breeding season.	NA

Type of Effect	Effect Characteristic	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
Invasive Species Effects	Magnitude or Intensity	Extensive increase in invasive species populations over several seasons.	Effect that is potentially significant, but with BMPs and mitigation measures is less than significant.	Mortality observed in individual native species with no measurable increase in invasive species populations.	No loss of forage and cover due to the invasion of exotic or invasive plants introduced to project sites from machinery or human activity.
	Geographic Extent	Regional impacts observed throughout Louisiana.		Effects realized at one location.	NA
	Duration or Frequency	Chronic and long-term changes not likely to be reversed over several years or seasons.		Periodic, temporary, or short-term changes that are reversed over one or two seasons.	NA

[a] Anthropogenic: "Made by people or resulting from human activities. Usually used in the context of emissions that are produced as a result of human activities" (USEPA, 2016c).
NA = Not Applicable

8.2.6.3 Terrestrial Vegetation

Impacts to terrestrial vegetation occurring in Louisiana are discussed in this section.

Description of Environmental Concerns

Direct Injury/Mortality

Direct injury/mortality effects are physical injuries, extreme physiological stress, or death of an individual organism from interactions associated with the Proposed Action. The most common direct injuries are permanent or temporary loss or disturbance of individual plants. Based on the impact significance criteria presented in Table 8.2.6-1, direct injury or mortality impacts could be significant if population-level or sub-population effects were observed for at least one species depending on the distribution and the management of the subject species. Although unlikely, direct mortality/injury to plants could occur in construction zones from land clearing, excavation activities, or vehicle traffic; however, FirstNet deployment events are expected to be relatively small in scale and therefore would have less than significant impacts at the programmatic level. The implementation of BMPs, mitigation measures, and avoidance measures could help to minimize or altogether avoid potential impacts to plant population survival. Chapter 16, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Vegetation and Habitat Loss, Alteration, or Fragmentation

Habitat impacts are primarily physical disturbances that result in alterations in the amount or quality of a habitat. As with all of the effects categories, the magnitude of the potential impact depends on the duration, location, and spatial scale of the system and associated activities. Habitat fragmentation is the loss or breaking down of continuous and connected habitat. About 16 percent of Louisiana has experienced extensive land use change due to cropland creation and about 6 percent of the state has experienced extensive land use change due to urbanization. However, a large portion of the state, about 42 percent, remains relatively unfragmented forest, particularly the Kisatchie National Forest and wildlife management areas throughout the state (*NRCS 2010*).

Construction of new infrastructure and long-term facility maintenance would result in the alteration of the type of vegetative communities in these localized areas, and in some instances the permanent loss of vegetation. In general, these impacts are expected to be less than significant at the programmatic level, due to the short-term, localized nature of the deployment activities. Further, some limited amount of infrastructure may be built in sensitive or rare regional vegetative communities, in which case BMPs and mitigation measures could be recommended and consultation with appropriate resource agencies, if required, could be undertaken to minimize or avoid potential impacts. Chapter 16, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Indirect Injury/Mortality

Indirect effects are effects that are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable (40 CFR 1508.8[b]). Indirect injury/mortality could include stress related to disturbance. The alteration of soils or hydrology within a localized area could result in stress or mortality of plants. Construction activities that remove large quantities of soil in the immediate vicinity of trees could cause undue stress to trees from root exposure, although this is unlikely to occur due to the small size of expected FirstNet activities. Indirect injury/mortality impacts vary depending on the species, time of year and duration of construction or deployment. Overall, these impacts are expected to be less than significant at the programmatic level, due to the short-term and small-scale nature of deployment activities. Chapter 16, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Effects to Migration or Migratory Patterns

No effects to the long-term migration or migratory patterns for terrestrial vegetation (e.g., forest migration) are expected as a result of the Proposed Action given the small-scale of deployment activities.

Reproductive Effects

No reproductive effects to terrestrial vegetation are expected as a result of the Proposed Action given the small-scale of deployment activities.

Invasive Species Effects

When human activity results in a species entering an ecosystem new to it, the species is classified as introduced or, depending on its ability to spread rapidly and outcompete native species, invasive. The introduction of invasive species could have a dramatic effect on natural resources and biodiversity. Louisiana’s humid subtropical climate puts it at high risk for invasive species introductions and serves to increase the potential for those introductions to lead to established populations (LDWF, 2015n). There is one state-listed noxious weed, the Chinese tallow tree.

As described in Section 7.1.6.4, when non-native species are introduced into an ecosystem in which they did not evolve, their populations sometimes increase rapidly. The potential to introduce invasive plants within construction zones and during long-term site maintenance could occur from vehicles and equipment being transported from one region to another, or when conducting revegetation of a site after deployment activities are complete. Overall, these impacts are expected to be less than significant at the programmatic level, due to the small-scale and localized nature of likely FirstNet activities. BMPs could help to minimize or avoid the potential for introducing invasive plant species during implementation of the Proposed Action. Chapter 16, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Potential Impacts of the Preferred Alternative

The following section assesses potential impacts associated with implementation of the Preferred Alternative, including construction/deployment and operational activities.

Deployment Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, implementation of the Preferred Alternative could result in the deployment of various types of facilities or infrastructure. Depending on the physical nature and location of the facility/infrastructure and the specific deployment requirements, some activities would result in potential impacts to terrestrial vegetation resources and others would not. In addition, and as explained in this section, the same type of Proposed Action infrastructure could result in a range impacts, from no impacts to less than significant impacts at the programmatic level, depending on the deployment scenario or site-specific conditions. The terrestrial vegetation that would be affected would depend on the ecoregion, the species' phenology[125], and the nature as well as the extent of the habitats affected. Chapter 16, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

<u>Activities Likely to Have No Impacts</u>

Of the types of facilities or infrastructure deployment scenarios described in Section 2.1.2, Proposed Action Infrastructure, the following are expected to have no impacts to terrestrial vegetation under the conditions described below:

- Wired Projects
  - Use of Existing Conduit – New Buried Fiber Optic Plant: Disturbance associated with the installation of fiber optic cable in existing conduit would be limited to entry and exit points of the existing conduit in previously disturbed areas. Although terrestrial vegetation could be impacted, it is anticipated that effects to vegetation would be minimal since the activities that would be conducted at these small entry and exit points are not likely to produce perceptible changes.
  - Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting up of dark fiber would have no impacts to terrestrial vegetation because there would be no ground disturbance.
- Satellites and Other Technologies
  - Satellite-Enabled Devices and Equipment: It is anticipated that the installation of permanent equipment on existing structures, attaching equipment to satellite launches for other purposes, and the use of portable devices that use satellite technology would not impact terrestrial vegetation because those activities would not require ground disturbance.

[125] Phenology is the seasonal changes in plant and animal lifecycles, such as emergence of insects or migration of birds.

- Deployment of Satellites: FirstNet does not anticipate launching satellites as part of the deployment of the NPSBN; however, it could include equipment on satellites that are already being launched for other purposes. As adding equipment to an existing launch vehicle would be very unlikely to impact terrestrial vegetation.

Activities with the Potential to Have Impacts

Potential deployment-related impacts to terrestrial vegetation as a result of implementation of the Preferred Alternative would encompass a range of impacts that could occur, including direct injury/mortality; vegetation and habitat loss, alteration, or fragmentation; indirect injury/mortality; and invasive species effects. The types of infrastructure deployment activities that could be part of the Preferred Alternative and result in potential impacts to terrestrial vegetation include the following:

- Wired Projects
  - New Build – Buried Fiber Optic Plant: Plowing, trenching, or directional boring and the construction of POPs, huts, or other associated facilities or hand-holes to access fiber could result in potential impacts to terrestrial vegetation. Land/vegetation clearing and excavation activities, associated with construction of POPs, huts, or other associated facilities could result in direct or indirect injury to plants; the loss, alteration, or fragmentation of vegetative communities; and invasive species effects.
  - New Build – Aerial Fiber Optic Plant: The installation of new poles and hanging cable and associated security, safety, or public lighting components on public ROWs or private easements as well as the construction of access roads, POPs, huts, or facilities to house outside plant equipment could result in potential impacts to terrestrial vegetation. Impacts may vary depending on the number or individual poles installed, but could include direct or indirect injury to plants; the loss, alteration, or fragmentation of vegetative communities; and invasive species effects.
  - Collocation on Existing Aerial Fiber Optic Plant: Land clearing and excavation during replacement of poles and structural hardening could result in direct or indirect injury to plants; the loss, alteration, or fragmentation of vegetative communities; and invasive species effects.
  - New Build – Submarine Fiber Optic Plant: The installation of cables in limited nearshore or inland bodies of water would not impact terrestrial vegetation. However, impacts to terrestrial vegetation could potentially occur as a result of the construction of landings and/or facilities on shores or the banks of waterbodies that accept the submarine cables could potentially occur as a result of land clearing, excavation activities, and heavy equipment use. Effects could include direct or indirect injury to plants; the loss, alteration, or fragmentation of vegetative communities; and invasive species effects.
  - Installation of Optical Transmission or Centralized Transmission Equipment: If installation of transmission equipment required construction of access roads, trenching,

and/or land clearing, such disturbance could result in direct or indirect injury to plants, vegetation loss, and invasive species effects.

- Wireless Projects
  - New Wireless Communication Towers: Installation of new wireless towers and associated structures (generators, equipment sheds, fencing, security and aviation lighting, electrical feeds, and concrete foundations and pads), microwave facilities, or access roads could result in impacts to terrestrial vegetation. Land/vegetation clearing, excavation activities, landscape grading, and other disturbance activities during the installation of new wireless towers and associated structures or access roads could result in direct or indirect injury to plants; the loss, alteration, or fragmentation of vegetative communities; and invasive species effects.
  - Collocation on Existing Wireless Tower, Structure, or Building: Collocation would involve mounting or installing equipment (such as antennas or microwave dishes) on an existing tower, which would not result in impacts to terrestrial vegetation. However, if new power units, replacement towers, structural hardening, and physical security measures require land clearing or excavation activities, impacts would be similar to new wireless construction.
  - Deployable Technologies: Implementation of deployable technologies including COWs, COLTs, or SOWs could result in direct impacts to terrestrial vegetation if deployment occurs on vegetated areas, or the implementation results in paving of previously unpaved surfaces. Some staging or landing areas (depending on the type of technology) may require land/vegetation clearing, excavation, and paving. These activities could result in direct or indirect injury to plants; the loss, alteration, or fragmentation of vegetative communities; and invasive species effects. Deployment of drones, balloons, blimps, or piloted aircraft could potentially impact terrestrial vegetation if launching or recovery occurs on vegetated areas. Impacts would be similar to deployment of COWs, COLTs, and SOWs.

In general, the abovementioned activities could potentially involve land/vegetation clearing; topsoil removal; excavation and trenching; construction of access roads; installation or restructuring of towers, poles, or cables; heavy equipment movement; installation of security/safety lighting and fencing; and deployment of aerial platforms. Potential impacts to terrestrial vegetation associated with deployment of this infrastructure, depending on their scale, could include direct or indirect injury/mortality to plants; the loss, alteration, or fragmentation of vegetative communities; and invasive species depending on the ecoregion, the species' phenology, and the nature and extent of the vegetation affected. Despite the variability, these impacts are expected to be less than significant at the programmatic level, due to the small-scale and limited geographic scope of expected deployment activities. Chapter 16, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, operational activities associated with the Preferred Alternative would consist of routine maintenance and inspection of the facilities. Any major infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the abovementioned deployment impacts. The terrestrial vegetation that would be affected would depend on the ecoregion, the species' phenology, and the nature and extent of the habitats affected.

It is anticipated that there would be no impacts to terrestrial vegetation associated with routine inspections of the Preferred Alternative, assuming that the same access roads used for deployment are also used for inspections because there would be no ground disturbance. Site maintenance, including mowing or herbicides, may result in less than significant effects at the programmatic level, due to the small-scale of expected activities. These potential impacts could result from accidental spills from maintenance equipment or release of herbicides and because these areas would not be allowed to revert to a more natural state. If usage of heavy equipment or land clearing activities occurs off established roads or corridors as part of routine maintenance or inspections, direct or indirect injury/mortality to plants; the loss, alteration, or fragmentation of vegetative communities; and invasive species could occur to terrestrial vegetation, however impacts are expected to be less than significant at the programmatic level, due to the small-scale of expected activities. Chapter 16, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Alternatives Impact Assessment

The following section assesses potential impacts to terrestrial vegetation associated with the Deployable Technologies Alternative and the No Action Alternative.

Deployable Technologies Alternative

Under the Deployable Technologies Alternative option, a nationwide fleet of mobile communications systems would provide temporary coverage in areas not covered by the existing, usable infrastructure. There would be no collocation of equipment and minimal new construction associated with wired or wireless projects discussed above under the Preferred Alternative. Some limited construction could be associated with implementation such as land clearing or paving for parking or staging areas. The specific infrastructure associated with the Deployable Technologies Alternative would be the same as the deployable technologies implemented as part of the Preferred Alternative but would likely be implemented in greater numbers, over a larger geographic extent, and used with greater frequency and duration. Therefore, potential impacts to terrestrial vegetation as a result of implementation of this alternative could be as described below.

<u>Deployment Impacts</u>

As described above, implementation of deployable technologies could result in less than significant impacts at the programmatic level from land/vegetation clearing, excavation, and paving activities. These activities could result in direct or indirect injury to plants; the loss, alteration, or fragmentation of vegetative communities; and invasive species effects. Greater frequency and duration of deployments could change the magnitude of impacts. Nonetheless, impacts are expected to remain less than significant at the programmatic level, due to the relatively small-scale of FirstNet activities at individual locations. Chapter 16, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Operational Impacts

As described above, operational activities would consist of implementation/running of the deployable technology and routine maintenance and inspections. The impacts could vary greatly among species, vegetative community, and geographic region, but are expected to remain less than significant at the programmatic level. As with the Preferred Alternative, at the programmatic level, it is anticipated that there would be less than significant impacts to terrestrial vegetation associated with routine operations and maintenance due to the relatively small scale of likely FirstNet project sites. Chapter 16, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

No Action Alternative

Under the No Action Alternative, the NPSBN would not be deployed; therefore, there would be no associated construction or installation of wired, wireless, deployable infrastructure or satellites and other technologies. As a result, there would be no impacts to terrestrial vegetation as a result of construction and operation of the Proposed Action. Environmental conditions would therefore be the same as those described in Section 8.1.6.3, Terrestrial Vegetation.

8.2.6.4 Wildlife

Impacts to amphibians and reptiles, terrestrial mammals, marine mammals, birds, and terrestrial invertebrates occurring in Louisiana and Louisiana's near offshore environment (i.e., less than two miles from the edge of the coast) are discussed in this section. Chapter 16, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Description of Environmental Concerns

Direct Injury/Mortality

Direct injury/mortality effects are physical injuries, extreme physiological stress, or death of an individual organism from interactions associated with the Proposed Action. The most common direct injuries are entanglement, vehicle or vessel strike, problems associated with accidental ingestion, and injuries incurred by sensitive animals from disturbance events.

Based on the impact significance criteria presented in Table 8.2.6-1, less than significant impacts would be anticipated at the programmatic level given that the majority of proposed deployment activities are likely to be small-scale and would be dependent on the location and type of deployment activity. Although anthropogenic disturbances may be measurable (although minimal) for some FirstNet projects, impacts to individual behavior of animals would be short-term and direct injury or mortality impacts at the population-level or sub-population effects would not likely be observed; therefore, at the programmatic level, impacts are generally expected to be less than significant, as discussed further below. Chapter 16, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Terrestrial Mammals

Vehicle strikes are common sources of direct mortality or injury to both small and large mammals in Louisiana. Mammals are attracted to roads for a variety of reasons including use as a source of minerals, foraging, and migration (FHWA, 2009). Individual injury or mortality as a result of vehicle strikes associated with the Proposed Action could occur.

Entanglement in fences or other barriers could be a source of mortality or injury to terrestrial mammals, though entanglements would likely be isolated, individual events.

For example, if tree-roosting bats, and particularly maternity colonies are present at a site location, removal of trees during land clearing activities could result in direct injury/mortality if bats are utilizing them as roost trees or for rearing young. The scale of this impact would be expected to be small-scale and would be dependent on the location and type of deployment activity, and the amount of tree removal. Site avoidance measures could be implemented to avoid disturbance to bats.

Marine Mammals

Marine mammals swimming or hauled out on land are sensitive to boats, aircraft, and human presence. Noises, smells, sounds, and sights may elicit a flight reaction. Trampling deaths associated with haulout disturbance are known source of mortality for seals but are not anticipated from likely FirstNet deployment activities.

Entanglements from marine debris as well as ingestion of marine debris could result in injury or death to marine mammals. Marine debris is any manmade object discarded, disposed of, or abandoned that enters the marine environment. Entanglements from marine debris are not anticipated from FirstNet activities.

The manatee species known to occur offshore of Louisiana is also protected under the ESA. Environmental consequences pertaining to these manatees are discussed in Section 8.2.6.6, Threatened and Endangered Species and Species of Conservation Concern.

Birds

Mortalities from collisions or electrocutions with manmade cables and wires are environmental concerns for avian species. Generally, collision events occur to night-migrating birds, “poor” fliers (e.g., ducks), night-migrating birds, heavy birds (e.g., swans and cranes), and birds that fly in flocks; while species susceptible to electrocution are birds of prey, ravens, and thermal soarers, typically having large wing spans (FAA 2012; Gehring, J., Kerlinger, P. and Manville, A. M. 2011).

Avian mortalities or injuries could also result from vehicle strikes, although typically occur as isolated events.

Direct injury and mortality of birds could occur to ground-nesting birds when nests are either disturbed or destroyed during land clearing, excavation and trenching, and other ground disturbing activities. Removal of trees during land clearing activities could also result in direct injury/mortality to forest dwelling birds if they are utilizing them as roost trees for resting or shelter from predators and inclement weather, or as nest trees for rearing young. The scale of this impact would be associated with the amount of tree removal and the abundance of forest-dwelling birds roosting/nesting in the area. These impacts could be particularly pronounced in IBAs within the state as these areas provide them with essential habitat that supports various life stages (Hill, 1997).

Direct mortality and injury to birds of Louisiana are not likely to be widespread or affect populations of species as a whole; individual impacts may be realized depending on the location and type of the deployment activity. Direct injury/mortality are not anticipated to be widespread or affect bird populations due to the small scale of likely FirstNet actions. If siting considerations and BMPs and mitigation measures are implemented (Chapter 16), potential impacts could be minimized. Additionally, potential impacts under MBTA and BGEPA could be addressed through BMPs and mitigation measures as defined through consultation with USFWS.

<u>Reptiles and Amphibians</u>

Some of Louisiana's reptiles and amphibians are widespread throughout the state, while some species are found only in specific environments. Direct mortality to amphibians or reptiles could occur in construction zones either by excavation activities or by vehicle strikes; however, these effects are expected to be temporary and isolated, affecting only individual animals.

Five species of marine turtles – all listed as threatened or endangered under the ESA – occur in Louisiana's offshore environment. Environmental consequences pertaining to these reptiles are discussed in Section 8.2.6.6, Threatened and Endangered Species and Species of Conservation Concern.

<u>Terrestrial Invertebrates</u>

The terrestrial invertebrate populations of Louisiana are so widely distributed that injury/mortality events are not expected to affect populations of species as a whole.

Vegetation and Habitat Loss, Alteration, or Fragmentation

As described in Section 8.2.6.3, habitat loss could occur through exclusion, directly or indirectly, preventing an animal from accessing an optimal habitat (e.g., breeding, forage, or refuge), either by physically preventing use of a habitat or by causing an animal to avoid a habitat, either temporarily or long-term. It is expected that activities associated with the Proposed Action would cause exclusion effects only in very special circumstances, as in most cases an animal could fly, swim, or walk to a nearby area that would provide refuge.

In general, potential effects of vegetation and habitat loss, alteration, or fragmentation are expected to be less than significant at the programmatic level, because of the small-scale nature and limited geographic scope of expected deployment activities. These potential impacts are described for Louisiana's wildlife species below. Chapter 16, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Terrestrial Mammals

Mammals occupy a wide range of habitats throughout Louisiana and may experience localized effects of habitat loss or fragmentation. Removal or loss of vegetation may impact large mammals (e.g., black bears) by decreasing the availability of forest for cover from predators or foraging. Loss of cover may increase predation on both breeding adults as well as their young. The loss, alteration, or fragmentation of forested habitat would also impact some small mammals (e.g., bats, foxes) that utilize these areas for roosting, foraging, sheltering, and for rearing their young. Loss of habitat or exclusions from these areas could be avoided or minimized by BMPs and mitigation measures (see Chapter 16).

Marine Mammals

The West Indian manatee regularly inhabits Louisiana's tidal waters. Manatees often use secluded canals, creeks, embayments, and lagoons, particularly near the mouths of coastal rivers and sloughs, for feeding, resting, mating, and calving (USFWS, 2001a). Manatees could be temporarily excluded from a resource due to the presence of humans, noise, or vessel traffic during deployment activities. Effects on manatees from exclusion from resources would be low magnitude and temporary in duration.

Loss of habitat or exclusions from these areas for manatees and whales could be avoided or minimized by BMPs and mitigation measures (see Chapter 16). Environmental consequences pertaining to the endangered whales and West Indian manatee protected under the ESA are discussed in Section 8.2.6.6, Threatened and Endangered Species and Species of Conservation Concern.

Birds

The direct removal of migratory bird nests is prohibited under the MBTA. The USFWS and the LDFW provide regional guidance on the most critical periods (e.g., breeding season) to avoid vegetation clearing. The removal and loss of vegetation could affect avian species directly by loss of nesting, foraging, stopover, and cover habitats.

Noise disturbance and human activity, as discussed previously, could directly restrict birds from using their preferred resources. Greater human activity of longer duration would increase the likelihood that birds would avoid the area, possibly being excluded from essential resources.

These impacts could be particularly pronounced if birds temporarily avoid IBAs within the state as these areas provide them with essential habitat that supports various life stages (Hill, 1997).

The degree to which habitat exclusion affects birds depends on many factors. The impact to passerine[126] species from disturbance or displacement from construction activities is likely to be short-term with minor effects from exclusion. Exclusion from resources concentrated in a small migratory stop area during peak migration could have major impacts to species that migrate in large flocks and concentrate at stopovers (e.g., shorebirds). BMPs and mitigation measures, including nest avoidance during construction-related activities, would help to avoid or minimize the potential impacts to birds from exclusion of resources, as appropriate.

Reptiles and Amphibians

Important habitats for Louisiana's amphibians and reptiles typically consist of wetlands and, in some cases as with the timber rattlesnake, the surrounding upland forest. Impacts are expected to be less than significant at the programmatic level, given the short-term nature and limited geographic scope of individual activities. If proposed project sites were unable to avoid sensitive areas, BMPs and mitigation measures (see Chapter 16) would be implemented to avoid or minimize the potential impacts.

Filling or draining of wetland breeding habitat (see Section 8.2.4, Water Resources) and alterations to ground or surface water flow from development associated with the Proposed Action may also have effects to Louisiana's amphibian and reptile populations, though BMPs and mitigation measures would help to avoid or minimize the potential impacts.[127]

Terrestrial Invertebrates

Habitat loss and degradation are the most common causes of invertebrate species' declines; however, habitat for many common terrestrial invertebrates is generally assumed to be abundant and widely distributed across the state, therefore no significant effects to terrestrial invertebrates are expected. Impacts to sensitive invertebrate species are discussed below in Section 8.2.6.6, Threatened and Endangered Species and Species of Concern.

Indirect Injury/Mortality

Indirect injury/mortality impacts vary depending on the species, time of year and duration of deployment. Overall, impacts are expected to remain less than significant at the programmatic level, due to the short-term nature and limited geographic scope of expected activities, though BMPs and mitigation measures could further help to avoid or minimize the potential impacts. Chapter 16, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

[126] Passerines are an order of "perching" birds that have four toes, three facing forward and one backward, which allows the bird to easily cling to both horizontal and nearly vertical perches.
[127] See Section 16.2.5, Wetlands, for a discussion of BMPs for wetlands.

<u>Terrestrial Mammals</u>

Stress from repeated disturbances during critical time periods (e.g., roosting and mating) could reduce the overall fitness and productivity of young and adult terrestrial mammals. Indirect effects could occur to roosting bats from noise, light, or human disturbance causing them to leave their roosting locations or excluding them from their summer roosting/maternity colony roosts. For example, some bat species establish summer roosting or maternity colonies in the same general area that they return to year and after year. The majority of FirstNet deployment activities would be short-term in nature, and repeated disturbances would not occur.

<u>Marine Mammals</u>

Repeated disturbance (e.g., from vessel traffic) could cause stress to individuals resulting in lower fitness and productivity. At the programmatic level, given that the majority of FirstNet deployment activities are not expected to be offshore or in the oceanic environment, less than significant impacts to no impacts would be anticipated for marine mammals.

<u>Birds</u>

Repeated disturbance, especially during the breeding and nesting season, could cause stress to individuals lowering fitness and productivity. These impacts could be particularly pronounced in IBAs within the state if birds temporarily avoid those areas, since they provide essential habitat for various life stages. The majority of FirstNet deployment activities would be short-term in nature, and repeated disturbances would not occur.

<u>Reptiles and Amphibians</u>

Changes in water quality, especially during the breeding seasons, could cause stress resulting in lower productivity. The majority of FirstNet deployment activities would be short-term in nature, and repeated disturbances would not occur.

<u>Terrestrial Invertebrates</u>

Terrestrial invertebrates could experience chronic stress, either by changes in habitat composition or competition for resources, resulting in lower productivity. Due to the large number of invertebrates distributed throughout the state, and given the short-term nature of most of the deployment activities, this impact would likely be less than significant at the programmatic level.

Effects to Migration or Migratory Patterns

Migration is the regular movement of animals from one region to another and back again. Migratory patterns vary by species and sometimes within the same species. Overall, potential impacts are anticipated to be less than significant at the programmatic level, due to the small-scale and localized nature of expected activities, which would be unlikely to result in long-term avoidance. Potential effects to migration patterns of Louisiana’s amphibians and reptiles, terrestrial mammals, marine mammals, birds, and terrestrial invertebrates are described below.

Chapter 16, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Terrestrial Mammals

Some large mammals (e.g., black bears) will perform short seasonal migrations between foraging/breeding habitats and denning habitats. Some small mammals (e.g., bats) also have migratory routes that include spring and fall roosting areas between their summer maternity roosts and hibernacula.[128]

Any clearance, drilling, and construction activities needed for network deployment, including noise associated with these activities, has the potential to divert mammals from these migratory routes. Impacts could vary depending on the species, time of year of construction/operation, and duration, but are generally expected to be less than significant at the programmatic level. BMPs and mitigation measures could help to further avoid or minimize the potential impacts.

Marine Mammals

Noise associated with the installation of cables in the near/offshore waters of coastal Louisiana could impact marine mammal migration patterns, though impacts are likely to be short-term provided the noise sources are not wide ranging and below Level A and B sound exposure thresholds.[129] Marine mammals have the capacity to divert from sound sources during migration, and therefore impacts are expected to be less than significant at the programmatic level, since noise generating activities would be of short duration and are not likely to result in long-term avoidance. BMPs and mitigation measures could help to further avoid or minimize the potential impacts.

Birds

Because many birds have extremely long migrations, protection efforts for critical sites along migratory routes must be coordinated over distances often involving many different countries. For example, as a group, shorebirds migrating through Louisiana undertake some of the longest-distance migrations of all animals. Louisiana is at the southernmost edge of the Mississippi Flyway, which spans from breeding grounds in Canada and the northern United States to Gulf of Mexico and South American wintering locations. Over 325 species of birds utilize this flyway during their annual migrations northward in the spring and southward in the fall. Audubon staff have worked with the Baton Rouge Audubon Society, Orleans Audubon Society and the Louisiana Bird Resource Center to identify and map 23 IBAs in Louisiana (Louisiana Audubon Society 2015). Many migratory routes are passed from one generation to the next. Impacts could vary (e.g., mortality of individuals or abandonment of stopover sites by whole flocks)

[128] A location chosen by an animal for hibernation.

[129] Level A: 190 dB re 1µPa (rms) for seals and 180 dB re 1µPa (rms) for whales, dolphins, and porpoises. It is the minimum exposure criterion for injury at the level at which a single exposure is estimated to cause onset of permanent hearing loss. Level B: 160 dB re 1µPa (rms). It is defined as the onset of significant behavioral disturbance is proposed to occur at the lowest level of noise exposure that has a measurable transient effect on hearing (Southall, et al., 2007).

depending on the species, time of year of construction/operation, and duration, and impacts are expected to be less than significant at the programmatic level. BMPs and mitigation measures could help to further avoid or minimize effects to migratory pathways.

Reptiles and Amphibians

Several species of salamanders and frogs are known to migrate seasonally in Louisiana. For example, wood frogs use diverse vegetation types from grassy meadows to open forests. After they emerge from dormancy, wood frogs migrate up 900 feet to breeding pools, where they breed rapidly in early spring in permanent or ephemeral water (Homan, et al. 2010). Mortality and barriers to movement could occur as result of the Proposed Action (Berven & Grudzien 1990; Calhoun & DeMaynadier 2007).

Species that use streams as dispersal or migratory corridors may be impacted if these waterways are restricted or altered, but impacts are expected to be less than significant at the programmatic level. BMPs and mitigation measures could help to further avoid or minimize the potential impacts.

Terrestrial Invertebrates

The proposed deployment activities would be expected to be short-lived or temporary in nature. No effects to migratory patterns of Louisiana's terrestrial invertebrates are expected as a result of the Proposed Action.

Reproductive Effects

Reproductive effects are considered those that either directly or indirectly reduce an animal's ability to produce offspring or reduce the rates of growth, maturation, and survival of offspring, which could affect the overall population of individuals. Overall, potential impacts are anticipated to be less than significant at the programmatic level, due to the short-term and limited nature of expected activities. Chapter 16, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Terrestrial Mammals

Restricted access to important winter hibernacula or summer maternity roosts for bats and dens for large mammals, such as black bears, has the potential to affect negatively body condition and reproductive success of mammals in Louisiana.

Disturbance from deployment and operations could also result in the abandonment of offspring leading to reduced survival, although these activities are expected to be small-scale and impacts are expected to be less than significant at the programmatic level. Reproductive effects as a result of displacement and disturbance could be minimized with BMPs and mitigation measures.

Marine Mammals

Although unlikely, the displacement of female seals from preferred pupping habitats due to deployment and operations may reduce fitness and survival of pups potentially affecting overall productivity, though activities are likely to be small-scale in nature and contribute only minimally to minor, short-term displacement, and BMPs and mitigation measures could help to avoid or minimize the potential impacts.

Disturbance to marine mammals from activities associated with the Proposed Action could result in the abandonment, or death of offspring, though BMPs and mitigation measures would help to avoid or minimize the potential impacts.

Birds

Impacts due to Proposed Action deployment and operations could include abandonment of the area and nests due to disturbance. Disturbance (visual and noise) may displace birds into less suitable habitat and thus reduce survival and reproduction. These impacts could be particularly pronounced in IBAs within the state if birds temporarily avoid those areas, since they provide essential habitat for various life stages (Hill, 1997). The majority of FirstNet deployment or operation activities are likely to be small-scale and temporary. Applicable BMPs and mitigation measures, as defined through consultation with USFWS for MBTA or BGEPA, if required, could help to avoid or minimize any potential impacts. Environmental consequences pertaining to federally listed species will be discussed in Section 8.2.6.6, Threatened and Endangered Species.

Reptiles and Amphibians

Reproductive effects to reptile nests may occur through direct loss or disturbance of nests. For example, the hawksbill sea turtle travels from its habitat in shallow coastal waters to remote nesting sites on beaches in the Gulf of Mexico and Caribbean (NOAA, 2015e). This travel could expose the turtles to disturbance while on their way to nesting, thereby adversely impacting their reproduction.

Reproductive effects to sub-populations of amphibians and reptiles may occur through the direct loss of vernal pools as breeding habitat if deployment activities occur near breeding pools, or alter water quality through sediment infiltration, or obstruction of natural water flow to pools, though BMPs would help to avoid or minimize the potential impacts.

Terrestrial Invertebrates

The majority of FirstNet deployment or operation activities are likely to be short-term in nature; therefore, no reproductive effects to terrestrial invertebrates are expected as a result of the Proposed Action.

Invasive Species Effects

When human activity results in a species entering an ecosystem new to it, the species is classified as introduced or invasive. The introduction of invasive species could have a dramatic effect on natural resources. The LDWF and other conservation organizations monitor and work to control the spread of invasive wildlife species in critical habitats and natural communities in Louisiana. There are two mammal species identified as invasive in Louisiana: the nutria rat and feral hogs.

FirstNet deployment or operation activities could result in short-term or temporary changes to specific project sites, although these sites are expected to return to their natural state in a year or two. Invasive species are not expected to be introduced to project sites as part of the deployment activities from machinery or construction workers. Therefore, potential impacts are expected to be less than significant at the programmatic level.

Potential invasive species effects to Louisiana's wildlife are described below.

Terrestrial Mammals

In Louisiana, feral hogs adversely impact several native large and small mammals, including turkey, squirrels, and deer. They feed on young mammals, destroy native vegetation resulting in erosion and water resource concerns, and could carry/transmit disease to livestock and humans (LDWF, 2014c).

FirstNet deployment or operation activities could result in short-term or temporary changes to specific project sites, although these sites are expected to return to their natural state in a year or two. FirstNet deployment activities are not expected to introduce terrestrial mammal species to project sites as these activities are temporary and would not provide a mechanism for transport of invasive terrestrial mammals to project sites from other locations.

Marine Mammals

Proposed FirstNet deployment activities near water would likely occur onshore with limited activities in the water; therefore, the introduction of non-native species would not occur.

Birds

FirstNet deployment activities could result in short-term or temporary changes to specific project sites although these sites are expected to return to their natural state in a year or two. Invasive bird species are not expected to be introduced at project sites as part of the deployment activities from machinery or construction workers.

Reptiles and Amphibians

Although FirstNet deployment activities could result in short-term or temporary changes to specific project sites, these sites are expected to return to their natural state in a year or two. Invasive reptile or amphibian species are not expected to be introduced at project sites from machinery or laborers during deployment operations.

Terrestrial Invertebrates

Terrestrial invertebrate populations are susceptible to invasive plant species that may change or alter the community composition of specific plants on which they depend. Effects from invasive plant species to terrestrial invertebrates would be similar to those described for habitat loss and degradation.

Invasive insects pose a threat to Louisiana's forest and agricultural resources. The potential to introduce invasive invertebrates within construction zones and during long-term site maintenance could occur from vehicles and equipment being transported from one region to another, or when conducting revegetation of a site after deployment activities are complete. BMPs and mitigation measures could help to avoid or minimize the potential for introducing invasive terrestrial invertebrate species during implementation of the Proposed Action. Invasive species effects related to terrestrial invertebrates could be minimized with the implementation of BMPs and mitigation measures (Chapter 16).

Potential Impacts of the Preferred Alternative

The following section assesses potential impacts associated with implementation of the Preferred Alternative, including construction/deployment and operational activities.

Deployment Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, implementation of the Preferred Alternative could result in the deployment of various types of facilities or infrastructure. Depending on the physical nature and location of the facility/infrastructure and the specific deployment requirements, some activities would result in potential impacts to wildlife resources and others would not. In addition, and as described in this section, infrastructure developed under the Preferred Alternative could result in a range of impacts, from no impacts to less than significant impacts, depending on the deployment scenario or site-specific conditions. The wildlife that would be affected would depend on the ecoregion, the species' phenology and the nature and extent of the habitats affected. Chapter 16, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

<u>Activities Likely to Have No Impacts</u>

Of the types of facilities or infrastructure deployment scenarios described in Section 2.1.2, Proposed Action Infrastructure, the following are expected to have no impacts to wildlife resources under the conditions described below:

- Wired Projects
  - Use of Existing Conduit – New Buried Fiber Optic Plant: Disturbance associated with the installation of fiber optic cable in existing conduit would be limited to entry and exit points of the existing conduit in previously disturbed areas. Noise generated by equipment required to install fiber would be infrequent and of short duration, and unlikely to produce measurable changes in wildlife behavior. It is anticipated that effects to wildlife would be temporary and would not result in any perceptible change.

  - Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting up of dark fiber would have no impacts on wildlife resources because there would be no ground disturbance.
- Satellites and Other Technologies
  - Satellite-Enabled Devices and Equipment: It is anticipated that the installation of permanent equipment on existing structures, attaching equipment to satellites launched for other purposes, and the use of portable devices that use satellite technology would not impact wildlife because those activities would not require ground disturbance.
  - Deployment of Satellites: FirstNet does not anticipate launching satellites as part of the deployment of the NPSBN; however, it may include equipment on satellites that are already being launched for other purposes. As adding equipment to an existing launch vehicle would be very unlikely to impact wildlife resources, it is anticipated that this activity would have no impact on wildlife resources.

Activities with the Potential to Have Impacts

Potential deployment-related impacts to wildlife resources as a result of implementation of the Preferred Alternative would encompass a range of impacts that could occur, including direct injury/mortality; vegetation and habitat loss, alteration, or fragmentation; effects to migratory patterns; indirect injury/mortality; reproductive effects; and invasive species effects. The types of infrastructure development scenarios or deployment activities that could be part of the Preferred Alternative and result in potential impacts to wildlife resources include the following:

- Wired Projects
  - New Build – Buried Fiber Optic Plant: Plowing, trenching, or directional boring and the construction of POPs, huts, or other associated facilities or hand-holes to access fiber could result in potential impacts to wildlife resources. Land/vegetation clearing and excavation activities, associated with construction of POPs, huts, or other associated facilities could result in direct injury/mortalities of wildlife that are not mobile enough to avoid construction activities (e.g., reptiles, small mammals, and young individuals), that utilize burrows (e.g., ground squirrels), or that are defending nest sites (such as ground-nesting birds). Disturbance, including noise, associated with the above activities involving heavy equipment or land clearing could result in habitat loss, effects to migration patterns, indirect injury/mortality, reproductive effects, and invasive species effects. Implementation of BMPs and mitigation measures could help to avoid or minimize potential impacts.
  - New Build – Aerial Fiber Optic Plant: The installation of new poles and hanging cable and associated security, safety, or public lighting components on public ROWs or private easements as well as the construction of access roads, POPs, huts, or facilitates to house outside plant equipment could result in potential impacts to wildlife resources. Impacts may vary depending on the number or individual poles installed and the extent of ground disturbance, but could include direct injury/mortality of individuals as described above;

habitat loss, alteration, or fragmentation; effects to migratory patterns; indirect injury/mortality; and invasive species effects.

- Collocation on Existing Aerial Fiber Optic Plant: Land clearing and excavation during replacement of poles and structural hardening could result in direct injury/mortality, habitat loss or alteration, effects to migratory patterns, indirect injury/mortality, and invasive species effects. Noise disturbance from heavy equipment use associated with these activities as well as with installing new fiber on existing poles could result in migratory effects and indirect injury/mortality.
- New Build – Submarine Fiber Optic Plant: The installation of cables in limited nearshore or inland bodies of water and construction of landings and/or facilities on the shores or the banks of waterbodies that accept submarine cables could potentially impact wildlife, marine mammals in particular (see Section 8.2.4, Water Resources, for a discussion of potential impacts to water resources). Potential effects could include direct injury/mortality, habitat loss, alteration, or fragmentation depending on the site location. If activities occurred during critical time periods, effects to migratory patterns as well as reproductive effects and indirect injury/mortality could occur.
- Installation of Optical Transmission or Centralized Transmission Equipment: If installation of transmission equipment required construction of access roads, trenching, and/or land clearing, such disturbance could result in direct injury/mortality of wildlife as described for other New Build activities. Habitat loss, alteration and fragmentation; effects to migration or migratory patterns, indirect injury/mortality, and invasive species effects could occur as a result of construction and resulting disturbance.

- Wireless Projects
  - New Wireless Communication Towers: Installation of new wireless towers and associated structures (e.g., generators, equipment sheds, fencing, security and aviation lighting, electrical feeds, and concrete foundations and pads) or access roads could result in impacts to wildlife resources. Land/vegetation clearing, excavation activities, landscape grading, and other disturbance activities during the installation of new wireless towers and associated structures or access roads could result in direct injury/mortality, habitat loss, alteration or fragmentation, and effects to migratory patterns. Security lighting and fencing could result in direct and indirect injury or mortality, effects to migratory patterns, as well as reproductive effects. For a discussion of radio frequency emissions, refer to Section 2.4, Radio Frequency Emissions.
  - Collocation on Existing Wireless Tower, Structure, or Building: Collocation would involve mounting or installing equipment (such as antennas or microwave dishes) on an existing tower, which would not result in impacts to wildlife. However, if a new power unit, replacement tower, or structural hardening is required, impacts would be similar to new wireless construction. For a discussion of radio frequency emissions, refer to Section 2.4, Radio Frequency Emissions.

- Deployable Technologies: Implementation of deployable technologies including COWs, COLTs, or SOWs could result in direct injury/mortalities to wildlife on roadways. If external generators are used, noise disturbance could potentially impact migratory patterns of wildlife. RF hazards could result in indirect injury or mortality as well as reproductive effects depending on duration and magnitude of operations. For a discussion of RF emissions, refer to Section 2.4, Radio Frequency Emissions. Deployment of drones, balloons, blimps, or piloted aircraft could potentially impact wildlife by direct or indirect injury/mortality from collision, entanglement or ingestion and effects to migratory patterns and reproductive effects from disturbance and/or displacement due to noise. The magnitude of these effects depends on the timing and frequency of deployments. However, deployment activities are expected to be temporary and isolated, and likely affecting only a small number of wildlife.

In general, the abovementioned activities could potentially involve land/vegetation clearing; excavation and trenching; construction of access roads; installation or restructuring of towers or poles; installation of security/safety lighting and fencing; and deployment of aerial platforms. Potential impacts to wildlife resources associated with deployment of this infrastructure are anticipated to be less than significant at the programmatic level given the small-scale of likely individual FirstNet projects; however, some deployment activities could include direct injury/mortality, habitat loss, indirect injury/mortality, effects to migration, reproductive effects, and effects of invasive species depending on the project type, location, ecoregion, the species' phenology, and the nature and extent of the habitats affected. As stated above, these impacts would likely be limited to individual wildlife species and unlikely to cause population-level impacts, and are therefore expected to remain less than significant at the programmatic level. Proposed FirstNet actions at some specific individual sites may have a higher level of impacts due to location-specific conditions, and therefore those proposed activities would undergo site-specific environmental review. Chapter 16, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, operational activities associated with the Preferred Alternative would consist of routine maintenance and inspection of the facilities. Any major infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the abovementioned deployment impacts. The wildlife that would be affected would depend on the ecoregion, the species' phenology, and the nature and extent of the habitats affected.

It is anticipated that there would be less than significant impacts to wildlife resources at the programmatic level associated with routine inspections and maintenance of the Preferred Alternative. Site inspections and maintenance would be infrequent, including mowing or limited application of herbicides, may result in less than significant effects at the programmatic level to wildlife including direct injury/mortality to less mobile wildlife, or exposure to contaminants from accidental spills from maintenance equipment or release of pesticides. Potential spills of these materials would be expected to be in small quantities.

During operations, direct injury/mortality of wildlife could occur from collisions and/or entanglements with transmission lines, towers, and aerial platforms.

Wildlife resources could still be affected by the reduction in habitat quality associated with habitat fragmentation from the presence of access roads, transmission corridors, and support facilities. These features could also continue to disrupt movements of terrestrial wildlife, particularly during migrations between winter and summer ranges or in calving areas.

In addition, the presence of new access roads and transmission line ROWs may increase human use of the surrounding areas, which could increase disturbance to wildlife resulting in effects to migratory pathways, indirect injury/mortalities, reproductive effects, as well as the potential introduction and spread of invasive species as explained above. As stated above, these impacts would likely be limited to individuals and unlikely to cause population-level impacts, and therefore would likely be less than significant at the programmatic level given the short-term nature and limited geographic scope for individual activities. Chapter 16, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Alternatives Impact Assessment

The following section assesses potential impacts to wildlife resources associated with the Deployable Technologies Alternative and the No Action Alternative.

Deployable Technologies Alternative

Under the Deployable Technologies Alternative option, a nationwide fleet of mobile communications systems would provide temporary coverage in areas not covered by the existing, usable infrastructure. There would be no collocation of equipment and minimal new construction associated with wired or wireless projects discussed above under the Preferred Alternative. Some limited construction could be associated with implementation such as land clearing or paving for parking or staging areas. The specific infrastructure associated with the Deployable Technologies Alternative would be the same as the deployable technologies implemented as part of the Preferred Alternative but would likely be implemented in greater numbers, over a larger geographic extent, and used with greater frequency and duration. Therefore, potential impacts to wildlife resources as a result of implementation of this Alternative could be as described below.

<u>Deployment Impacts</u>

As described above, implementation of deployable technologies could result in less than significant impacts from direct and indirect injury or mortality events, changes in migratory patterns, disturbance, or displacement. Greater frequency and duration of deployments could change the magnitude of impacts depending on species, life history, and region of the state. However, impacts are expected to remain less than significant at the programmatic level because deployment activities are expected to be temporary and localized, likely affecting only a small number of wildlife. Chapter 16, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Operational Impacts

As described above, operational activities would consist of implementation/running of the deployable technology and routine maintenance and inspections. As with the Preferred Alternative, it is anticipated that there would be less than significant impacts at the programmatic level because deployable activities are expected to be temporary and likely affecting only a small number of wildlife. Proposed FirstNet actions at specific individual sites may have a higher level of impacts due to location-specific conditions, and therefore those proposed activities would undergo site-specific environmental review. Chapter 16, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

No Action Alternative

Under the No Action Alternative, the nationwide, interoperable, public safety broadband network would not be deployed; therefore, there would be no associated construction or installation of wired, wireless, deployable infrastructure or satellites and other technologies. As a result, there would be no impacts to wildlife resources as a result of construction and operation of the Proposed Action. Environmental conditions would therefore be the same as those described in Section 8.1.6.4, Terrestrial Wildlife.

8.2.6.5 Fisheries and Aquatic Habitats

Impacts to fisheries and aquatic habitats occurring in Louisiana and Louisiana's near offshore environment are discussed in this section. Chapter 16, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Description of Environmental Concerns

Direct Injury/Mortality

The most common direct injuries are entanglement, vessel strike, problems associated with accidental ingestion, and injuries incurred by sensitive animals from disturbance events (USEPA 2012).

Based on the impact significance criteria presented in Table 8.2.6-1, less than significant impacts would be anticipated at the programmatic level given the majority of proposed deployment activities are likely to be small-scale and would be dependent on the location and type of deployment activity. Although anthropogenic disturbances may be measurable (although minimal) for some FirstNet projects, direct injury or mortality impacts at the population-level or sub-population effects would not likely be observed. BMPs and mitigation measures could help to avoid or minimize potential impacts to fisheries and aquatic invertebrate population survival.

Vegetation and Habitat Loss, Alteration, or Fragmentation

As with all of the effects categories, the magnitude of the impact depends on the duration, location, and spatial scale of the system and associated activities. Habitat fragmentation is the breaking down of continuous and connected habitat, and impeding access to resources and mates.

Depending on the location, construction of new infrastructure and long-term facility maintenance could result in the shoreline habitat alteration in localized areas; in some instances, the permanent loss of riparian vegetation could occur, which could lead to water quality impacts and in turn aquatic habitat alteration. Habitat loss is not likely to be widespread or affect populations of species as a whole; fish species would be expected to swim to a nearby location depending on the nature of the deployment activity. Therefore, potential impacts are expected to be less than significant at the programmatic level. Additionally, deployment activities with the potential for impacts under the MSFCMA or other sensitive aquatic habitats could be addressed through BMPs and mitigation measures, as defined through consultation with the appropriate resource agency.

Indirect Injury/Mortality

Erosion or sedimentation from land clearing and excavation activities near or within riparian areas, floodplains, wetlands, streams, and other aquatic habitats could have potential impacts on water quality. Exposure to contaminants from accidental spills from vehicles and equipment could also potentially affect water quality. These potential effects could result in changes to habitat, food sources, or prey resulting in indirect mortality/injury to fish and aquatic invertebrates. Filter feeding invertebrates of Louisiana, such as the Sandbank Pocketbook (*Lampsilis satura*), can be vulnerable to such effects (LDWF, 2006g). Indirect injury/mortality impacts vary depending on the species, time of year, and duration of deployment. Nonetheless, these impacts are expected to be less than significant at the programmatic level, due to the short-term nature and limited geographic scope of deployment activities. BMPs and mitigation measures to protect water resources (see Section 8.2.4, Water Resources) could help to minimize or avoid potential impacts.

Effects to Migration or Migratory Patterns

Migration is the regular movement of animals from one region to another and back again. Migratory patterns vary by species and sometimes within the same species. For example, restrictions or alterations to waterways could alter migration patterns, limit fish passage, or affect foraging and spawning site access, such as the various anadromous fish in Louisiana, such as the striped bass that initially spawned in the Mississippi and Atchafalaya Rivers (LDWF, 2016b) (GSMFC, 1990). FirstNet deployment impacts are anticipated to be localized and at a small-scale, and would vary depending on the species, time of year, and duration of deployment. Impacts would vary depending on the species, time of year, and duration of deployment, but would be localized and small-scale, and therefore are expected to be less than significant at the programmatic level. BMPs and mitigation measures could help to further avoid or minimize the potential impacts.

Reproductive Effects

Reproductive effects are those that either directly or indirectly reduce an animal's ability to produce offspring or reduce the rates of growth, maturation, and survival of offspring, which could affect the overall population of individuals. Restrictions to spawning/breeding areas for fish and aquatic invertebrates and the alteration of water quality through sediment infiltration, obstruction of natural water flow, or loss of submerged vegetation resulting from the deployment of various types of infrastructure, are not anticipated, and therefore impacts are expected to be less than significant at the programmatic level. BMPs and mitigation measures could help to further avoid or minimize any potential impacts.

Invasive Species Effects

The potential to introduce invasive plants within construction zones could occur from vessels and equipment being transported from one region to another. FirstNet deployment activities could result in short-term or temporary changes to specific project sites and these sites are expected to return to their natural state in a year or two. Invasive species are not expected to be introduced to project sites as part of the deployment activities from machinery or construction workers due to the application of BMPs and mitigation measures. Therefore, impacts are anticipated to be less than significant at the programmatic level. BMPs and mitigation measures could help to avoid or minimize the potential for introducing invasive aquatic plant and animal species during implementation of the Proposed Action.

Potential Impacts of the Preferred Alternative

The following section assesses potential impacts associated with implementation of the Preferred Alternative, including construction/deployment and operational activities.

Deployment Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, implementation of the Preferred Alternative could result in the deployment of various types of facilities or infrastructure. Depending on the physical nature and location of the facility/infrastructure and the specific deployment requirements, some activities would result in potential impacts to fisheries and aquatic habitats and others would not. In addition, and as explained in this section, the same type of Proposed Action infrastructure could result in a range of no impacts to less than significant impacts at the programmatic level, depending on the deployment scenario or site-specific conditions. The fisheries and aquatic habitats that would be affected would depend on the ecoregion, the species' phenology, and the nature and extent of the habitats affected. Chapter 16, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Activities Likely to Have No Impacts

Of the types of facilities or infrastructure deployment scenarios described in Section 2.1.2, Proposed Action Infrastructure, the following are expected to have no impacts to fisheries and aquatic habitats under the conditions described below:

- Wired Projects
  - Use of Existing Conduit – New Buried Fiber Optic Plant: Disturbance, including noise, associated with the installation of fiber optic cable in existing conduit would be limited to entry and exit points of the existing conduit in previously disturbed areas. It is anticipated that effects to fisheries and aquatic habitats would be temporary and would not result in any perceptible change.
  - Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting up of dark fiber would have no impacts to fisheries and aquatic habitats because there would be no ground disturbance.
- Satellites and Other Technologies
  - Satellite-Enabled Devices and Equipment: It is anticipated that the installation of permanent equipment on existing structures and the use of portable devices that use satellite technology would not impact fisheries and aquatic habitats because those activities would not require ground disturbance.
  - Deployment of Satellites: FirstNet does not anticipate launching satellites as part of the deployment of the NPSBN; however, it could include equipment on satellites that are already being launched for other purposes. As adding equipment to an existing launch vehicle would be very unlikely to impact fisheries, it is anticipated that this activity would have no impact on the aquatic environment.

Activities With the Potential to Have Impacts

Potential deployment-related impacts to fisheries and aquatic habitats as a result of implementation of the Preferred Alternative would encompass a range of impacts that could occur, including direct injury/mortality; vegetation and habitat loss, alteration, or fragmentation; effects to migratory patterns; indirect injury/mortality; reproductive effects; and invasive species effects. The types of infrastructure deployment activities that could be part of the Preferred Alternative and result in potential impacts to fisheries and aquatic habitats include the following:

- Wired Projects
  - New Build – Buried Fiber Optic Plant: Plowing, trenching, or directional boring and the construction of POPs, huts, or other associated facilities or hand-holes to access fiber could result in potential impacts to fisheries and aquatic habitats. Land/vegetation clearing and excavation activities, associated with construction of POPs, huts, or other associated facilities, particularly if they occur adjacent to water resources that support fish, could result in habitat loss, alteration and fragmentation; indirect injury/mortality; and invasive species effects.

- New Build – Aerial Fiber Optic Plant: The installation of new poles and hanging cable and associated security, safety, or public lighting components on public ROWs or private easements as well as the construction of access roads, POPs, huts, or facilitates to house outside plant equipment could result in potential impacts to fisheries and aquatic habitats if activities occur near water resources that support fish. Impacts may vary depending on the number or individual poles installed or if access roads or stream crossings are needed, but could include habitat loss, alteration and fragmentation; indirect injury/mortality; and invasive species effects.
- Collocation on Existing Aerial Fiber Optic Plant: Land clearing and excavation during replacement of poles and structural hardening could, if conducted near water resources that support fish, result in habitat loss, alteration and fragmentation; indirect injury/mortality; and invasive species effects.
- New Build – Submarine Fiber Optic Plant: The installation of cables in limited nearshore and inland bodies of water and construction of landings and/or facilities on the shores or the banks of waterbodies that accept submarine cables could result in direct injury/mortalities of fisheries and aquatic invertebrates that are not mobile enough to avoid construction activities (e.g., mussels), that utilize burrows (e.g., crayfish), or that are defending nest sites (some fish). Disturbance, including noise, associated with the above activities could result in habitat loss, effects to migration patterns, indirect injury/mortality, reproductive effects, and invasive species effects.
- Installation of Optical Transmission or Centralized Transmission Equipment: If installation of transmission equipment required construction of access roads, trenching, and/or land clearing, particularly near water resources that support fish, such disturbance could result in habitat loss, alteration and fragmentation; indirect injury/mortality, and invasive species effects.

- Wireless Projects
  - New Wireless Communication Towers: Installation of new wireless towers and associated structures (generators, equipment sheds, fencing, security and aviation lighting, electrical feeds, and concrete foundations and pads) or access roads could result in impacts to fisheries and aquatic habitats, if such actions were deployed near water resources. Land/vegetation clearing, excavation activities, landscape grading, and other disturbance activities during the installation of new wireless towers and associated structures or access roads, particularly if they occur near waterbodies, could result in habitat loss or indirect injury/mortality, and invasive species effects, although highly unlikely. Refer to Section 2.4, Radio Frequency Emissions, for more information on RF emissions.
  - Collocation on Existing Wireless Tower, Structure, or Building: Collocation would involve mounting or installing equipment (such as antennas or microwave dishes) on an existing tower that would not result in impacts to fisheries and aquatic habitats. However, if new power units, replacement towers, structural hardening, or physical security measures required ground disturbance, impacts would be similar to new wireless

construction. For a discussion of radio frequency emissions, refer to Section 2.4, Radio Frequency Emissions.

- Deployable Technologies: Implementation of deployable technologies including COWs, COLTs, or SOWs could result in habitat loss, alteration and fragmentation; indirect injury/mortality, and invasive species effects if new access roads or other ground disturbing activities are necessary that generate erosion, sedimentation, or water quality impacts. For a discussion of radio frequency emissions, refer to Section 2.4, Radio Frequency Emissions. Deployment of drones, balloons, blimps, or piloted aircraft could potentially impact fisheries and aquatic habitat if deployment occurs within or adjacent to water resources. The magnitude of these effects depends on the timing and frequency of deployments, and could result in result in habitat loss, alteration and fragmentation; indirect injury/mortality, and invasive species effects.

In general, the abovementioned activities could potentially involve land/vegetation clearing; excavation and trenching; construction of access roads; installation or restructuring of towers, poles, or underwater cables; installation of security/safety lighting and fencing; and deployment of aerial platforms. Potential impacts to fisheries and aquatic habitats associated with deployment of this infrastructure could include direct injury/mortality, habitat loss, indirect injury/mortality, effects to migration, reproductive effects, and effects of invasive species depending on the ecoregion, the species' phenology, and the nature and extent of the habitats affected. These impacts are anticipated to be less than significant at the programmatic level due to the small scale and localized nature of deployment activities that have the potential to impact aquatic habitats. Chapter 16, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, operational activities associated with the Preferred Alternative would consist of routine maintenance and inspection of the facilities. Any major infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the abovementioned deployment impacts. The fisheries and aquatic habitats that would be affected would depend on the ecoregion, the species' phenology, and the nature and extent of the habitats affected.

It is anticipated, at the programmatic level, that there would be less than significant impacts to fisheries and aquatic habitats associated with routine inspections of the Preferred Alternative. Site maintenance activities that might include accidental spills from maintenance equipment or pesticide runoff near fish habitat are expected to have less than significant effects at the programmatic level to fisheries and aquatic habitats due to the limited nature of such activities and the likely small quantities of potentially harmful liquids used.

Fisheries and aquatic habitat could still be affected by the reduction in habitat quality associated with habitat fragmentation from the presence of access roads, transmission corridors, and support facilities. These features could also continue to disrupt movements of fish passage. In addition, the presence of new access roads and transmission line ROWs near water resources that support fish may increase human use of the surrounding areas, which could increase disturbance to fisheries and aquatic habitats resulting in effects to migratory pathways, indirect injury/mortalities, reproductive effects, as well as the potential introduction and spread of invasive species as explained above. Fisheries and aquatic habitat may also be impacted if increased access leads to an increase in the legal or illegal take of biota. However, impacts are expected to be less than significant at the programmatic level due to the small scale of expected activities with the potential to affect fisheries and aquatic habitat. As a result of the small scale, only a limited number of individuals are anticipated to be impacted, furthermore, habitat impacts would also be minimal in scale. Chapter 16, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Alternatives Impact Assessment

The following section assesses potential impacts to fisheries and aquatic habitats associated with the Deployable Technologies Alternative and the No Action Alternative.

Deployable Technologies Alternative

Under the Deployable Technologies Alternative option, a nationwide fleet of mobile communications systems would provide temporary coverage in areas not covered by the existing, usable infrastructure. There would be no collocation of equipment and minimal new construction associated with wired or wireless projects discussed above under the Preferred Alternative. Some limited construction could be associated with implementation such as land clearing or paving for parking or staging areas. The specific infrastructure associated with the Deployable Technologies Alternative would be the same as the deployable technologies implemented as part of the Preferred Alternative but would likely be implemented in greater numbers, over a larger geographic extent, and used with greater frequency and duration. Therefore, potential impacts to fisheries and aquatic habitats as a result of implementation of this alternative could be as described below.

<u>Deployment Impacts</u>

As explained above, at the programmatic level, implementation of deployable technologies could result in less than significant impacts from habitat loss, alteration and fragmentation, indirect injury/mortality, and invasive species effects. Greater frequency and duration of deployments could change the magnitude of impacts depending on species, life history, and region of the state. However, impacts are expected to remain less than significant at the programmatic level due to the limited nature of expected deployment activities. Chapter 16, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

<u>Operational Impacts</u>

Operational activities would consist of implementation/running of the deployable technology and routine maintenance and inspections. As with the Preferred Alternative, the impacts could vary greatly among species and geographic region. Nonetheless, it is anticipated that there would be less than significant impacts at the programmatic level to fisheries and aquatic habitats associated with routine operations and maintenance due to the limited nature of expected deployment activities. Chapter 16, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

No Action Alternative

Under the No Action Alternative, the nationwide, interoperable, public safety broadband network would not be deployed; therefore, there would be no associated construction or installation of wired, wireless, deployable infrastructure or satellites and other technologies. As a result, there would be no impacts to fisheries and aquatic habitats as a result of construction and operation of the Proposed Action. Environmental conditions would therefore be the same as those described in Section 8.1.6.5, Fisheries and Aquatic Habitats.

8.2.6.6 Threatened and Endangered Species and Species of Conservation Concern

This section describes potential impacts to threatened and endangered species in Louisiana and Louisiana's offshore environment associated with deployment and operation of the Proposed Action and Alternatives. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 16, may be implemented as appropriate to minimize further potential impacts.

Impact Assessment Methodology and Significance Criteria

The impacts of the Proposed Action on threatened and endangered species and their habitat were evaluated using the significance criteria presented in Table 8.2.6-2. The categories of impacts for threatened and endangered species and their habitats are defined as may affect, likely to adversely affect; may affect, not likely to adversely affect; and no effect. Characteristics of each effect type, including magnitude or intensity, geographic extent, and duration or frequency, were used to determine the impact significance rating associated with each potential impact.

Given the nature of this programmatic evaluation, and because the Proposed Action could potentially cover a wide variety of actions that would take place in various landscapes across the state, the potential impacts to threatened and endangered species addressed below are presented as a range of possible impacts.

Table 8.2.6-2: Impact Significance Rating Criteria for Threatened and Endangered Species

Type of Effect	Effect Characteristic	Impact Level		
		May Affect, Likely to Adversely Affect	**May Affect, Not Likely to Adversely Affect**	**No Effect**
Injury/Mortality of a Listed Species	Magnitude or Intensity	As per the ESA, this impact threshold applies at the individual level so applies to any mortality of a listed species and any impact that has more than a negligible potential to result in unpermitted take of an individual of a listed species. Excludes permitted take.	Does not apply in the case of mortality (any mortality unless related to authorized take falls under likely to adversely affect category). Applies to a negligible injury that does not meet the threshold of take due to its low level of effect and/or ability to mitigate the effect fully. Includes permitted take.	No measurable effects on listed species.
	Geographic Extent	Any geographic extent of mortality or any extent of injury that could result in take of a listed species.	Any geographic extent that does not meet the threshold of take due to its low level of effect and/or ability to mitigate the effect fully. Typically applies to one or very few locations.	
	Duration or Frequency	Any duration or frequency that could result in take of a listed species.	Any duration or frequency that does not meet the threshold of take due to its low level of effect and/or ability to mitigate the effect fully. Typically applies to infrequent, temporary, and short-term effects.	
Reproductive Effects	Magnitude or Intensity	Any reduction in breeding success of a listed species.	Changes in breeding behavior (e.g., minor change in breeding timing or location) that are not expected to result in reduced reproductive success.	No measurable effects on listed species.
	Geographic Extent	Reduced breeding success of a listed species at any geographic extent.	Changes in breeding behavior at any geographic extent that are not expected to result in reduced reproductive success of listed species. Typically applies to one or very few locations.	
	Duration or Frequency	Any duration or frequency that could result in reduced breeding success of a listed species.	Infrequent, temporary, or short-term changes in breeding behavior that do not reduce breeding success of a listed species within a breeding season.	

Type of Effect	Effect Characteristic	Impact Level		
		May Affect, Likely to Adversely Affect	May Affect, Not Likely to Adversely Affect	No Effect
Behavioral Changes	Magnitude or Intensity	Disruption of normal behavior patterns (e.g., breeding, feeding, or sheltering) that could result in take of a listed species.	Minor behavioral changes that would not result in take of a listed species.	No measurable effects on listed species.
	Geographic Extent	Any geographic extent that could result in take of a listed species.	Changes in behavior at any geographic scale that are not expected to result in take of a listed species. Typically applies to one or very few locations.	
	Duration or Frequency	Any duration or frequency that could result in take of a listed species.	Infrequent, temporary, or short-term changes that are not expected to result in take of a listed species.	
Loss or Degradation of Designated Critical Habitat	Magnitude or Intensity	Effects to any of the essential features of designated critical habitat that would diminish the value of the habitat for the survival and recovery of the listed species for which the habitat was designated.	Effects to designated critical habitat that would not diminish the functions or values of the habitat for the species for which the habitat was designated.	No measurable effects on designated critical habitat.
	Geographic Extent	Effects to designated critical habitat at any geographic extent that would diminish the value of the habitat for listed species. Note that the likely adverse effect threshold for geographic extent depends on the nature of the effect. Some effects could occur at a large scale but still not appreciably diminish the habitat function or value for a listed species. Other effects could occur at a very small geographic scale but have a large adverse effect on habitat value for a listed species.	Effects realized at any geographic extent that would not diminish the functions and values of the habitat for which the habitat was designated. Typically applies to one or few locations within a designated critical habitat.	
	Duration or Frequency	Any duration or frequency that could result in reduction in critical habitat function or value for a listed species.	Any duration or frequency that would not diminish the functions and values of the habitat for which the habitat was designated. Typically applies to Infrequent, temporary, or short-term changes.	

Description of Environmental Concerns

Injury/Mortality of a Listed Species

Direct injury/mortality effects are physical injuries, extreme physiological stress, or death of an individual organism from interactions associated with the Proposed Action. The most common direct injuries are entanglement, vehicle strike, problems associated with accidental ingestion, and injuries incurred by sensitive animals from disturbance events.

Based on the impact significance criteria presented in Table 8.2.6-2, any direct injury or mortality of a listed species at the individual-level, as well as any impact that has the potential to result in unpermitted take of an individual species at any geographic extent, duration, or frequency, may affect and likely adversely affect a listed species. Direct injury/mortality environmental concerns pertaining to federally listed terrestrial mammals, marine mammals, birds, reptiles and amphibians, fish, invertebrates, and plants with known occurrence in Louisiana are described below. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 16, may be implemented as appropriate to minimize further potential impacts.

<u>Terrestrial Mammals</u>

One threatened terrestrial mammal is federally listed and known to occur in the state of Louisiana: the Northern long-eared bat. Direct mortality or injury to the Northern long-eared bat could occur if tree clearing activities occurred at roosting sites while bats were present (USFWS, 2015h). While projects would not likely directly affect winter hibernacula (e.g., caves), human disturbance in and around these sites when bats are present could lead to adverse effects to these species; when disturbed by noise or light, bats awaken resulting in a loss of body fat needed to help them survive in the spring (USFWS, 2015h). Impacts would likely be isolated, individual events and therefore may affect, but are not likely to adversely affect, a listed species.

BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 16, may be implemented as appropriate to minimize further potential impacts.

<u>Marine Mammals</u>

One federally listed manatee species is known to occur in Louisiana's near offshore environment, the West Indian manatee. Direct mortality or injury to this species could occur from entanglements resulting from the Proposed Action, but are unlikely as the majority of FirstNet deployment projects would not occur in the aquatic environment. Therefore, potential impacts may affect, but are not likely to adversely affect, listed species. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 16, may be implemented as appropriate to minimize further potential impacts.

Birds

Two endangered and two threatened avian species are federally listed and known to occur in Louisiana; they include the least tern, piping plover, red knot, and red-cockaded woodpecker. Depending on the project types and location, direct mortality or injury to these birds could occur from collisions or electrocutions with manmade cables and wires, vehicle strikes, or by disturbance or destruction of nests during ground disturbing activities. However, these potential impacts may affect, but are not likely to adversely affect, listed species, as FirstNet would attempt to avoid deployment activities in these areas. If proposed project sites were unable to avoid sensitive areas, BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 16, may be implemented as appropriate to minimize further potential impacts.

Fish

One endangered and one threatened fish species are federally listed and known to occur in the state of Louisiana; they include the Atlantic sturgeon (Gulf subspecies) and pallid sturgeon. Direct mortality or injury to this species could occur from entanglements resulting from the Proposed Action, but are unlikely as the majority of FirstNet deployment projects would not occur in the aquatic environment. Therefore, potential impacts may affect, but are not likely to adversely affect, listed species. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 16, may be implemented as appropriate to minimize further potential impacts.

Reptiles and Amphibians

Two threatened reptile species are federally listed and known to occur in Louisiana; they include the gopher tortoise and ringed turtle. Direct mortality to these species could occur in construction zones either by excavation activities or by vehicle strikes. Potential effects would likely be isolated, individual events, and FirstNet would attempt to avoid areas where the species may occur, as practicable and feasible. Therefore, potential impacts may affect, but would not likely adversely affect, the listed species.

Four federally listed marine reptiles are also known to occur in the coastal area and offshore environment of Louisiana; they include the hawksbill sea turtle, Kemp’s ridley sea turtle, leatherback sea turtle, and loggerhead sea turtle. The majority of FirstNet deployment projects would not occur in an aquatic environment. Direct mortality or injury could occur from accidental trampling at nest sites if eggs are present during the Proposed Action. Potential effects would likely be isolated, individual events. Therefore, potential impacts may affect, but would not likely adversely affect, listed species. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 16, may be implemented as appropriate to minimize further potential impacts.

No federally listed amphibians are known to occur in Louisiana. Therefore, no injury or mortality effects to federally threatened and endangered amphibians are expected as a result of the Proposed Action.

<u>Invertebrates</u>

Two endangered and three threatened invertebrate species are federally listed and known to occur in Louisiana; they include the Alabama heelsplitter, fat pocketbook, Louisiana pearlshell, pink mucket, and rabbitsfoot. FirstNet would attempt to avoid areas where these species may occur, as practicable and feasible.

The majority of FirstNet deployment projects would not occur in an aquatic environment. Direct mortality or injury to these species are unlikely but could occur from entanglements resulting from the Proposed Action. Potential impacts may affect, but are not likely to adversely affect, the listed species. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 16, may be implemented as appropriate to minimize further potential impacts.

<u>Plants</u>

Two endangered and one threatened plant species are federally listed and known to occur in Louisiana; they include the *Geocarpon minimum* (no common name), American chaffseed, and Louisiana quillwort. Direct mortality to federally listed plants could occur if land clearing or excavation activities associated with the Proposed Action occur in an area inhabited by one of these species. FirstNet would attempt to avoid areas where these species may occur, as practicable and feasible; therefore, potential impacts may affect, but are not likely to adversely affect, listed species. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 16, may be implemented as appropriate to minimize further potential impacts.

Reproductive Effects

Reproductive effects are considered those that either directly or indirectly reduce the breeding success of a listed species either by altering its breeding timing or location, or reducing the rates of growth, maturation, and survival of offspring, which could affect the breeding success. Potential effects to federally listed terrestrial mammals, marine mammals, birds, terrestrial reptiles and marine reptiles, amphibians, fish, invertebrates, and plants with known occurrence in Louisiana are described below.

<u>Terrestrial Mammals</u>

Noise, light, and other human disturbances associated with the Proposed Action could affect federally listed terrestrial mammals within or in the vicinity of Project activities. The northern long-eared bat hibernates in caves and roosts in crevices of trees could be vulnerable to such disturbances (USFWS, 2015i). Impacts would be directly related to the frequency, intensity, and duration of these activities; however, they are anticipated to be small-scale and localized. FirstNet would attempt to avoid these areas. Therefore, potential impacts may affect, but are not likely to adversely affect, listed species. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 16, may be implemented as appropriate to minimize further potential impacts.

Marine Mammals

The West Indian manatee often uses secluded canals, creeks, embayments, and lagoons, particularly near the mouths of coastal rivers and sloughs, for feeding, resting, mating, and calving (USFWS, 2001a). Noise, light, and other human disturbances associated with the Proposed Action could adversely affect manatees within or in the vicinity of Project activities. Impacts would be directly related to the frequency, intensity, and duration of these activities, but are unlikely as the majority of FirstNet deployment projects would not occur in an aquatic environment and FirstNet would attempt to avoid these areas. Therefore, potential impacts may affect, but are not likely to adversely affect, listed species. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 16, may be implemented as appropriate to minimize further potential impacts.

Birds

Noise, light, or human disturbance within nesting areas could cause federally listed birds to abandon their nests or relocate to less desirable locations, or may result in stress to individuals, reducing survival and reproduction. FirstNet would attempt to avoid these areas. Therefore, potential impacts may affect, but are not likely to adversely affect, listed species. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 16, may be implemented as appropriate to minimize further potential impacts.

Reptiles and Amphibians

Changes in water quality, especially during the breeding seasons, resulting from ground disturbing activities could cause stress to amphibians resulting in lower productivity. Land clearing activities, noise, and human disturbance during the critical time periods (e.g., mating, nesting) could lower fitness and productivity. According to the USFWS, the ringed map turtle is "threatened by natural and man-made changes in river hydrology, which decreases availability of exposed sandbars." (LDWF, 2006h) FirstNet would attempt to avoid these areas. Therefore, potential impacts may affect, but are not likely to adversely affect, listed species. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 16, may be implemented as appropriate to minimize further potential impacts.

No federally listed reptiles are known to occur in Louisiana. Therefore, no injury or mortality effects to federally threatened and endangered amphibians are expected as a result of the Proposed Action.

<u>Fish</u>

Deployment activities resulting in increased disturbance (e.g., humans, noise), especially during spawning activity, and changes in water quality could cause stress resulting in lower productivity (see Section 8.2.4, Water Resources, for a discussion of potential impacts to water resources). Effects to reproduction of the federally listed fish species in Louisiana are unlikely as the majority of FirstNet deployment projects would not occur in an aquatic environment and FirstNet would attempt to avoid these areas. Therefore, potential impacts may affect, but are not likely to adversely affect, listed species. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 16, may be implemented as appropriate to minimize further potential impacts.

<u>Invertebrates</u>

Changes in water quality could cause stress resulting in lower productivity for federally listed mollusk species known to occur in Louisiana. The introduction of invasive aquatic species could indirectly affect mollusks as a result of fish populations that they rely on for their reproductive cycle being altered (*USFWS 2012*). Potential impacts to federally listed invertebrate species may affect, but are not likely to adversely affect, those species, as FirstNet would attempt to avoid these areas. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 16, may be implemented as appropriate to minimize further potential impacts.

<u>Plants</u>

Potential impacts could occur from ground-disturbing activities to listed plant species as a result of the Proposed Action. However, FirstNet would attempt to avoid these areas. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 16, may be implemented as appropriate to minimize further potential impacts.

Behavioral Changes

Effects to normal behavior patterns that could lead to disruptions in breeding, feeding, or sheltering, resulting in take of a listed species would be considered potentially significant. Potential effects to federally listed terrestrial mammals, marine mammals, birds, reptiles and amphibians, fish, invertebrates, and plants with known occurrence in Louisiana are described below.

Mammals

Noise associated with the installation of cables in the near/offshore waters of coastal Louisiana could affect marine mammal migration patterns, though impacts are likely to be short-term provided the noise sources are not wide ranging and below Level A and B sound exposure thresholds. Marine mammals have the capacity to divert from sound sources during migration. FirstNet would attempt to avoid areas where these species are known to occur, as practicable and feasible; therefore, potential impacts may affect, but would likely not adversely affect, these species. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 16, may be implemented as appropriate to minimize further potential impacts.

Birds

Because many birds have extremely long migrations, protection efforts for critical sites along migratory routes must be coordinated over great distances often involving many different countries. For example, the red knot has been found to fly up to 9,300 miles from their breeding and wintering sites and often return to the same sites year and after year in Louisiana (USFWS, 2013b) (USFWS, 2016f). Disturbance in stopover, foraging, or breeding areas (visual or noise) or habitat loss/fragmentation could cause stress to individuals causing them to abandon areas for less desirable habitat and potentially reduce over fitness and productivity. Activities related to the Proposed Action, such as aerial deployment or construction activities, could result in effects to federally listed birds. FirstNet would attempt to avoid areas where these species are known to occur, as practicable and feasible; therefore, potential impacts may affect, but would likely not adversely affect, these species. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 16, may be implemented as appropriate to minimize further potential impacts.

Reptiles and Amphibians

Habitat loss or alteration, particularly from fragmentation or invasive species, could affect nesting and foraging sites of the federally listed reptile species, resulting in reduced survival and productivity; however, the localized nature of disturbances during deployment activities are not anticipated to stress federally listed reptiles. FirstNet would attempt to avoid areas where these species are known to occur, as practicable and feasible; therefore, potential impacts may affect, but would likely not adversely affect, these species. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 16, may be implemented as appropriate to minimize further potential impacts.

Disturbances during deployment activities are not anticipated to stress federally listed sea turtles.

No federally listed amphibians are known to occur in Louisiana. Therefore, no behavioral effects to federally threatened and endangered amphibians are expected as a result of the Proposed Action.

Fish

Changes in water quality as a result of ground disturbing activities could impact food sources for the federally listed fish species in Louisiana. Further, increased human disturbance, noise, and vessel traffic could cause stress to these species causing them to abandon spawning locations or altering migration patterns. Behavioral changes to these listed species are unlikely as the majority of FirstNet deployment projects would not occur in aquatic environment. Therefore, potential impacts may affect, but are not likely to adversely affect, these species. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 16, may be implemented as appropriate to minimize further potential impacts.

Invertebrates

Changes in water quality, habitat loss or alternation, and introduction of aquatic invasive species could impact food sources for federally listed mollusks resulting in lower productivity. Disturbances to food sources utilized by the federally listed terrestrial species, especially during the breeding season, could impact foraging behavior. FirstNet would attempt to avoid areas where these species are known to occur, as practicable and feasible; therefore, potential impacts may affect, but would likely not adversely affect, these species. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 16, may be implemented as appropriate to minimize further potential impacts.

Plants

No behavioral effects to federally listed plants are expected as a result of the Proposed Action.

Loss or Degradation of Designated Critical Habitat

Effects to designated critical habitat and any of its essential features that could diminish the value of the habitat for the listed species or its survival and recovery would be considered an adverse effect and could be potentially significant. Depending on the species or habitat, the adverse effect threshold would vary for geographic extant. In some cases, large-scale impacts could occur that would not diminish the functions and values of the habitat, while in other cases, small-scale changes could lead to potentially significant adverse effects, such as impacts to designated critical habitat for a listed species that is only known to occur in one specific location geographically. Potential effects to federally listed terrestrial mammals, marine mammals, birds, reptiles and amphibians, fish, invertebrates, and plants with designated critical habitat in Louisiana are described below.

Terrestrial Mammals

No designated critical habitat occurs for terrestrial mammals in Louisiana. Therefore, no effect to threatened and endangered species from the loss or degradation of designated critical habitat is expected as a result of the Proposed Action.

Marine Mammals

No designated critical habitat occurs for marine mammals in Louisiana. Therefore, no effect to threatened and endangered species from the loss or degradation of designated critical habitat is expected as a result of the Proposed Action.

Birds

One federally listed bird species in Louisiana has federally designated critical habitat. Critical habitat for the piping plover was designated within eight parishes along coastal areas within Louisiana. The piping plover use sites in Louisiana as stopover habitat during their migration from the Northern Great Plains and Great Lakes Area to the coastal habitats in the south. Stopover sites consist of shorelines that occur throughout the state along reservoirs, lakes, ponds, rivers, and wetlands (USFWS, 2003a). FirstNet would attempt to avoid areas where these species are known to occur, as practicable and feasible; therefore, potential impacts may affect, but would likely not adversely affect, designated critical habitat. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 16, may be implemented as appropriate to minimize further potential impacts.

Reptiles and Amphibians

No designated critical habitat occurs for reptiles or amphibians in Louisiana. Therefore, no effect to threatened and endangered species from the loss or degradation of designated critical habitat is expected as a result of the Proposed Action.

Fish

One of the federally listed fish species in Louisiana has federally designated critical habitat. Critical habitat for the Atlantic sturgeon (Gulf subspecies) includes portions of the Pearl and Bogue Chitto rivers, the eastern half of Lake Pontchartrain, Lake Catherine, Little Lake, The Rigolets, Lake Borgne, and Pascagoula Bay. Proposed FirstNet deployment activities near water would likely occur onshore with limited activities in the water and therefore would not likely disturb critical habitat. FirstNet would attempt to avoid areas where these species are known to occur, as practicable and feasible; therefore, potential impacts may affect, but would likely not adversely affect, designated critical habitat. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 16, may be implemented as appropriate to minimize further potential impacts.

Invertebrates

No designated critical habitat occurs for invertebrates in Louisiana. Therefore, no effect to threatened and endangered species from the loss or degradation of designated critical habitat is expected as a result of the Proposed Action.

Plants

No designated critical habitat occurs for plants in Louisiana. Therefore, no effect to threatened and endangered species from the loss or degradation of designated critical habitat is expected as a result of the Proposed Action.

Potential Impacts of the Preferred Alternative

The following section assesses potential impacts associated with implementation of the Preferred Alternative, including deployment and operational activities.

Deployment Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, implementation of the Preferred Alternative could result in the deployment of various types of facilities or infrastructure. Depending on the physical nature and location of the facility/infrastructure and the specific deployment requirements, some activities would result in potential effects to threatened and endangered species and others would not. In addition, and as explained in this section, the same type of Proposed Action infrastructure could result in a range of no impacts to less than significant impacts at the programmatic level, depending on the deployment scenario or site-specific conditions. The threatened and endangered species that would be affected would depend on the ecoregion, the species' phenology, and the nature and extent of the habitats affected. Chapter 16, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Activities Likely to Have No Effect

Of the types of facilities or infrastructure deployment scenarios described in Section 2.1.2, Proposed Action Infrastructure, the following are expected to have no effect on threatened and endangered species or their habitat under the conditions described below:

- Wired Projects
    - Use of Existing Conduit – New Buried Fiber Optic Plant: Disturbance, including noise, associated with the installation of fiber optic cable in existing conduit would be limited to entry and exit points of the existing conduit in previously disturbed areas. Although threatened and endangered species and their habitat could be impacted, it is anticipated that effects to threatened and endangered species would be temporary, infrequent, and likely not conducted in locations designated as vital or critical for any period.
    - Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting up of dark fiber would have no impacts to threatened and endangered species or their habitat because there would be no ground disturbance and very limited human activity.
- Satellites and Other Technologies
    - Satellite-Enabled Devices and Equipment: It is anticipated that the installation of permanent equipment on existing structures and the use of portable devices that use

satellite technology would have no effect on threatened and endangered species because those activities would not require ground disturbance.

- Deployment of Satellites: FirstNet does not anticipate launching satellites as part of the deployment of the NPSBN; however, it could include equipment on satellites that are already being launched for other purposes. As adding equipment to an existing launch vehicle would be very unlikely to affect protected species, it is anticipated that this activity would have no effect on protected species.

Activities With the Potential Affect Listed Species

Potential deployment-related effects to threatened and endangered species and their habitats as a result of implementation of the Preferred Alternative would encompass a range of effects that could occur, including direct injury/mortality, reproductive effects, behavioral changes, and loss/degradation of designated critical habitat. The types of infrastructure deployment activities that could be part of the Preferred Alternative and result in potential effects to threatened and endangered species include the following:

- Wired Projects
  - New Build – Submarine Fiber Optic Plant: The installation of cables in or near bodies of water and construction of landings and/or facilities on the shores or the banks of waterbodies that accept submarine cables could result in direct injury/mortalities of fisheries and aquatic invertebrates that are not mobile enough to avoid construction activities (e.g., mussels), that utilize burrows (e.g., crayfish), or that are defending nest sites (some fish).
  - New Build – Buried Fiber Optic Plant: Plowing, trenching, or directional boring and the construction of POPs, huts, or other associated facilities or hand-holes to access fiber could result in potential effects to threatened and endangered species. Land/vegetation clearing and excavation activities, associated with construction of POPs, huts, or other associated facilities could result in direct injury/mortalities of threatened and endangered species that are not mobile enough to avoid construction activities (e.g., reptiles, mollusks, small mammals, and young), that utilize burrows (e.g., ground squirrels), or that are defending nest sites (e.g., ground-nesting birds). Disturbance, including noise, associated with the above activities could result in direct injury/mortality, reproductive effects, behavioral changes, and loss/degradation of designated critical habitat.
  - New Build – Aerial Fiber Optic Plant: The installation of new poles and hanging cable and associated security, safety, or public lighting components on public ROWs or private easements as well as the construction of access roads, POPs, huts, or facilitates to house outside plant equipment could result in potential effects to threatened and endangered species and their habitat. Impacts may vary depending on the number or individual poles installed, but could include direct injury/mortality, reproductive effects, behavioral changes, and loss/degradation of designated critical habitat.

- Collocation on Existing Aerial Fiber Optic Plant: Land clearing and excavation during replacement of poles and structural hardening could result in direct injury/mortality, reproductive effects, behavioral changes, and loss/degradation of designated critical habitat to threatened and endangered species. Noise disturbance from heavy equipment use associated with these activities as well as with installing new fiber on existing poles could result in reproductive effects or behavior changes.
- New Build – Submarine Fiber Optic Plant: The installation of cables in limited nearshore and inland bodies of water and construction of landings and/or facilities on the shores or the banks of waterbodies that accept submarine cables could potentially affect threatened and endangered species and their habitat, particularly aquatic species (see Section 8.2.4, Water Resources, for a discussion of potential impacts to water resources). Effects could include direct injury/mortality, reproductive effects, behavioral changes, and loss/degradation of designated critical habitat. If activities occurred during critical time periods, reproductive effects and behavioral changes could occur.
- Installation of Optical Transmission or Centralized Transmission Equipment: If installation of transmission equipment would occur in existing boxes or huts, there would be no impacts to threatened and endangered species or their habitats. If installation of transmission equipment required construction of access roads, trenching, and/or land clearing, such disturbance could result in direct injury/mortality of threatened and endangered species as described for other New Build activities. Reproductive effects, behavioral changes, and loss/degradation of designated critical habitat could also occur as a result of construction and resulting disturbance.

- Wireless Projects
  - New Wireless Communication Towers: Installation of new wireless towers and associated structures (generators, equipment sheds, fencing, security and aviation lighting, electrical feeds, and concrete foundations and pads) or access roads could result in impacts to threatened and endangered species and their habitat. Land/vegetation clearing, excavation activities, landscape grading, and other disturbance activities during the installation of new wireless towers and associated structures or access roads could result in direct injury/mortality, reproductive effects, behavioral changes, and loss/degradation of designated critical habitat. Security lighting and fencing could result in direct injury/mortality, disruption of normal behavior patterns, as well as reproductive effects. For a discussion of radio frequency emissions, refer to Section 2.4, Radio Frequency Emissions.
  - Collocation on Existing Wireless Tower, Structure, or Building: Collocation would involve mounting or installing equipment (such as antennas or microwave dishes) on an existing tower. FirstNet activities would be infrequent, temporary, or short-term in nature and are unlikely to result in direct injury/mortality or behavioral changes to threatened and endangered species. However, if a replacement tower or structural hardening is required, effects would be similar to new wireless construction. Hazards related to security/safety lighting and fencing may produce direct injury/mortality,

reproductive effects, and behavioral changes. For a discussion of radio frequency emissions, refer to Section 2.4, Radio Frequency Emissions.

- Deployable Technologies: Implementation of land-based deployable technologies including COWs, COLTs, or SOWs could result in direct injury/mortalities to threatened and endangered species on roadways. If external generators are used, noise disturbance could potentially result in reproductive effects or behavioral changes to threatened and endangered species. For a discussion of radio frequency emissions, refer to Section 2.4, Radio Frequency Emissions. Deployment of drones, balloons, piloted aircraft, or blimps could potentially impact threatened and endangered species by direct injury/mortality, reproductive effects, behavioral changes, and loss/degradation of designated critical habitat. The magnitude of these effects depends on the timing and frequency of deployments.

In general, the abovementioned activities could potentially involve land/vegetation clearing; excavation and trenching; construction of access roads; installation or restructuring of towers, poles, or underwater cables; installation of security/safety lighting and fencing; and deployment of aerial platforms. Potential impacts to threatened and endangered species associated with deployment of this infrastructure could include direct injury/mortality, reproductive effects, behavioral changes, and loss/degradation of designated critical habitat depending on the species' phenology and the nature and extent of the habitats affected. FirstNet would attempt to avoid areas where these species are known to occur, as practicable and feasible; therefore, potential impacts may affect, but are not likely adversely affect protected species. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 16, may be implemented as appropriate to minimize further potential impacts.

Operation Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, operational activities associated with the Preferred Alternative would consist of routine maintenance and inspection of the facilities. Any major infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the abovementioned deployment impacts.

It is anticipated that operational activities may affect, but are not likely to adversely affect threatened and endangered species due to routine inspections of the Preferred Alternative, assuming that the same access roads used for deployment are also used for inspections. Site maintenance, including mowing or application of herbicides, may affect, but are not likely to adversely affect threatened and endangered species, as they would be conducted infrequently, and BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 16, may be implemented as appropriate to minimize further potential impacts.

During operations, direct injury/mortality of threatened and endangered species could occur from collisions and/or entanglements with transmission lines, towers, and aerial platforms. FirstNet would attempt to avoid areas where these species are known to occur, as practicable and feasible.

Therefore, listed species may be affected, but are not likely to be adversely affected. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 16, may be implemented as appropriate to minimize further potential impacts.

Threatened and endangered species may be affected, but are not likely to be adversely affected, by the reduction in habitat quality associated with habitat fragmentation from the presence of access roads, transmission corridors, and support facilities. These features could also continue to disrupt movements of some species, particularly during migrations between winter and summer ranges. FirstNet would attempt to avoid areas where these species are known to occur, as practicable and feasible. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 16, may be implemented as appropriate to minimize further potential impacts.

Alternatives Impact Assessment

The following section assesses potential effects to threatened and endangered species associated with the Deployable Technologies Alternative and the No Action Alternative.

Deployable Technologies Alternative

Under the Deployable Technologies Alternative option, a nationwide fleet of mobile communications systems would provide temporary coverage in areas not covered by the existing, usable infrastructure. There would be no collocation of equipment and minimal new construction associated with wired or wireless projects discussed above under the Preferred Alternative. Some limited construction could be associated with implementation such as land clearing or paving for parking or staging areas. The specific infrastructure associated with the Deployable Technologies Alternative would be the same as the deployable technologies implemented as part of the Preferred Alternative but would likely be implemented in greater numbers, over a larger geographic extent, and used with greater frequency and duration. Therefore, potential effects to threatened and endangered species as a result of implementation of this alternative could be as described below.

<u>Deployment Impacts</u>

As explained above, implementation of deployable technologies may affect, but is not likely to adversely affect, threatened and endangered species through direct injury/mortality, reproductive effects, behavioral changes, and loss/degradation of designated critical habitat. Greater frequency and duration of deployments could change the magnitude of impacts depending on species, life history, and region of the state. FirstNet would attempt to avoid areas where these species are known to occur, as practicable and feasible. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 16, may be implemented as appropriate to minimize further potential impacts.

<u>Operational Impacts</u>

As explained above, operational activities would consist of implementation/running of the deployable technology and routine maintenance and inspections. As with the Preferred Alternative, it is anticipated that activities may affect, but are not likely to adversely affect, threatened and endangered species and their habitats as a result of routine operations, management, and monitoring. FirstNet would attempt to avoid areas where these species are known to occur, as practicable and feasible. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 16, may be implemented as appropriate to minimize further potential impacts.

No Action Alternative

Under the No Action Alternative, the nationwide, interoperable, public safety broadband network would not be deployed; therefore, there would be no associated construction or installation of wired, wireless, deployable infrastructure or satellites and other technologies. As a result, there would be no effects to threatened and endangered species as a result of construction and operation of the Proposed Action. Environmental conditions would therefore be the same as those described in Section 8.1.6.6, Threatened and Endangered Species and Species of Concern.

8.2.7 Land Use, Recreation, and Airspace

8.2.7.1 Introduction

This section describes potential impacts to land use, recreation, and airspace resources in Louisiana associated with deployment and operation of the Proposed Action and Alternatives. Chapter 16, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

8.2.7.2 Impact Assessment Methodology and Significance Criteria

The impacts of the Proposed Action on land use, recreation, and airspace resources were evaluated using the significance criteria presented in Table 8.2.7-1. As described in Section 8.2, Environmental Consequences, the categories of impacts are defined as potentially significant, less than significant with mitigation incorporated, less than significant, or no impact. Characteristics of each impact type, including magnitude or intensity, geographic extent, and duration or frequency, were used to determine the impact significance rating associated with each potential impact.

Given the nature of this programmatic evaluation, and because the Proposed Action could potentially cover a wide variety of actions that would take place in various landscapes, the potential impacts to land use, recreation, and airspace resources addressed in this section are presented as a range of possible impacts.

Table 8.2.7-1: Impact Significance Rating Criteria for Land Use, Recreation, and Airspace

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less Than Significant**	**No Impact**
Direct land use change	Magnitude or Intensity	Change in designated/permitted land use that conflicts with existing permitted uses, and/or would require a change in zoning. Conversion of prime or unique agricultural lands.	Effect that is potentially significant, but with mitigation is less than significant.	Minimal changes in existing land use, or change that is permitted by right, through variance, or through special exception.	No changes to existing development, land use, land use plans, or policies. No conversion of prime or unique agricultural lands.
	Geographic Extent	Regional impacts observed throughout the state or territory.		Effects realized at one or multiple isolated locations.	NA
	Duration or Frequency	Permanent: Land use altered indefinitely.		Short-Term: Land use altered for as long as the entire construction phase or a portion of the operations phase.	NA
Indirect land use change	Magnitude or Intensity	New land use directly conflicts with surrounding land use pattern, and/or causes substantial restriction of land use options for surrounding land uses.	Effect that is potentially significant, but with mitigation is less than significant.	New land use differs from, but is not inconsistent with, surrounding land use pattern; minimal restriction of land use options for surrounding land uses.	No conflicts with adjacent existing or planned land uses.
	Geographic Extent	Regional impacts observed throughout the state or territory.		Effects realized at one or multiple isolated locations.	NA
	Duration or Frequency	Permanent: Land use altered indefinitely.		Short-Term: Land use altered for as long as the entire construction phase or a portion of the operations phase.	NA

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	Less than Significant with BMPs and Mitigation Measures Incorporated	Less Than Significant	No Impact
Loss of access to public or private recreation land or activities	Magnitude or Intensity	Total loss of access to recreation land or activities.	Effect that is potentially significant, but with mitigation is less than significant.	Restricted access to recreation land or activities.	No disruption or loss of access to recreational lands or activities.
	Geographic Extent	Most or all recreational land/sites in a state or territory; recreational lands/sites that are of national significance.		Effects realized at one or multiple isolated locations; recreational lands that are not nationally significant, but that are significant within the state/territory.	NA
	Duration or Frequency	Persists during the life of the project.		Persists for as long as the entire construction phase or a portion of the operations phase.	NA
Loss of enjoyment of public or private recreation land (due to visual, noise, or other impacts that make recreational activity less desirable)	Magnitude or Intensity	Total loss of enjoyment of recreational activities; substantial reduction in the factors that contribute to the value of the recreational resource, resulting in avoidance of activity at one or more sites.	Effect that is potentially significant, but with mitigation is less than significant.	Small reductions in visitation or duration of recreational activity.	No loss of enjoyment of recreational activities or areas; no change to factors that contribute to the value of the resource.
	Geographic Extent	Most or all recreational land/sites in a state or territory; recreational lands/sites that are of national significance.		Effects realized at one or multiple isolated locations; recreational lands that are not nationally significant, but that are significant within the state/territory.	NA
	Duration or Frequency	Persists during or beyond the life of the project.		Persists for as long as the entire construction phase or a portion of the operations phase.	NA

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less Than Significant**	**No Impact**
Use of airspace	Magnitude or Intensity	Measurable, substantial change in flight patterns and/or use of airspace.	Effect that is potentially significant, but with mitigation is less than significant.	Alteration to airspace usage is minimal.	No alterations in airspace usage or flight patterns.
	Geographic Extent	Regional impacts observed throughout the state or territory.		Effects realized at one or multiple isolated locations.	NA
	Duration or Frequency	Permanent: Airspace altered indefinitely.		Short-Term: Airspace altered for as long as the entire construction phase or a portion of the operations phase	NA

NA = Not Applicable

8.2.7.3 Description of Environmental Concerns

Direct Land Use Change

Changes in land use could be influenced by the deployment, operation, and maintenance of facilities or other infrastructure, and the acquisition of rights-of-way or easement. The deployment, operation, and maintenance of structures, towers, roads, and other permanent features could conflict with exiting development or land use. The installation of poles, towers, structures, or other aboveground facilities or assets could have short- or long-term effects to existing development or land use based on the characteristics of the structures or facilities, such as the location, type, or height. In addition, the acquisition of ROWs or easements and the construction of roads to access facilities and locations could influence changes in land use. The effects from these actions would depend on the geographic location; compatibility with existing land uses; and characteristics of the right-of-way, easement, or access road. These characteristics, such as the length, width, and location could change the existing land use to another category or result in the short- or long-term loss of the existing land use.

Based on the impact significance criteria presented in Table 8.2.7-1, less than significant impacts would be anticipated at the programmatic level given the size and nature of the majority of the proposed deployment activities. Direct land use changes would be minimized and isolated at specific locations and all required permits would be obtained; only short-term impacts during the construction phase would be expected.

Indirect Land Use Change

Changes in surrounding land use patterns and options for surrounding land uses could be influenced by the deployment, operation, and maintenance of facilities and the acquisition of rights-of-way or easement. The deployment, operation, and maintenance of structures, towers, roads, and other permanent features could conflict with surrounding land use patterns and options for surrounding land uses. The installation of poles, towers, structures, or other aboveground facilities or assets could have short- or long-term effects to surrounding land use patterns or options for surrounding land uses based on the characteristics of the structures or facilities, such as the location, type, or height. In addition, the acquisition of ROWs or easements and the construction of roads to access facilities and locations could influence changes in surrounding land uses. The effects from these actions would depend on the geographic location; compatibility with surrounding land uses; and characteristics of the ROW, easement, or access road. These characteristics, such as the length, width, and location could conflict with surrounding land use patterns or restrict options for surrounding land uses.

Based on the impact significance criteria presented in Table 8.2.7-1, less than significant impacts would be anticipated at the programmatic level, as any new land use would be small-scale and short-term during the construction phase.

Loss of Access to Public or Private Recreation Land or Activities

The deployment, operation, and maintenance of facilities and the acquisition of ROW or easement could influence access to public or private recreation land or activities. Localized, short-term accessibility to recreation land or activities could be impacted by the deployment and maintenance of structures, towers, roads, and other permanent features. In the long-term, the deployment and installation of poles, towers, structures, or other aboveground facilities could alter the types and locations of recreation activities.

Based on the impact significance criteria presented in Table 8.2.7-1, less than significant impacts would be anticipated at the programmatic level, as restricted access or a loss of access to recreation areas would not occur; only short-term impacts or small-scale limitations during the construction phase would be expected.

Loss of Enjoyment of Public or Private Recreation Land

The deployment of new towers, and the resulting built tower, could influence the enjoyment of public or private recreation land. Crews accessing the site during the deployment and maintenance of structures, towers, roads, and other permanent features could temporarily impact enjoyment of recreation land. The deployment of poles, towers, structures, or other aboveground facilities could affect the enjoyment of recreational land based on the characteristics of the structures or facilities, including permanent impacts to scenery, short-term noise impacts, and the presence of deployment or maintenance crews.

Based on the impact significance criteria presented in Table 8.2.7-1, less than significant impacts would be anticipated at the programmatic level as only small reductions, if any, in recreational visits or durations would occur due to the relatively small-scale nature of likely FirstNet activities. Only short-term impacts during the construction phase would be expected.

Use of Airspace

Primary concerns to airspace include the following: if aspects of the Proposed Action would result in violation of FAA regulations; undermine the safety of civilian, military, or commercial aviation; or infringe on flight activity and flight corridors. Potential impacts could include air routes or flight paths, available flight altitudes, disruption of normal flight patterns, and restrictions to flight activities. Construction of new towers or alternations to existing towers could obstruct navigable airspace depending on the tower location. Use of aerial technologies could result in SUA considerations.

Based on impact significance criteria presented in Table 8.2.7-1, airspace impacts are not likely to change or alter flight patterns or airspace usage. As drones, balloons, and piloted aircraft would likely only be deployed in an emergency and for a short period, FirstNet would be unlikely to have a significant impact on airspace resources.

8.2.7.4 Potential Impacts of the Preferred Alternative

The following section assesses potential impacts associated with implementation of the Preferred Alternative, including deployment and operation activities.

Deployment Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, implementation of the Preferred Alternative could result in the deployment of various types of facilities or infrastructure. Depending on the physical nature and location of the facility/infrastructure, and the specific deployment requirements, some activities would result in potential impacts to land use, recreation, and airspace resources and others would not. In addition, and as explained in this section, at the programmatic level, the same type of Proposed Action infrastructure could result in a range of no impacts to less than significant impacts depending on the deployment scenario or site-specific conditions. Chapter 16, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Activities Likely to Have No Impacts

Of the types of facilities or infrastructure development scenarios described in Section 2.1.2, Proposed Action Infrastructure, the following are likely to have no impacts to land use, recreation, and airspace resources under the conditions described below:

- Wired Projects
  - New Build – Buried Fiber Optic Plant: Plowing (including vibratory plowing), trenching, or directional boring alongside the road in utility corridors or within public road rights-of-way.
    - Land Use: See *Activities with the Potential to Have Impacts* below.
    - Recreation: See *Activities with the Potential to Have Impacts* below.
    - Airspace: No impacts to airspace would be anticipated since the activities would not affect flight patterns or cause obstructions that would require FAA and/or state review based on FAR 14 CFR, Part 77, *Safe, Efficient Use, and Preservation of the Navigable Airspace* (See Section 8.1.7.5 Obstructions to Airspace Considerations).
  - Use of Existing Conduit – New Buried Fiber Optic Plant: Disturbance associated with the installation of fiber optic cable in existing conduit would be limited to entry and exit points of the existing conduit in previously disturbed areas.
    - Land Use: It is anticipated that there would be no impacts to land use since the activities that would be conducted would not directly or indirectly result in changes to existing and surrounding land uses.
    - Recreation: See *Activities with the Potential to Have Impacts* below.
    - Airspace: It is anticipated that there would be no impacts to airspace since the activities would not affect flight patterns or cause obstructions that would require FAA and/or state review based on FAR 14 CFR, Part 77, *Safe, Efficient Use, and Preservation of the Navigable Airspace*. (See Section 8.1.7.5 Obstructions to Airspace Considerations)

- New Build – Aerial Fiber Optic Plant: Installing new poles and hanging cables on previously disturbed or new (undisturbed) ROWs or easements and the potential construction of access roads.
  - Land Use: See *Activities with the Potential to Have Impacts* below.
  - Recreation: See *Activities with the Potential to Have Impacts* below.
  - Airspace: Installation of new poles would not have an effect on airspace because utility poles are an average of 40 feet in height and do not intrude into useable airspace.
- Collocation on Existing Aerial Fiber Optic Plant: Installation of new fiber on existing poles would be limited to previously disturbed areas.
  - Land Use: It is anticipated that there would be no impacts to land use since the activities that would be conducted would not directly or indirectly result in changes to existing and surrounding land uses.
  - Recreation: No impacts to recreation would be anticipated since the activities that would be conducted would not cause disruption or loss of access to recreational lands or activities or the enjoyment of those lands or activities.
  - Airspace: No impacts are anticipated to airspace from collocations.
- Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting of dark fiber and installation of new equipment in existing huts.
  - Land Use: It is anticipated that there would be no impacts to land use since the activities would not directly or indirectly result in changes to existing and surrounding land uses.
  - Recreation: Use of existing dark fiber would not impact recreation because it would not impede access to recreational resources.
  - Airspace: Lighting of dark fiber would have no impacts to airspace.
- New Build – Submarine Fiber Optic Plant: Installing cables in limited nearshore and inland bodies of water and the constructing landings and/or facilities on shore to accept submarine cable.
  - Land Use: See *Activities with the Potential to Have Impacts* below.
  - Recreation: See *Activities with the Potential to Have Impacts* below.
  - Airspace: The installation of cables in or near bodies of water and construction of landings/facilities would not impact flight patterns or cause obstructions that would require FAA and/or state review based on FAR 14 CFR, Part 77, *Safe, Efficient Use, and Preservation of the Navigable Airspace*. (See Section 8.1.7.5 Obstructions to Airspace Considerations).

- Installation of Optical Transmission or Centralized Transmission Equipment: Installation of transmission equipment would occur in existing boxes or huts. The section below addresses potential impacts to land use, recreation resources, and airspace if deployment of new boxes, huts, or access roads is required.
  - Land Use: See *Activities with the Potential to Have Impacts* below.
  - Recreation: See *Activities with the Potential to Have Impacts* below.
  - Airspace: No impacts to airspace would be anticipated since the activities would not affect flight patterns or cause obstructions that would require FAA and/or state review based on FAR 14 CFR, Part 77, *Safe, Efficient Use, and Preservation of the Navigable Airspace*.

- Wireless Projects
  - Collocation on Existing Wireless Tower, Structure, or Building: Collocation would involve mounting or installing equipment (such as antennas or microwave dishes) on an existing tower, structure, or building.
    - Land Use: There would be no impacts to existing and surrounding land uses. The potential addition of power units, structural hardening, and physical security measures would not impact existing or surrounding land uses.
    - Recreation: See *Activities with the Potential to Have Impacts* below.
    - Airspace: See *Activities with the Potential to Have Impacts* below.
- Deployable Technologies
  - Deployable Technologies: These technologies would be used where permanent, fixed infrastructure cannot be deployed due to a variety of factors such as the need to supplement coverage or to avoid or mitigate permanent impacts to sensitive resources or receptors.
    - Land Use: It is anticipated that there would be no impacts to existing or surrounding land uses because these technologies would be temporarily located in areas compatible with other land uses.
    - Recreation: No impacts to recreation are anticipated as deployable technologies would not affect the use or enjoyment of recreational lands.
    - Airspace: Use of land-based deployable technologies (COW, COLT, and SOW) is not expected to result in impacts to airspace, provided antenna masts do not exceed 200 feet Aboveground Level (AGL) or do not trigger any of the other FAA obstruction to airspace criteria listed in Section 8.1.7.5, Obstructions to Airspace Considerations.
- Satellites and Other Technologies
  - Satellite-Enabled Devices and Equipment: Installation of permanent equipment on existing structures and the use of portable devices that use satellite technology.

- Land Use: It is anticipated that there would be no impacts to existing or surrounding land uses because these technologies would be temporarily located in areas compatible with other land uses.
- Recreation: It is anticipated that there would be no impacts to recreational uses because these technologies would be temporarily deployed but would not restrict access to, or enjoyment of, recreational lands.
- Airspace: It is anticipated that the installation of permanent equipment on existing structures and the use of portable devices that use satellite technology would not impact airspace because those activities would not result in changes to flight patterns and airspace usage or result in obstructions to airspace.

- Deployment of Satellites FirstNet does not anticipate launching satellites as part of the deployment of the NPSBN; however, it could include equipment on satellites that are already being launched for other purposes. As adding equipment to an existing launch vehicle would be very unlikely to impact to land use, recreation, or airspace, it is anticipated that this activity would have no impact on land use, recreation, or airspace.

Activities with the Potential to Have Impacts

Potential deployment-related impacts to land use, recreation resources, or airspace as a result of implementation of the Preferred Alternative would encompass a range of impacts that could occur, including changes to existing and surrounding land uses. The types of infrastructure or deployment activities that could be part of the Preferred Alternative and result in potential impacts to land use resources include the following:

- Wired Projects
  - New Build – Buried Fiber Optic Plant: Plowing (including vibratory plowing), trenching, or directional boring alongside the road in utility corridors or within public road rights-of-way.
    - Land Use: Construction activities could temporarily restrict existing and surrounding land uses at isolated locations.
    - Recreation: It is anticipated that plowing, trenching, or directional boring may cause temporary, localized restrictions to recreational land or activities, which may persist during the deployment phase. It is reasonable to anticipate that small reductions in visitation to localized areas may occur during the deployment phase.
    - Airspace: No impacts are anticipated – see previous section.
  - Use of Existing Conduit – New Buried Fiber Optic Plant: Disturbance associated with the installation of fiber optic cable in existing conduit would be limited to entry and exit points of the existing conduit in previously disturbed areas.
    - Land Use: No impacts are anticipated – see previous section.

  - Recreation: Installation of fiber optic cable in existing conduits occurs in previously disturbed areas, which may include areas used for recreational purposes. It is possible that access to recreational lands or activities may be restricted during the deployment phase or a portion of the operations phase.
  - Airspace: No impacts are anticipated – see previous section.
- New Build – Aerial Fiber Optic Plant: Installing new poles and hanging cables on previously disturbed or new (undisturbed) ROWs or easements and the potential construction of access roads.
  - Land Use: These activities could result in term potential impacts to land uses. Construction activities could temporarily restrict existing and surrounding land uses at isolated locations. New structures, poles, or access roads on previously undisturbed ROWs or easements could have long-term impacts to existing and surrounding land uses. The magnitude of the impact would depend on the specific location and the compatibility of the new structures with existing and surrounding land uses.
  - Recreation: Deployment activities may cause temporary, localized restricted access to recreation land or activities, which may persist for the duration of the deployment phase. Small reductions to visitation during the deployment phase may be anticipated.
  - Airspace: No impacts are anticipated – see previous section.
- New Build – Submarine Fiber Optic Plant: Installing cables in limited nearshore or inland bodies of water and the constructing landings and/or facilities on shore to accept submarine cable.
  - Land Use: Construction activities could temporarily restrict existing and surrounding land uses at isolated locations. New landings and/or facilities on shore could have long-term impacts to existing and surrounding land uses. The magnitude of the impact would depend on the specific location and the compatibility of the new facilities with existing and surrounding land uses.
  - Recreation: Deployment may temporarily restrict recreation on or within bodies of water and the surrounding area during the deployment phase. Reductions in visitation may result during deployment.
  - Airspace: No impacts are anticipated – see previous section.
- Installation of Optical Transmission or Centralized Transmission Equipment: Installation of equipment including construction of new boxes, huts, or access roads.
  - Land Use: Construction activities could temporarily restrict existing and surrounding land uses at isolated locations. New boxes, huts, or access roads could have long-term impacts to existing and surrounding land uses. The magnitude of the impact

would depend on the specific location and the compatibility of the new facilities with existing and surrounding land uses.

- Recreation: Deployment of installation equipment and the construction of boxes, huts, or access roads may restrict access to recreation land or activities. Reductions in visitation during deployment may occur.
- Airspace: No impacts are anticipated – see previous section.

- Wireless Projects
  - New Wireless Communication Towers: Installing new wireless towers, associated structures (generators, equipment sheds, fencing, security and aviation lighting, electrical feeds, and concrete foundations and pads) or access roads.
    - Land Use: Construction activities could temporarily restrict existing and surrounding land uses at isolated locations. New wireless towers, associated structures, or access roads could have long-term impacts to existing and surrounding land uses. The magnitude of the impact would depend on the specific location and the compatibility of the new facilities with existing and surrounding land uses.
    - Recreation: Deployment of new towers and associated structures could result in temporary, localized restricted access for recreation land or activities for the duration of the deployment phase. Reductions in visitation or duration of recreational activity may result from restricted access.
    - Airspace: Installation of new wireless towers could result in impacts to airspace if towers exceed 200 feet AGL or meets other criteria listed in Section 8.1.7.6. An OE/AAA could be required for the FAA to determine if the proposed construction does affect navigable airways or flight patterns of an airport if the aerial fiber optic plant is located in proximity to one of Louisiana's airports
  - Collocation on Existing Wireless Tower, Structure, or Building: Collocation would involve mounting or installing equipment (such as antennas or microwave dishes) on an existing tower.
    - Land Use: No impacts are anticipated – see previous section.
    - Recreation: Installation of antennas or microwaves to existing towers may cause temporary, localized restricted access to recreation lands or activities during installation, which may cause small reductions in visitation for the duration of installation.
    - Airspace: Collocation of mounting or installing equipment (such as antennas or microwave dishes) on an existing tower, addition of power units, structural hardening, and physical security measures could result in impacts if located near airports or air navigation facilities.
- Deployable Technologies

- Deployable Technologies: These technologies would be used where permanent, fixed infrastructure cannot be deployed due to a variety of factors such as the need to supplement coverage or to avoid or mitigate permanent impacts to sensitive resources or receptors.
  - Land Use: No impacts are anticipated – see previous section.
  - Recreation: No impacts are anticipated – see previous section.
  - Airspace: Implementation of deployable aerial communications architecture could result in temporary or intermittent impacts to airspace. Deployment of tethered systems (such as balloons or blimps) could pose an obstruction hazard if deployed above 200 feet and near Louisiana airports. Potential impacts to airspace (such as SUAs and MTRs) may be possible depending on the planned use of drones, piloted aircraft, untethered balloons, and blimps (e.g., frequency of deployment, altitudes, proximity to airports and airspaces classes/types, length of deployment, etc.). Coordination with the FAA would be required to determine the actual impact and the required certifications. It is expected that FirstNet would attempt to avoid changes to airspace and the flight profiles (boundaries, flight altitudes, operating hours, etc.).

- Satellites and Other Technologies
  - Satellite-Enabled Devices and Equipment: The installation of permanent equipment on existing structures and the use of portable devices that use satellite technology.
    - Land Use: No impacts are anticipated – see previous section.
    - Recreation: It is anticipated the installation of equipment on existing structures may cause temporary, localized restricted access to recreation lands or activities during installation, which may cause small reductions in visitation for the duration of installation.
    - Airspace: It is anticipated that the installation of permanent equipment on existing structures and the use of portable devices that use satellite technology may impact airspace if equipment creates an obstruction.

In general, the abovementioned activities could potentially involve construction activities. Potential impacts to land uses associated with deployment of this infrastructure could include temporary restrictions to existing and surrounding land uses in isolated locations. Potential impacts to recreation land and activities could include temporary, localized restricted access and reductions in visitation or duration of recreational activities. Potential impacts to airspace could include obstructions. These potential impacts are expected to be less than significant at the programmatic level due to the temporary and small-scale nature of deployment activities. Additionally, FirstNet (or its network partners), would prepare an OE/AAA for any proposed tower that might affect navigable airways or flight patterns of an airport. Chapter 16, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, operation activities associated with the Preferred Alternative would consist of routine maintenance and inspection of the facilities. Any major infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the abovementioned deployment impacts. It is anticipated that there would be no impacts to land use, recreation resources, or airspace associated with routine inspections of the Preferred Alternative, assuming that the same access roads used for deployment are also used for temporary, short-term inspections because there would be no ground disturbance, no airspace activity, and no access restrictions to recreational lands. If routine maintenance or inspection activities would conflict with existing or surrounding land uses, impact recreation resources, or conflict with airspace, impacts could result as explained above.

Operation of the Deployable Technologies options of the Preferred Alternative could result in the temporary presence of deployable vehicles and equipment (including airborne equipment), potentially for up to two years in some cases. Operation activities would consist of implementation/running of the deployable technology and routine maintenance and inspections. It is anticipated that there would be no impacts to land use, recreation resources, or airspace associated with routine inspections, assuming that the same access roads used for deployment are also used for inspections.

The degree of change in the visual environment (see Section 8.2.8, Visual Resources)—and therefore the potential indirect impact on a landowner's ability to use or sell of their land as desired—would be highly dependent on the specific deployment location and length of deployment. Once deployment locations are known, the location would be subject to an environmental review to help ensure environmental concerns are identified. The use of deployable aerial communications architecture could temporarily add new air traffic or aerial navigation hazards. The magnitude of these effects would depend on the specific location of airborne resources along with the duration of their use. FirstNet would coordinate with the FAA to review required certifications. Chapter 16, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

8.2.7.5 Alternatives Impact Assessment

The following section assesses potential impacts to land use, recreation resources, and airspace associated with the Deployable Technologies Alternative and the No Action Alternative.[130]

Deployable Technologies Alternative

Under the Deployable Technologies Alternative option, a nationwide fleet of mobile communications systems would provide temporary coverage in areas not covered by the existing, usable infrastructure. There would be no collocation of equipment and minimal new

[130] As mentioned above and in Section 2.1.2, Proposed Action Infrastructure, the Preferred Alternative includes implementation of deployable technologies.

construction associated with wired or wireless projects discussed above under the Preferred Alternative. Some limited construction could be associated with implementation such as land clearing or paving for parking or staging areas. The specific infrastructure associated with the Deployable Technologies Alternative would be the same as the deployable technologies implemented as part of the Preferred Alternative but would likely be implemented in greater numbers, over a larger geographic extent, and used with greater frequency and duration. Therefore, potential impacts to land use, recreation, and airspace resources as a result of implementation of this alternative could be as described below.

Deployment Impacts

As explained above, implementation of deployable technologies could result in less than significant impacts to land use at the programmatic level. While a single deployable technology may have imperceptible impact, multiple technologies operating in close proximity for longer periods could impact existing and surrounding land uses. There could be impacts to recreation activities during the deployment of technologies if such deployment were to occur within or near designated recreation areas. Enjoyment of activities dependent upon the visibility of wildlife or scenic vistas may be affected; however, impacts would be less than significant at the programmatic level, due to the temporary nature of likely deployment activities. If deployment triggers any obstruction criterion or results in changes to flight patterns and airspace restrictions, FirstNet (or its partners) would consult with the FAA to determine how to proceed. Chapter 16, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

As explained above, operation activities would consist of implementation/running of the deployable technology and routine maintenance and inspections. As with the Preferred Alternative, it is anticipated that there would be no impacts to land use, recreation resources, or airspace associated with routine inspections of the Deployable Technologies Alternative, assuming that the same access roads used for deployment are also used for inspections. Operation of deployable technologies would result in land use, land ownership, airspace, and recreation (access and enjoyment) similar in type to those described for the Preferred Alternative. The frequency and extent of those potential impacts would be greater than for the Proposed Action because under this Alternative, deployable technologies would be the only options available. As a result, this alternative would require a larger number of terrestrial and airborne deployable vehicles and a larger number of deployment locations in—all of which would potentially affect a larger number of properties and/or areas of airspace. Overall, these potential impacts would be less than significant at the programmatic level, due to the temporary nature of deployment activities. Chapter 16, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

No Action Alternative

Under the No Action Alternative, the NPSBN would not be deployed; therefore, there would be no associated construction or installation of wired, wireless, deployable infrastructure, or satellites and other technologies. As a result, there would be no impacts to land use, recreation resources, or airspace. Environmental conditions would therefore be the same as those described in Section 8.1.7, Land Use, Recreation, and Airspace.

8.2.8 Visual Resources

8.2.8.1 Introduction

This section describes potential impacts to visual resources in Louisiana associated with deployment and operation of the Proposed Action and alternatives. Chapter 16, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

8.2.8.2 Impact Assessment Methodology and Significance Criteria

The impacts of the Proposed Action on visual resources were evaluated using the significance criteria presented in Table 8.2.8-1. As described in Section 8.2, Environmental Consequences, the categories of impacts are defined as potentially significant, less than significant with mitigation incorporated, less than significant, or no impact. Characteristics of each impact type, including magnitude or intensity, geographic extent, and duration or frequency, were used to determine the impact significance rating associated with each potential impact.

Given the nature of this programmatic evaluation, and because the Proposed Action could potentially cover a wide variety of actions that would take place in various landscapes, the potential impacts to visual resources addressed in this section are presented as a range of possible impacts.

Table 8.2.8-1: Impact Significance Rating Criteria for Visual Resources

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
Adverse Change in Aesthetic Character of Scenic Resources or Viewsheds	Magnitude or Intensity	Fundamental and irreversibly negative change in aesthetic character.	Effect that is potentially significant, but with mitigation is less than significant.	Intermittently noticeable change in aesthetic character that is marginally negative.	No visible effects.
	Geographic Extent	Regional impacts observed throughout the state/territory.		Effects realized at one or multiple isolated locations.	No visible effects.
	Duration or Frequency	Permanent or persistent changes to aesthetic character lasting throughout or beyond the construction or deployment phase.		Persisting through the construction and deployment phase, but aesthetics of the area would be returned to original state following the construction and deployment phase.	Transient or no visible effects.
Nighttime Lighting	Magnitude or Intensity	Lighting dramatically alters night-sky conditions.	Effect that is potentially significant, but with mitigation is less than significant.	Lighting alters night-sky conditions to a degree that is only intermittently noticeable.	Lighting does not noticeably alter night-sky conditions.
	Geographic Extent	Regional impacts observed throughout the state/territory.		Effects realized at one or multiple isolated locations.	No visible effects.
	Duration or Frequency	Permanent or persistent changes to night-sky conditions lasting throughout or beyond the construction or deployment phase.		Persisting through the construction and deployment phase, but lighting would be removed and night-sky conditions would be returned to original state following the construction and deployment phase.	Transient or no visible effects.

8.2.8.3 Description of Environmental Concerns

Adverse Change in Aesthetic Character of Scenic Resources or Viewsheds

A primary concern during and following construction of structures, towers, roads or other permanent features is the long-term disruption of scenery and viewsheds. In Louisiana, residents and visitors travel to many national monuments, historic sites, and state parks, such as Kisatchie National Forest contains more than 604,000 acres and includes visual resources such as bald cypress groves, bayous, and pine stands (USFS, 2015). If lands considered visually significant or scenic were subject to vegetation loss or removal, short- or long-term effects to viewsheds or scenic resources could occur. Bare ground or interruption of a landscape due to vegetation removal could be considered an adverse change in the aesthetic character of scenic resources or viewsheds. New towers or structures constructed within scenic areas could disrupt the perceived aesthetic character or scenery of an area. If new towers were constructed to a height that required lighting, nighttime vistas could be affected in areas where the night skies do not have light disruptions or are within unpopulated areas.

Louisiana regulates impacts to visual resources for historic properties through their State Historic Preservation Office to "avoid or minimize adverse visual effects on historic properties wherever feasible." Historic properties in Louisiana are assessed prior to a proposed project to determine if any adverse effects to the integrity or historic significance could occur. (DHP, 2016)

Based on the impact significance criteria presented in Table 8.2.8-1, impacts to the aesthetic character of scenic resources or viewsheds would be considered potentially significant if landscapes were permanently removed or fragmented, or if damage to historic or cultural resources occurred. Given the small-scale of likely FirstNet activities, impacts are expected to be less than significant at the programmatic level.

Nighttime Lighting

If new towers or facilities were constructed to a height that required lighting, nighttime vistas could be affected in areas where the night skies do not have light disruptions or are within unpopulated areas. If nighttime lighting were necessary for the operation or function of a facility that caused regional impacts or permanent changes to night sky conditions, those effects could be considered potentially significant.

Based on the impact significance criteria presented in Table 7.2.8 1, lighting that illuminates the night sky, diminishes night sky viewing over long distances, and persists over the long-term could be considered potentially significant. Although likely FirstNet actions are expected to be small-scale, certain discrete locations may experience potentially significant impacts to night skies, although potentially minimized to less than significant at the programmatic level with implementation of BMPs and mitigation measures, as defined in Chapter 16, BMPs and Mitigation Measures. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented.

8.2.8.4 Potential Impacts of the Preferred Alternative

The following section assesses potential impacts associated with implementation of the Preferred Alternative, including deployment and operation activities.

Deployment Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, implementation of the Preferred Alternative could result in the deployment of various types of facilities or infrastructure. Depending on the physical nature and location of the facility/infrastructure and the specific deployment requirements, some activities would result in potential impacts to visual resources and others would not. In addition, and as explained in this section, at the programmatic level, the same type of Proposed Action Infrastructure could result in a range of no impacts to less than significant impacts depending on the deployment scenario or site-specific conditions. Chapter 16, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Activities Likely to Have No Impacts

Of the types of facilities or infrastructure deployment scenarios described in Section 2.1.2, Proposed Action Infrastructure, the following are likely to have no impacts to visual resources under the conditions described below:

- Wired Projects
  - Collocation on Existing Aerial Fiber Optic Plant: While the addition of new aerial fiber optic plant to an existing aerial fiber optic transmission system would likely be visible, the change associated with this option is so small as to be essentially imperceptible. This option would involve no new nighttime lighting and pole replacement would be limited.
  - Use of Existing Conduit – New Buried Fiber Optic Plant: Disturbance associated with the installation of fiber optic cable in existing conduit would be limited to entry and exit points of the existing conduit in previously disturbed areas. It is anticipated that there would be no impacts to visual resources since the activities would be conducted at small entry and exit points and are not likely to produce perceptible changes, and would not require nighttime lighting.
  - Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting up of dark fiber would have no impacts to visual resources. If required, and if done in existing huts with no ground disturbance, installation of new associated equipment would have no impacts to visual resources because there would be no ground disturbance, would not require nighttime lighting, and would not produce any perceptible changes.
- Satellites and Other Technologies
  - Satellite-Enabled Devices and Equipment: It is anticipated that the installation of permanent equipment on existing structures and the use of portable devices that use

satellite technology would not impact visual resources since those activities would not require ground disturbance or vegetation removal.

- Deployment of Satellites: FirstNet does not anticipate launching satellites as part of the deployment of the NPSBN; however, it may include equipment on satellites that are already being launched for other purposes. As adding equipment to an existing launch vehicle would be very unlikely to impact visual resources, it is anticipated that this activity would have no impact on visual resources.

Activities with the Potential to Have Impacts

Potential deployment-related impacts to visual resources as a result of implementation of the Preferred Alternative would encompass a range of impacts that could occur as a result of ground disturbance, vegetation removal, or installation of permanent structures if development occurs in scenic areas. The types of deployment activities that could be part of the Preferred Alternative and result in potential impacts to visual resources include the following:

- Wired Projects
  - New Build – Buried Fiber Optic Plant: Plowing (including vibratory plowing), trenching, or directional boring and the construction of POPs, huts, or other associated facilities or hand-holes to access fiber could result in potential impacts to visual resources. The degree of impact would depend on the timing, location, and type of project; installation of a hut or POP would be permanent, whereas ground-disturbing activities would be short-term. In most cases, development in or next to existing roadways would not affect visual resources unless vegetation were removed or excavation occurred in scenic areas.
  - New Build – Aerial Fiber Optic Plant: Construction and installation of new or replacement poles and hanging cables could result in impacts to the aesthetic character of scenic resources or viewsheds depending on the location of the installation. In most cases, development in public rights-of-ways would not affect visual resources unless vegetation were removed or construction occurred in scenic areas. If new lighting were necessary, impacts to night skies could occur. Construction of new roadways could result in linear disruptions to the landscape, surface disturbance, and vegetation removal, all of which could impact the aesthetic character of scenic resources or viewsheds, depending on the location of the installation.
  - New Build – Submarine Fiber Optic Plant: The installation of cables in limited nearshore and inland bodies of water would not impact visual resources. However, impacts to the aesthetic character of scenic resources or viewsheds could potentially occur as result of the construction of landings and/or facilities on shores or the banks of waterbodies that accept submarine cable.
  - Installation of Optical Transmission or Centralized Transmission Equipment: If installation of transmission equipment required grading, vegetation removal, or other ground disturbance to install small boxes or huts, or access roads, potential impacts to visual resources could occur but effects would be temporary and localized.

- Wireless Projects
  - New Wireless Communication Towers: Installation of new wireless towers and associated structures (generators, equipment sheds, fencing, security and aviation lighting, electrical feeds, and concrete foundations and pads) or access roads could result in impacts to visual resources. Land/vegetation clearing, excavation activities, landscape grading, and other surface disturbing activities during the installation of new wireless towers and associated structures or access roads could result in the degradation of the aesthetic character of scenic resources or viewsheds. Impacts may be experienced by viewers if new towers were located in or near a national park unit or other sensitive area. If new towers were constructed to a height that required aviation lighting, nighttime vistas could be impacted in areas where the night skies do not have light disruptions or are within unpopulated areas. If nighttime lighting were necessary for the operation or function of a facility, impacts to night sky conditions could occur.
  - Collocation on Existing Wireless Tower, Structure, or Building: Collocation would involve mounting or installing equipment (such as antennas or microwave dishes) on an existing tower and would not likely result in additional impacts to visual resources. However, if additional power units, structural hardening, or physical security measures required ground disturbance or removal of vegetation, impacts to the aesthetic character of scenic resources or viewsheds could occur.
  - Deployable Technologies: Implementation of deployable technologies could result in potential impacts to visual resources if long-term deployment occurs in scenic areas, or if the implementation requires minor construction of staging or landing areas, results in vegetation removal, areas of surface disturbance, or additional nighttime lightning.

In general, the abovementioned activities could potentially involve land/vegetation clearing, and potential scenic intrusion of towers, poles, roads, infrastructure, and other structures. Potential impacts to visual resources associated with deployment could include interruptions of landscapes, degradation of the aesthetic character of scenic resources or viewsheds, and overall changes in valued scenic resources, particularly for permanent fixtures such as towers or facilities. These impacts are expected to be less than significant at the programmatic level, due to the temporary and small-scale nature of deployment activities. As discussed above, potential impacts to night skies from lighting are expected to be less than significant at the programmatic level with BMPs and mitigation measures incorporated. Chapter 16, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, operation activities associated with the Preferred Alternative would consist of routine maintenance and inspection of the facilities. Any major infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the abovementioned construction impacts. It is anticipated that there would be no impacts to visual resources associated with routine inspections of the Preferred

Alternative, assuming that the same access roads used for deployment are also used for inspections. Nighttime lighting in isolated rural areas or if sited near a national park would be less than significant at the programmatic level with BMPs and mitigation measures incorporated during operations. Additionally, FirstNet would work closely with the NPS to address any concerns they might have if a tower needed to be placed in an area that might affect the nighttime sky at a NPS unit. Chapter 16, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

8.2.8.5 Alternatives Impact Assessment

The following section assesses potential impacts to visual resources associated with the Deployable Technologies Alternative and the No Action Alternative.

Deployable Technologies Alternative

Under the Deployable Technologies Alternative option, a nationwide fleet of mobile communications systems would provide temporary coverage in areas not covered by the existing, usable infrastructure. There would be no collocation of equipment and minimal new construction associated with wired or wireless projects discussed above under the Preferred Alternative. Some limited construction could be associated with implementation such as land clearing or paving for parking or staging areas. The specific infrastructure associated with the Deployable Technologies Alternative would be the same as the deployable technologies implemented as part of the Preferred Alternative but would likely be implemented in greater numbers, over a larger geographic extent, and used with greater frequency and duration. Therefore, potential impacts to infrastructure as a result of implementation of this alternative could be as described below.

Deployment Impacts

As explained above, implementation of deployable technologies could result in potential impacts to visual resources if long-term deployment occurs in scenic areas. If staging or landing areas (depending on the type of technology) require surface disturbance or vegetation clearing, or if these areas were within scenic landscapes or required new nighttime lighting, impacts could occur to the aesthetic character of scenic resources or viewsheds. These impacts are expected to be less than significant at the programmatic level, as generally they would be limited to the deployment location and could often be screened or otherwise blocked from view. Chapter 16, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

As explained above, operation activities would consist of implementation/running of the deployable technology and routine maintenance and inspections. As with the Preferred Alternative, it is anticipated that there would be no impacts to visual resources associated with routine inspections of the Preferred Alternative, assuming that the same access roads used for deployment are also used for inspections. The potential visual impacts—including aesthetic conditions and nighttime lighting—of the operation of deployable technologies would be less than significant at the programmatic level, given the limited geographic scope for individual activities. Chapter 16, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

No Action Alternative

Under the No Action Alternative, the NPSBN would not be deployed; therefore, there would be no associated construction or installation of wired, wireless, deployable infrastructure or satellites and other technologies. As a result, there would be no impacts to visual resources as a result of construction and operation of the Proposed Action. Environmental conditions would therefore be the same as those described in Section 8.1.8, Visual Resources.

8.2.9 Socioeconomics

8.2.9.1 Introduction

This section describes potential impacts to socioeconomics in Louisiana associated with deployment and operation of the Proposed Action and alternatives. Chapter 16, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts

8.2.9.2 Impact Assessment Methodology and Significance Criteria

The impacts of the Proposed Action on socioeconomics were evaluated using the significance criteria presented in Table 8.2.9-1. As described in Section 7.2, Environmental Consequences, the categories of impacts are defined as potentially significant, less than significant with mitigation incorporated, less than significant, or no impact. Characteristics of each impact type, including magnitude or intensity, geographic extent, and duration or frequency, were used to determine the impact significance rating associated with each potential impact.

Given the nature of this programmatic evaluation, and because the Proposed Action could potentially cover a wide variety of actions that would take place in various landscapes, the potential impacts to socioeconomics addressed in this section are presented as a range of possible impacts.

Table 8.2.9-1: Impact Significance Rating Criteria for Socioeconomics

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
Impacts to real estate (could be positive or negative)	Magnitude or Intensity	Changes in property values and/or rental fees, constituting a significant market shift.	Effect that is potentially significant, but with mitigation is less than significant.	Indiscernible impact to property values and/or rental fees.	No impacts to real estate in the form of changes to property values or rental fees.
	Geographic Extent	Regional impacts observed throughout the state/territory.		Effects realized at one or multiple isolated locations.	NA
	Duration or Frequency	Persists during the life of the project.		Persists for as long as the entire construction phase or a portion of the operations phase.	NA
Changes to spending, income, industries, and public revenues	Magnitude or Intensity	Economic change that constitutes a market shift.	Effect that is potentially significant, but with mitigation is less than significant.	Indiscernible economic change.	No change to spending, income, industries and public revenues.
	Geographic Extent	Regional impacts observed throughout the state/territory.		Effects realized at one or multiple isolated cities/towns.	NA
	Duration or Frequency	Persists during or beyond the life of the project.		Persists for as long as the entire construction phase or a portion of the operations phase.	NA
Impacts to employment	Magnitude or Intensity	High level of job creation at the state or territory level.	Effect that is potentially significant, but with mitigation is less than significant.	Low level of job creation at the state/territory level.	No job creation due to project activities at the state/territory level.
	Geographic Extent	Regional impacts observed throughout the state/territory.		Effects realized at one or multiple isolated cities/towns.	NA

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
	Duration or Frequency	Persists during the life of the project.		Persists for as long as the entire construction phase or a portion of the operations phase.	NA
Changes in population number or composition	Magnitude or Intensity	Substantial increases in population, or changes in population composition (age, race, gender).	Effect that is potentially significant, but with mitigation is less than significant.	Minor increases in population or population composition.	No changes in population or population composition.
	Geographic Extent	Regional impacts observed throughout the state or territory.		Effects realized at one or multiple isolated locations.	NA
	Duration or Frequency	Persists during the life of the project.		Persists for as long as the entire construction phase or a portion of the operations phase.	NA

NA = Not Applicable

8.2.9.3 Description of Environmental Concerns

This section discusses at a high level the types of socioeconomic impacts that could result from deployment of the NPSBN. Socioeconomic impacts could be negative or positive. Subsections below address socioeconomic impacts in four general areas, following the breakdown of the significance rating criteria in the table above:

- Impacts to Real Estate;
- Economic Benefits or Adverse Impacts Related to Changes in Spending, Income, Industries, and Public Revenues;
- Impacts to Employment; and
- Changes in Population Number or Composition.

In addition to the specific impacts noted below, the Proposed Action would likely have broad, beneficial impacts to all four areas in times of disaster, by improving the response of public safety personnel. Reduced damages and faster recovery would result. This would support property values; maintain corporate income, personal income, and government revenues; preserve jobs; and reduce disruptions to populations.

Impacts to Real Estate

Deployment of the NPSBN has the potential to improve property values in areas that have reduced property values due to below average public safety communication services. Improved services would reduce response times and improve responses. These effects would reduce the potential for economic losses and thus support investments in property and greater market value for property. Any increases in property values are most likely in areas that have low property values and below average public safety communication services. Increases are less likely in areas that already have higher property value. As discussed in Affected Environment, property values vary considerably across Louisiana. Median values of owner-occupied housing units in the 2009–2013 period ranged from over $231,000 in the greater Mandeville/Covington area, to around $122,000 in the Alexandria and Lake Charles areas. These figures are general indicators only. Property values are probably both higher and lower in specific localities. Any property value effects of deployment of the NPSBN would occur at a localized level.

Some telecommunications infrastructure, such as wireless communications towers, may adversely affect property values, depending on infrastructure location and other characteristics. Researchers believe these negative impacts relate to perceptions of the aesthetics of towers, or fears over electromagnetic radiation. Economists and appraisers have studied this issue and use a statistical analysis methodology known as hedonic pricing, or hedonic modelling, to assess how different attributes of properties such as distance from a tower affect property value (Bond, Sims, & Dent, 2013). Essentially, analysts compare the value of multiple properties while statistically controlling for differences in property attributes, in order to isolate the effect of a specific attribute such as proximity of a communications tower.

A recent literature review examined such studies in the United States, Germany, and New Zealand (Bond, Sims, & Dent, 2013). These studies all focused on residential properties. One study identified a positive effect on price in one neighborhood due to the presence of a wireless communications tower. Most studies identified negative effects on price. Generally, these negative effects were small: an approximately two percent decrease in property price. In one case, the average reduction in price was 15 percent. In all cases, the effects declined rapidly with distance, with some cases showing no effect beyond 100 meters (328 feet) and one case showing effects up to about 300 meters (984 feet).

Based on review of the particulars of each study, the literature review authors hypothesize that many additional factors regarding communications towers, besides distance, may affect property value. These include the type, height, size, and appearance of communication towers; grouping of towers; the level of activity in the property market at the time properties are listed or sold; and the level of negative local media focus on potential health effects of communication towers at the time properties are listed or sold.

Economic Benefits or Adverse Impacts Related to Changes in Spending, Income, Industries, and Public Revenues

Developing the NPSBN may increase economic activity as governments and partners make expenditures to deploy, operate, and maintain telecommunications and broadband infrastructure. Funds for such expenditures would come primarily from federal, state, and local government sources or through private entities under a written agreement with such governmental entities. FirstNet has three primary sources of funding to carry out its mission: (1) up to $7 billion in cash funded by proceeds of incentive auctions authorized by the Act; (2) network user or subscriber fees; and (3) fees from covered leasing agreements that allow FirstNet to permit a secondary user to access network capacity on a secondary basis for non-public safety services only. The use of NPSBN capacity on a secondary basis for non-public safety services, including commercial services, by parties entering into a covered leasing agreement with FirstNet may also increase economic activity and generation of income for such party.

Direct spending of federal, state, and private sector funds to deploy and operate the NPSBN would likely represent new income to businesses that provide goods and services for the network, resulting in a positive impact. This direct impact would lead to indirect impacts (as directly impacted businesses purchase supporting goods and services) and induced impacts (as the employees of all affected businesses spend the wages they have earned). Because most FirstNet infrastructure investments would be dispersed across the nation, the business income and wages generated in any particular state or community would generally be small relative to the overall state or community economy, but measurable. Based on the significance criteria above, the business income and wage impacts would be considered positive and less than significant at the programmatic level. It is also highly unlikely that these impacts would lead to significant market shifts or other significant changes to local/regional economic structure.

Spending and income generation related to developing the NPSBN would also result in changes to public revenues. Property taxes may change as property values increase or decrease due to the installation of new infrastructure. General and selective sales taxes may change (most likely increase), reflecting expenditures during system development and maintenance. Public utility tax revenues may change. These taxes are a subcategory of selective sales taxes that includes taxes on providers of land and mobile telephone, telegraph, cable, and internet services (U.S. Census Bureau, 2006). These service providers may obtain new taxable revenues from operation of components of the public safety broadband network. In such cases, public utility tax revenues may increase, but they could also remain the same or decrease if providers are granted tax breaks in return for operating portions of the network. Individual and corporate income taxes may change as FirstNet infrastructure development and operation creates new taxable income for involved companies and workers.

FirstNet's partner(s) may be given the right to use excess NPSBN capacity commercially. This would result in additional economic activity and generation of income. In turn, this could have revenue implications for federal and state governments, through taxes on sales and on corporate income generated by commercial use of the network.

FirstNet may have an additional, non-revenue benefit to the public sector. The network is likely to create operational cost savings and increased productivity for public safety personnel.

Impacts to Employment

Private companies and government organizations that receive income from deploying and operating the NPSBN would use portions of that income to hire the employees they need to provide their support to the network. This generation of new employment could be a minor, direct, beneficial impact of expenditures on FirstNet. Additional, indirect employment increases would occur as additional businesses hire workers to provide supporting goods and services. For instance, FirstNet partner(s) and their subcontractors and vendors would need engineers and information technology professionals, project managers, construction workers, manufacturing workers, maintenance workers, and other technical and administrative staff. Further employment gains would occur as businesses throughout the economy benefit from consumer spending by wage-earners in direct and indirectly affected businesses.

For the most part, employment gains in any particular state or community would generally be measurable, but small relative to the overall state or community economy. This is because FirstNet infrastructure investments would be dispersed across the nation. Based on the significance criteria above, the employment gains would be considered positive and less than significant at the programmatic level. However, even small employment gains are beneficial, and would be especially welcomed in areas that have high unemployment. As discussed in Affected Environment, unemployment rates (as shown by the unemployment rate map and selected economic indicators table) vary considerably across Louisiana. The average unemployment rate in 2014 was 6.4 percent, similar to the national rate of 6.2 percent. Parishes with unemployment rates below the national average (that is, better employment performance) were distributed throughout the state, with higher concentration in the southeastern and southwestern portions of the state. Most of the central and northern parishes had unemployment rates above the national average. The highest unemployment rates were generally in the northeast.

Large companies that win major contracts for deploying and operating the NPSBN may have concentrations of employees in some specific locations; for instance, engineers and other system designers may be located in one or a few specific offices. While such employment concentrations could be important to specific communities, these and other employment impacts would still not be significant based on the criteria in Table 8.2.9-1 because they would not constitute a "high level of job creation *at the state or territory level."*

Changes in Population Number or Composition

In general, changes in population numbers occur when employment increases or decreases to a degree that affects the decisions of workers on where they can find employment; that is, when workers and their families move to or leave an area because of employment opportunities or the lack thereof. As noted above, deployment and operation of the NPSBN is likely to generate new employment opportunities (directly and indirectly), but employment changes would not be large enough in any state to be considered significant. Therefore, it is highly unlikely that the NPSBN would lead to significant changes in population numbers according to the significance criteria table above. Further, it is unlikely that the NPSBN would lead to any measurable changes in population numbers in any geographic areas, with the possible exception of cities where companies that win major NPSBN contracts establish centers for NPSBN deployment and operation activities. Smaller numbers of employees in any area would not produce measurable population changes because population is always in flux due to births, deaths, and in-migration and out-migration for other reasons.

Population composition refers to age, gender, race, ethnicity, and other characteristics of the individuals making up a population. Given the low potential for changes to population numbers, it is highly unlikely that the NPSBN would lead to any changes in population composition.

8.2.9.4 Potential Impacts of the Preferred Alternative

The following section assesses potential impacts associated with implementation of the Preferred Alternative, including deployment and operation activities.

Deployment Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, implementation of the Preferred Alternative could deploy various types of facilities or infrastructure. Almost all deployment activities would have socioeconomic impacts, because all represent economic activity that would result, for instance, in expenditures and generation of income. These effects are measurable by economists, even if very small, but their significance is determined by application of the criteria in Table 8.2.9-1. Chapter 16, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Activities Likely to Have No Impacts

- Satellites and Other Technologies
  - Deployment of Satellites: FirstNet does not anticipate launching satellites as part of the deployment of the NPSBN; however, it could include equipment on satellites that are already being launched for other purposes. As adding equipment to an existing launch vehicle would be very unlikely to impact socioeconomics, it is anticipated that this activity would have no impact on socioeconomic resources.

Activities with the Potential to Have Impacts

Potential impacts to socioeconomics for the Preferred Alternative would encompass a range of impacts that could result from deployment activities. The discussion below summarizes how the four types of socioeconomic impacts discussed above and listed again here apply to each type of deployment activity. For greater detail on the nature of these impacts, see the Description of Environmental Concerns section above.

- Impacts to Real Estate;
- Changes to Spending, Income, Industries, and Public Revenues;
- Impacts to Employment; and
- Changes in Population Number or Composition.

Positive impacts on property values would generally not result from one or a few particular activities, but instead would result from the totality of the new NPSBN infrastructure and operational systems that enable improved public safety services to currently underserved areas. Similarly, any change to population numbers in a few locations as discussed above would result from large contract awards and contractor decisions about employee locations, not from specific deployment activities. Therefore, these types of impacts are not included in the activity-focused discussions below.

- Wired Projects
  - Use of Existing Conduit – New Buried Fiber Optic Plant: Installation of fiber optic cable in existing conduit would have the following types of socioeconomic impacts:
    - Changes to Spending, Income, Industries, and Public Revenues – Materials and labor for these projects would represent new expenditures that would generate income, help support industries, and may generate public revenues. All such effects would be small in scale relative to the regional and state economy and of limited duration; their impacts would be less than significant at the programmatic level.
    - Impacts to Employment – Similarly, at the programmatic level, expenditures for these projects would generate temporarily a less than significant number of jobs regionally and statewide.
  - Collocation on Existing Aerial Fiber Optic Plant: Collocation of new aerial fiber optic plant on existing utility poles and other structures would have the following types of socioeconomic impacts:

    - Changes to Spending, Income, Industries, and Public Revenues – Materials and labor for these projects would represent new expenditures that would generate income, help support industries, and may generate public revenues. All such effects would be small in scale relative to the regional and state economy and of limited duration; their impacts would be less than significant at the programmatic level.
    - Impacts to Employment – Similarly, at the programmatic level, expenditures for these projects would generate temporarily a less than significant number of jobs regionally and statewide.
  - Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting of dark fiber would be conducted electronically through existing infrastructure, and would have the following types of socioeconomic impacts:
    - Changes to Spending, Income, Industries, and Public Revenues – Labor for these projects would represent new expenditures that would generate income, help support industries, and may generate public revenues. All such effects would be small in scale relative to the regional and state economy and of limited duration; their impacts would be less than significant at the programmatic level.
    - Impacts to Employment – Similarly, at the programmatic level, expenditures for these projects would generate temporarily a less than significant number of jobs regionally and statewide.
  - New Build – Submarine Fiber Optic Plant: The installation of cables in limited nearshore and inland bodies of water, and associated onshore activities at existing or new facilities would have the following types of socioeconomic impacts:
    - Changes to Spending, Income, Industries, and Public Revenues – Materials and labor for these projects would represent new expenditures that would generate income, help support industries, and may generate public revenues. All such effects would be small in scale relative to the regional and state economy and of limited duration; their impacts would be less than significant at the programmatic level.
    - Impacts to Employment – Similarly, at the programmatic level, expenditures for these projects would generate temporarily a less than significant number of jobs regionally and statewide.
  - Installation of Optical Transmission or Centralized Transmission Equipment: Installation of transmission equipment through existing or new boxes or huts would have the following types of socioeconomic impacts:
    - Changes to Spending, Income, Industries, and Public Revenues – Materials and labor for these projects would represent new expenditures that would generate income, help support industries, and may generate public revenues. All such effects would be small in scale relative to the regional and state economy and of limited duration; their impacts would be less than significant at the programmatic level.

        - Impacts to Employment – Similarly, at the programmatic level, expenditures for these projects would generate temporarily a less than significant number of jobs regionally and statewide.

    - New Build – Buried Fiber Optic Plant: New fiber optic cable installation usually requires construction activities and would have the following types of socioeconomic impacts:

        - Changes to Spending, Income, Industries, and Public Revenues – Materials and labor for these projects would represent new expenditures that would generate income, help support industries, and may generate public revenues. All such effects would be small in scale relative to the regional and state economy and of limited duration; their impacts would be less than significant at the programmatic level.

        - Impacts to Employment – Similarly, at the programmatic level, expenditures for these projects would generate temporarily a less than significant number of jobs regionally and statewide.

    - New Build – Aerial Fiber Optic Plant: Pole/structure installation would have the following types of socioeconomic impacts:

        - Changes to Spending, Income, Industries, and Public Revenues – Materials and labor for these projects would represent new expenditures that would generate income, help support industries, and may generate public revenues. All such effects would be small in scale relative to the regional and state economy and of limited duration; their impacts would be less than significant at the programmatic level.

        - Impacts to Employment – Similarly, at the programmatic level, expenditures for these projects would generate temporarily a less than significant number of jobs regionally and statewide.

- Wireless Projects

    - New Wireless Communication Towers: Installation of new wireless towers and associated structures, such as generators, equipment sheds, fencing, security and aviation lighting, electrical feeds, and concrete foundations and pads, or access roads would have the following types of socioeconomic impacts:

        - Impacts to Real Estate – As discussed above, communication towers sometimes have adverse impacts on nearby property values (Bond, Sims, & Dent, 2013). Such impacts, if they occur, would be limited to a small area around each project and would generally be a small percentage reduction in property value; thus, the impacts would be less than significant at the programmatic level.

        - Changes to Spending, Income, Industries, and Public Revenues – Materials and labor for these projects would represent new expenditures that would generate income, help support industries, and may generate public revenues. All such effects would be small in scale relative to the regional and state economy and of limited duration; their impacts would be less than significant at the programmatic level.

- Impacts to Employment – Similarly, at the programmatic level, expenditures for these projects would generate temporarily a less than significant number of jobs regionally and statewide.

- Collocation on Existing Wireless Tower, Structure, or Building: Collocation would include mounting or installing equipment (such as antennas) on an existing facility would have the following types of socioeconomic impacts. While communication towers sometimes have adverse impacts on nearby property values (Bond, Sims, & Dent, 2013), the impacts of existing wireless towers are presumably already factored into property values and would not be affected by the addition of new equipment.
  - Changes to Spending, Income, Industries, and Public Revenues – Materials and labor for these projects would represent new expenditures that would generate income, help support industries, and may generate public revenues. All such effects would be small in scale relative to the regional and state economy and of limited duration; their impacts would be less than significant at the programmatic level.
  - Impacts to Employment – Similarly, at the programmatic level, expenditures for these projects would generate temporarily a less than significant number of jobs regionally and statewide.
- Deployable Technologies: COWs, COLTs, and SOWs and aerial deployable technologies require storage, staging, and (for aerial deployables) launch/landing areas. Development of such areas, or enlargement of existing areas to accommodate FirstNet equipment, would have the following types of socioeconomic impacts:
  - Impacts to Real Estate – It is possible that development or enlargement of storage, staging, and launch/landing areas could have adverse impacts on nearby property values. This is because such facilities may have adverse aesthetic aspects (e.g., large areas of pavement and large numbers of parked vehicles), equipment maintenance activities at such facilities may generate noise, and operational activities may generate traffic. Such factors could affect nearby property values. These impacts, if they occur, would occur within a limited distance of each site, and would be limited to a relatively small number of sites within the region and state. Therefore, these impacts would be less than significant at the programmatic level.
  - Changes to Spending, Income, Industries, and Public Revenues – Materials and labor for these projects would represent new expenditures that would generate income, help support industries, and may generate public revenues. All such effects would be small in scale relative to the regional and state economy and of limited duration; their impacts would be less than significant at the programmatic level.
  - Impacts to Employment – Similarly, at the programmatic level, expenditures for these projects would generate temporarily a less than significant number of jobs regionally and statewide.

- Satellites and Other Technologies
  - Satellite-Enabled Devices and Equipment: It is anticipated that the deployment of such devices and equipment would be similar to collocation of wireless equipment on existing wireless towers, structures, or buildings, and would have the following types of socioeconomic impacts:
    - Changes to Spending, Income, Industries, and Public Revenues – Materials and labor for these projects would represent new expenditures that would generate income, help support industries, and may generate public revenues. All such effects would be small in scale relative to the regional and state economy and of limited duration; their impacts would be less than significant at the programmatic level.
    - Impacts to Employment – Similarly, at the programmatic level, expenditures for these projects would generate temporarily a less than significant number of jobs regionally and statewide.

In general, the abovementioned activities would have less than significant beneficial socioeconomic impacts at the programmatic level. The discussion above characterized the impacts of each type of activity. The socioeconomic impacts of all activities considered together would also be less than significant. Even when considered together, the impacts would be very small relative to the total economic activity and property value of any region or the state. In addition, with the possible exception of property values, all deployment impacts would be limited to the construction phase. To the extent that certain activities could have adverse impacts to property values, those impacts are also expected to be less than significant at the programmatic level, as described above. Chapter 16, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, operation activities associated with the Preferred Alternative would consist of primarily of routine maintenance and inspection of fixed infrastructure. As with deployment activities, all operational activities would have socioeconomic impacts, because all represent economic activity. All operational activities would be conducted by public or private sector employees, and therefore support employment and involve payment of wages. Even if these economic effects are a very small for each operational activity, and not significant across the entire state, they are measurable socioeconomic impacts.

Potential socioeconomic impacts would primarily be beneficial, and generally of these types:

- Changes to Spending, Income, Industries, and Public Revenues – Operational activities would require expenditures, which then generate business income and employee wages, and may result in new public sector revenues such as taxes on sales and income. All such effects would be small in scale relative to the regional and state economy; their impacts would be less than significant at the programmatic level.

- Impacts to Employment – Public and private sector organizations responsible for operating the NPSBN would sustain existing employees and/or hire new employees to carry out operational activities. They would generate a less than significant number of jobs regionally and statewide at the programmatic level.

The potential negative impacts on property values mentioned above for deployment of new wireless communication towers and deployable technology storage, staging, and launch/landing areas may also apply in the operations phase. The ongoing presence of such facilities has aesthetic and other effects that may reduce nearby property values, relative to values in the absence of such facilities. These impacts, if they occur, would be less than significant at the programmatic level, as they would occur within a limited distance of each site, and would be limited to a relatively small number of sites within the region and state. Chapter 16, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

8.2.9.5 Alternatives Impact Assessment

The following section assesses potential impacts to socioeconomics associated with the Deployable Technologies Alternative and the No Action Alternative.

Deployable Technologies Alternative

Under the Deployable Technologies Alternative, a nationwide fleet of mobile communications systems would provide temporary coverage in areas not covered by the existing, usable infrastructure. There would be no collocation of equipment and minimal new construction associated with wired or wireless projects discussed above under the Preferred Alternative. Some limited construction could be associated with implementation such as land clearing or paving for parking or staging areas. The specific infrastructure associated with the Deployable Technologies Alternative would be the same as the deployable technologies implemented as part of the Preferred Alternative but would likely be implemented in greater numbers, over a larger geographic extent, and used with greater frequency and duration. Therefore, potential impacts to socioeconomics resulting from implementation of this alternative could be as described below.

Deployment Impacts

As explained above, all deployment activities represent economic activity and thus have socioeconomic impacts. These impacts would primarily be beneficial, such as generation of business income and employee wages, and creation or sustainment of jobs. The impacts would be small for each activity and, therefore, less than significant at the programmatic level.

Deployable technologies such as COWs, COLTs, and SOWs, along with aerial deployable technologies, would require storage, staging, and launch/landing areas. Development or enlargement of these facilities could have adverse impacts on nearby property values. The potential for such impacts is higher under this alternative than the Preferred Alternative because it is likely that these facilities would be implemented in greater numbers and over a larger geographic extent. These potential impacts are anticipated to be less than significant at the programmatic level, as described above. Chapter 16, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

All operational activities represent economic activity and thus have socioeconomic impacts. These impacts would primarily be beneficial, and because they are small individually, overall impacts would be less than significant at the programmatic level.

The ongoing presence of facilities for housing and maintaining deployable technologies may have adverse aesthetic aspects (e.g., large areas of pavement and large numbers of parked vehicles) or other aspects (e.g., noise and traffic) that could negatively affect the value of surrounding properties. The potential for such impacts is higher under this alternative than the Preferred Alternative because it is likely that these facilities would be more numerous, present over a larger geographic extent, and used with greater frequency and duration. These impacts, if they occur, would be less than significant at the programmatic level, as they would be limited to a relatively small number of sites within the region and state. Chapter 16, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

No Action Alternative

Under the No Action Alternative, the NPSBN would not be deployed. Therefore, there would be no associated deployment or installation activities to deploy wired, wireless, deployable infrastructure or satellites and other technologies. As a result, there would be no impacts to socioeconomics from deployment and operation of the No Action Alternative. Socioeconomic conditions would therefore be the same as those described in Section 8.1.9, Socioeconomics.

8.2.10 Environmental Justice

8.2.10.1 Introduction

This section describes potential impacts to environmental justice in Louisiana associated with deployment and operation of the Proposed Action and alternatives. Chapter 16, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

8.2.10.2 Impact Assessment Methodology and Significance Criteria

The impacts of the Proposed Action on environmental justice were evaluated using the significance criteria presented in Table 8.2.10-1. As described in Section 8.2, Environmental Consequences, the categories of impacts are defined as potentially significant, less than significant with mitigation incorporated, less than significant, or no impact. Characteristics of each impact type, including magnitude or intensity, geographic extent, and duration or frequency, were used to determine the impact significance rating associated with each potential impact.

Given the nature of this programmatic evaluation, and because the Proposed Action could potentially cover a wide variety of actions that would take place in various landscapes, the potential impacts to environmental justice addressed in this section are presented as a range of possible impacts.

Table 8.2.10-1: Impact Significance Rating Criteria for Environmental Justice

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	Less than Significant with BMPs and Mitigation Measures Incorporated	Less than Significant	No Impact
Effects associated with other resource areas (e. g., human health and safety, cultural resources, socioeconomics) that have a disproportionately high and adverse impact on low-income populations and minority populations	Magnitude or Intensity	Direct and disproportionately high and adverse effects on environmental justice communities (as defined by EO 12898) that cannot be fully mitigated.	Effect that is potentially significant, but with mitigation is less than significant.	Direct effects on environmental justice communities (as defined by EO 12898) that are not disproportionately high and adverse, and therefore do not require mitigation.	No direct effects on environmental justice communities, as defined by EO 12898.
	Geographic Extent	Effects realized within parishes (counties) at the Census Block Group level.		Effects realized within parishes (counties) at the Census Block Group level.	Effects realized within parishes (counties) at the Census Block Group level.
	Duration or Frequency	Persists during the life of the project.		Persists for as long as the entire construction phase or a portion of the operations phase.	NA

NA = Not Applicable

8.2.10.3 Description of Environmental Concerns

Effects Associated with Other Resource Areas that have a Disproportionately High and Adverse Impact on Low-Income Populations and Minority Populations

EO 12898,[131] *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (Executive Office of the President, 1994), and guidance from CEQ, require federal agencies to evaluate potential human health and environmental effects on environmental justice populations. Specifically, "Such effects may include ecological, cultural, human health, economic, or social impacts on minority communities, low-income communities, or Indian tribes when those impacts are interrelated to impacts on the natural or physical environment" (CEQ, 1997). Thus, effects associated with other resource areas are of interest from an environmental justice perspective. This includes Human Health and Safety, Cultural Resources, Socioeconomics, Noise, Aesthetics and Visual Resources, and other resources.

Potential concerns noted in the impact analyses for these resources include dust, noise, traffic, and other adverse impacts of construction activities. New wireless communication towers sometimes have adverse impacts on nearby property values (Bond, Sims, & Dent, 2013). See Socioeconomics Environmental Consequences for additional discussion. The presence and operation of large storage, staging, and launch/landing areas for deployable technologies could raise environmental justice concerns as described below. American Indian tribes are considered environmental justice populations (CEQ, 1997); thus, impacts on tribal cultural resources (for instance, due to construction) could be a concern from an environmental justice perspective.

Impacts are considered environmental justice impacts only if they are *both* "adverse" and "disproportionately high" in their incidence on environmental justice populations relative to the general population (CEQ, 1997). The focus in environmental justice impact assessments is always, by definition, on adverse effects. However, telecommunications projects, such as those proposed by FirstNet, could have beneficial effects. These effects may include better provision of police, fire, and emergency medical services; improvements in property values; and the generation of jobs and income. These impacts are considered in the Socioeconomics Environmental Consequences (Section 7.2.9).

Construction impacts are localized, and property value impacts of wireless telecommunications projects rarely extend beyond 300 meters (984 feet) of a communications tower (Bond, Sims, & Dent, 2013). In addition, impacts related to deployment are of short duration. The potential for significant environmental justice impacts from the FirstNet deployment activities would be limited. Most, but not all, of the FirstNet operational activities have very limited potential for impacts as these activities are limited in scale and short in their duration.

Before FirstNet deploys projects, additional site-specific analyses to identify specific environmental justice populations and assess specific impacts on those populations may be necessary. Such analyses could tier-off the methodology and results of this PEIS. The areas shown in the environmental justice screening map of Affected Environment (Section 8.1.10.4) as

[131] See https://www.epa.gov/laws-regulations/summary-executive-order-12898-federal-actions-address-environmental-justice.

having moderate potential or high potential for environmental justice populations would particularly warrant further screening. As discussed in Section 8.1.10.3, Environmental Setting: Minority and Low-Income Populations, Louisiana's population has a considerably higher percentage of persons who identify as Black/African American than the region or the nation. It has lower percentages for other minority groups, and an overall All Minorities percentage that is similar to that of the region and nation. The state has a higher rate of poverty than the region and nation. Louisiana has many areas with high potential for environmental justice populations. The distribution of these high potential areas is fairly even across the state, and occurs both within and outside of the 10 largest population concentrations. The distribution of areas with moderate potential for environmental justice populations is also fairly even across the state. Further analysis using the data developed for the screening analysis in Section 8.1.10.4, Environmental Justice Screening Results, may be useful. In addition, USEPA's EJSCREEN tool and USEPA's lists of environmental justice grant and cooperative agreement recipients may help identify local environmental justice populations (USEPA, 2015d; USEPA, 2016f).

A site-specific analysis would also evaluate whether an actual environmental justice impact on those populations would be likely to occur. Analysts could use the evaluation presented below under "Activities with the Potential to Have Impacts" as a starting point. Analysts should bear in mind that any such activities that are problematic based on the adverse impact criterion of environmental justice may also have beneficial impacts on those same environmental justice communities.

8.2.10.4 Potential Impacts of the Preferred Alternative

The following section assesses potential impacts associated with implementation of the Preferred Alternative, including deployment and operation activities.

Deployment Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, implementation of the Preferred Alternative could deploy various types of facilities or infrastructure. Depending on the physical nature and location of FirstNet facilities or infrastructure and the specific action, some activities would result in potential impacts to environmental justice communities and others would not. In addition, and as explained in this section, at the programmatic level, the same type of Proposed Action Infrastructure could result in a range of no impacts to less than significant impacts depending on the deployment scenario or site-specific conditions. Chapter 16, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Activities Likely to Have No Impacts

Of the types of facilities or infrastructure deployment scenarios described in Section 2.1.2, Proposed Action Infrastructure, the following are likely to have no impacts to environmental justice under the conditions described below:

- Wired Projects
  - Use of Existing Conduit – New Buried Fiber Optic Plant: Installation of fiber optic cable in existing conduit would be through existing hand holes, pulling vaults, junction boxes, huts, and POP structures. Activities at these small entry points would be limited and temporary and thus are not likely to produce perceptible changes affecting any surrounding communities. Therefore, they would not affect environmental justice communities.
  - Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting of dark fiber would be conducted electronically through existing infrastructure, and therefore would have no impacts to environmental justice. If physical access is required to light dark fiber, it would likely be through existing hand holes, pulling vaults, junction boxes, huts, and similar existing structures, with no resulting impacts on environmental justice communities.
- Satellites and Other Technologies
  - Satellite-Enabled Devices and Equipment: It is anticipated that the deployment of such devices and equipment would not involve new ground disturbance, impacts to environmental justice communities would not occur. Impacts associated with satellite-enabled devices requiring construction activities are addressed below.
  - Deployment of Satellites: FirstNet does not anticipate launching satellites as part of the deployment of the NPSBN; however, it may include equipment on satellites that are already being launched for other purposes. As adding equipment to an existing launch vehicle would be very unlikely to impact environmental justice, it is anticipated that this activity would have no impact on environmental justice.

Activities with the Potential to Have Impacts

Potential deployment-related impacts to environmental justice for the Preferred Alternative would encompass a range of impacts that could occur as a result of disturbance to communities from construction activities, such as noise, dust, and traffic. The types of infrastructure deployment activities that could be part of the Preferred Alternative and result in potential impacts to environmental justice communities include the following:

- Wired Projects
  - New Build – Buried Fiber Optic Plant: New fiber optic cable installation usually requires construction activities such as trenching, plowing (including vibratory plowing), or directional boring, as well as construction of hand holes, pulling vaults, junction boxes, huts, and POP structures. These activities could temporarily generate noise and dust, or disrupt traffic. If such impacts occur disproportionately to environmental justice communities, they would be considered environmental justice impacts.
  - New Build – Aerial Fiber Optic Plant: Pole/structure installation could temporarily generate noise and dust, or disrupt traffic. If these effects occur disproportionately in

environmental justice communities, they would be considered environmental justice impacts.

- New Build – Submarine Fiber Optic Plant: The installation of cables in limited nearshore and inland bodies of water would not impact environmental justice because there would be no ground disturbance or other impacts associated with this activity that would adversely impact communities. Associated onshore activities occurring at existing facilities such as staging of equipment and materials, or connection of cables, would be small in scale and temporary; thus, they would not impact environmental justice communities. Construction of new landings and/or facilities on shores or the banks of waterbodies that accept submarine cable could temporarily generate noise and dust, or disrupt traffic. If these effects occur disproportionately in environmental justice communities, they would be considered environmental justice impacts.
- Installation of Optical Transmission or Centralized Transmission Equipment: If installation of transmission equipment would occur in existing boxes or huts, there would be no adverse impacts on surrounding communities, and thus no potential for environmental justice impacts. Installation of optical transmission equipment or centralized transmission equipment requiring construction of new utility poles, hand holes, pulling vaults, junction boxes, huts, and POP structures could temporarily generate noise and dust, or disrupt traffic. If these effects occur disproportionately in environmental justice communities, they would be considered environmental justice impacts.

- Wireless Projects
  - New Wireless Communication Towers: Installation of new wireless towers and associated structures, such as generators, equipment sheds, fencing, security and aviation lighting, electrical feeds, and concrete foundations and pads, or access roads requires construction activities that could temporarily generate noise and dust, or disrupt traffic. New communication towers sometimes have adverse impacts on nearby property values (Bond, Sims, & Dent, 2013). (See Socioeconomics Environmental Consequences for additional discussion.) If these effects occur disproportionately in environmental justice communities, they would be considered environmental justice impacts.
  - Collocation on Existing Wireless Tower, Structure, or Building: Collocation would include mounting or installing equipment (such as antennas) on an existing facility. This activity would be small in scale, temporary, and highly unlikely to produce adverse human health or environmental impacts on the surrounding community. Thus, it would not impact environmental justice communities. However, if additional power units, structural hardening, and physical security measures required ground disturbance, the construction activity could temporarily generate noise and dust and disrupt traffic. If these effects occur disproportionately in environmental justice communities, they would be considered environmental justice impacts.

- Deployable Technologies: COWs, COLTs, and SOWs and aerial deployable technologies require storage, staging, and (for aerial deployables) launch and landing areas. To the extent such areas require new construction, noise and dust could be temporarily generated, and traffic could be disrupted. If these effects occur disproportionately in environmental justice communities, they would be considered environmental justice impacts.

In general, the impacts from the abovementioned activities would be short-term and could potentially involve objectionable dust, noise, traffic, or other localized impacts due to construction activities. In some cases, these effects and aesthetic effects could potentially impact property values, particularly from new towers. These impacts are expected to be less than significant at the programmatic level, but may be problematic from an environmental justice perspective if they occur disproportionately in environmental justice communities. Since environmental justice impacts occur at the site-specific level, analyses of individual proposed projects would help determine potential impacts to specific environmental justice communities. BMPs and mitigation measures may be required to address potential impacts to environmental justice communities at the site-specific level. Chapter 16, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, operation activities associated with the Preferred Alternative would consist of primarily of routine maintenance and inspection of fixed infrastructure. It is anticipated that such activities would not result in environmental justice impacts, as the intensity of these activities would be low (low potential for objectionable effects such as noise and dust) and their duration would be very short. Routine maintenance and inspection would not adversely affect property values, for the same reasons. Any major infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the abovementioned deployment activities that involve construction.

Impacts are expected to be less than significant at the programmatic level, given the short-term nature and limited geographic scope for individual activities. Chapter 16, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

8.2.10.5 Alternatives Impact Assessment

The following section assesses potential impacts to environmental justice associated with the Deployable Technologies Alternative and the No Action Alternative.

Deployable Technologies Alternative

Under the Deployable Technologies Alternative, a nationwide fleet of mobile communications systems would provide temporary coverage in areas not covered by the existing, usable infrastructure. There would be no collocation of equipment and minimal new construction associated with wired or wireless projects discussed above under the Preferred Alternative. Some limited construction could be associated with implementation such as land clearing or paving for parking or staging areas. The specific infrastructure associated with the Deployable Technologies Alternative would be the same as the deployable technologies implemented as part of the Preferred Alternative but would likely be implemented in greater numbers, over a larger geographic extent, and used with greater frequency and duration. Therefore, potential impacts to environmental justice communities resulting from implementation of this alternative could be as described below.

Deployment Impacts

As explained above, deployable technologies such as COWs, COLTs, and SOWs, along with aerial deployable technologies, could require storage, staging, and launch/landing areas. To the extent such areas require new construction, noise and dust could be generated temporarily, and traffic could be disrupted. If these effects occur disproportionately in environmental justice communities, they would be considered environmental justice impacts. Impacts are expected to be less than significant at the programmatic level, because they would be temporary in nature. Chapter 16, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

The ongoing presence of facilities for housing and maintaining deployable technologies may have adverse aesthetic aspects (e.g., large areas of pavement and large numbers of parked vehicles) that could negatively affect the value of surrounding properties. In addition, equipment maintenance activities at such facilities may temporarily generate noise, and operational activities may generate traffic. These effects may be adverse in themselves, and may impact property values. If these effects occur disproportionately in environmental justice communities, they would be considered environmental justice impacts. Impacts are expected to be less than significant at the programmatic level, as operations are expected to be temporary in nature. Chapter 16, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

No Action Alternative

Under the No Action Alternative, the NPSBN would not be deployed. Therefore, there would be no associated construction or installation activities to deploy wired, wireless, deployable infrastructure or satellites and other technologies. As a result, there would be no impacts to environmental justice as a result of deployment and operation of the No Action Alternative. Environmental conditions would therefore be the same as those described in Section 8.1.10, Environmental Justice.

8.2.11 Cultural Resources

8.2.11.1 Introduction

This section describes potential impacts to cultural resources in Louisiana associated with deployment and operation of the Proposed Action and alternatives. Chapter 16, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

8.2.11.2 Impact Assessment Methodology and Significance Criteria

The potential impacts of the Proposed Action on cultural resources were evaluated using the significance criteria presented in Table 8.2.11-1. As described in Section 8.2, Environmental Consequences, the categories of impacts are defined as potentially significant, less than significant with mitigation incorporated, less than significant, or no impact. Characteristics of each impact type, including magnitude or intensity, geographic extent, and duration or frequency, were used to determine the impact significance rating associated with each potential impact.

Given the nature of this programmatic evaluation, and because the Proposed Action could potentially cover a wide variety of actions that would take place in various landscapes, the potential impacts to cultural resources addressed in this section are presented as a range of possible impacts.

Table 8.2.11-1: Impact Significance Rating Criteria for Cultural Resources

Type of Effect	Effect Characteristics	Impact Level			
		Adverse Effect	Mitigated Adverse Effect[a]	Effect, but not Adverse	No Effect
Physical damage to and/or destruction of historic properties[b]	Magnitude or Intensity	Effects to a contributing portion of a single or many historic properties.	Adverse effect that has been procedurally mitigated through Section 106 process.	Effects to a non-contributing portion of a single or many historic properties.	No direct effects to historic properties.
	Geographic Extent	Direct effects area of potential effect (APE).		Direct effects APE.	Direct effects APE.
	Duration or Frequency	Permanent direct effects to a contributing portion of a single or many historic properties.		Permanent direct effects to a non-contributing portion of a single or many historic properties.	No direct effects to historic properties.
Indirect effects to historic properties (i.e., visual, noise, vibration, atmospheric)	Magnitude or Intensity	Effects to a contributing portion of a single or many historic properties.	Adverse effect that has been procedurally mitigated through Section 106 process.	Effects to a contributing or non-contributing portion of a single or many historic properties.	No indirect effects to historic properties.
	Geographic Extent	Indirect effects APE.		Indirect effects APE.	Indirect effects APE.
	Duration or Frequency	Long-term or permanent indirect effects to a single or many historic properties.		Infrequent, temporary, or short- or long-term or permanent indirect effects to a single or many historic properties.	No indirect effects to historic properties.
Loss of character defining attributes of historic properties	Magnitude or Intensity	Effects to a contributing portion of a single or many historic properties.	Adverse effect that has been procedurally mitigated through Section 106 process.	Effects to a non-contributing portion of a single or many historic properties.	No direct or indirect effects to historic properties.
	Geographic Extent	Direct and/or indirect effects APE.		Direct and/or indirect effects APE.	Direct and/or indirect effects APE.

Type of Effect	Effect Characteristics	Impact Level			
		Adverse Effect	Mitigated Adverse Effect[a]	Effect, but not Adverse	No Effect
	Duration or Frequency	Long-term or permanent loss of character defining attributes of a single or many historic properties.		Infrequent, temporary, or short-term changes to character defining attributes of a single or many historic properties.	No direct or indirect effects to historic properties.
Loss of access to historic properties	Magnitude or Intensity	Effects to a contributing portion of a single or many historic properties.	Adverse effect that has been procedurally mitigated through Section 106 process.	Effects to a non-contributing portion of a single or many historic properties.	No segregation or loss of access to historic properties.
	Geographic Extent	Any area surrounding historic properties that would cause segregation or loss of access to a single or many historic properties.		Any area surrounding historic properties that could cause segregation or loss of access to a single or many historic properties.	No segregation or loss of access to historic properties.
	Duration or Frequency	Long-term or permanent segregation or loss of access to a single or many historic properties.		Infrequent, temporary, or short-term changes in access to a single or many historic properties.	No segregation or loss of access to historic properties.

[a] Whereas mitigation measures for other resources discussed in this PEIS may be developed to achieve an impact that is "Less than Significant with Mitigation Incorporated," historic properties are considered to be "non-renewable resources," given their very nature. As such, any and all unavoidable adverse effects to historic properties, per Section 106 of the NHPA (as codified in 36 CFR Part 800.6), would require FirstNet to consult with the DHP/THPO and other consulting parties, including American Indian Tribes and Native Hawaiian Organizations, to develop appropriate mitigation.
[b] Per NHPA, a "historic property" is defined as any district, archaeological site, building, structure, or object that is either listed or eligible for listing in the NRHP. Cultural resources present within a project's APE are not historic properties if they do not meet the eligibility requirements for listing in the NRHP. Sites of religious and/or cultural significance refer to areas of concern to American Indian tribes and other consulting parties that, in consultation with the respective party(ies), may or may not be eligible for listing in the NRHP. These sites may also be considered TCPs. Therefore, by definition, these significance criteria only apply to cultural resources that are historic properties, significant sites of religious and/or cultural significance, or TCPs. For the purposes of brevity, the term historic property is used here to refer to either historic properties, significant sites of religious and/or cultural significance, or TCPs.

8.2.11.3 Description of Environmental Concerns

Physical Damage to and/or Destruction of Historic Properties

One of the primary environmental concerns during deployment activities is damage to or destruction of historic and cultural resources. Deployment involving ground disturbance has the potential to damage or destroy archaeological sites, and the attachment of communications equipment to historic building and structures has the potential to cause damage to features that are historically significant.

Based on the impact significance criteria presented in Table 8.2.11-1, direct deployment impacts could be potentially significant if FirstNet's deployment locations were in areas with moderate to high probabilities for archaeological deposits, within historic districts, or at historic properties. To the extent practicable, FirstNet would attempt to minimize activities in areas with archaeological deposits or within historic districts. However, given archaeological sites and historic properties are present throughout Louisiana, some deployment activities may be in these areas, in which case BMPs (see below) would help avoid or minimize the potential impacts.

Indirect Effects to Historic Properties (i.e., visual, noise, vibration, atmospheric)

The potential for indirect effects to historic properties would be present during deployment of the proposed facilities/infrastructure and during trenching, grading, and/or foundation excavation activities. Indirect effects include the introduction of visual, noise, atmospheric, and/or vibration effects that diminish a property's historic integrity. The greatest likelihood of potentially significant impacts from indirect effects would be from the deployment of equipment in areas that would cause adverse visual effects to historic properties. To the extent practicable, FirstNet would attempt to minimize activities in areas within or adjacent to historic districts or properties.

Loss of Character Defining Attributes of Historic Properties

Deployment of FirstNet equipment has the potential to cause the loss of character defining attributes of historic properties; such attributes are the features of historic properties that define their NRHP eligibility. Examples of such impacts would be the loss of integrity of archaeological sites through ground disturbing activities, and direct impacts to historic buildings from equipment deployment that adversely alter historic architectural features. Significant impacts such as these could be avoided or minimized through BMPs (see Chapter 16).

Loss of Access to Historic Properties

The deployment of equipment requiring a secure area has the potential to cause the loss of access to historic properties. The highest potential for this type of significant impact would be from the deployment of equipment in secure areas that impact the access to sites of cultural importance to American Indians. It is anticipated that FirstNet would identify potential impacts to such areas through the NHPA consultation process, and would minimize deployment activities that would cause such loss of access.

8.2.11.4 Potential Impacts of the Preferred Alternative

The following section assesses potential impacts associated with implementation of the Preferred Alternative, including deployment and operation activities.

Deployment Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, implementation of the Preferred Alternative could result in the deployment of various types of facilities or infrastructure. Depending on the physical nature and location of the facility/infrastructure and the specific deployment requirements, some activities would result in potential impacts to cultural resources, while others would not. In addition, and as explained in this section, the same type of Proposed Action Infrastructure could result in a range of no impacts to less than significant impacts at the programmatic level, depending on the deployment scenario or site-specific conditions. Chapter 16, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Activities Likely to Have No Impacts

Of the types of facilities or infrastructure deployment scenarios described in Section 2.1.2, Proposed Action Infrastructure, the following are likely to have no impacts to cultural resources under the conditions described below:

- Wired Projects
  - Use of Existing Conduit – New Buried Fiber Optic Plant: Disturbance associated with the installation of fiber optic cable in existing conduit would be limited to entry and exit points of the existing conduit in previously disturbed areas. It is anticipated that there would be no impacts to cultural resources since the activities that would be conducted at these small entry and exit points are not likely to produce impacts.
  - Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting up of dark fiber would have no impacts to cultural. If required, and if done in existing huts with no ground disturbance, installation of new associated equipment would also have no impacts to cultural resources. The section below addresses potential impacts to cultural resources because there would be no ground disturbance and no perceptible visual changes.
- Satellites and Other Technologies
  - Satellite-Enabled Devices and Equipment: It is anticipated that the installation of permanent equipment on existing structures and the use of portable devices that use satellite technology would not impact cultural resources because those activities would not require ground disturbance or create perceptible new visual effects.
  - Deployment of Satellites: FirstNet does not anticipate launching satellites as part of the deployment of the NPSBN; however, it could include equipment on satellites that are already being launched for other purposes. As adding equipment to an existing launch

vehicle would be very unlikely to impact cultural resources, it is anticipated that this activity would have no impact on cultural resources.

Activities with the Potential to Have Impacts

Potential deployment-related impacts to cultural resources as a result of implementation of the Preferred Alternative would encompass a range of impacts that could occur as a result of ground disturbance activities, including destruction of cultural or historic artifacts. The types of infrastructure deployment activities that could be part of the Preferred Alternative and result in potential impacts to cultural resources include the following:

- Wired Projects
  - New Build – Buried Fiber Optic Plant: Plowing (including vibratory plowing), trenching, or directional boring and the construction of POP, huts, or other associated facilities or hand-holes to access fiber could result in potential impacts to cultural resources. Soil disturbance and heavy equipment use associated with plowing, trenching, or directional boring as well as land/vegetation clearing, excavation activities, and landscape grading associated with construction of POPs, huts, or other associated facilities or hand-holes to access fiber could result in the disturbance of archaeological sites, and the associated structures could have visual effects on historic properties.
  - New Build – Aerial Fiber Optic Plant: Ground disturbance during the installation of new utility poles and the use of heavy equipment during the installation of new utility poles and hanging of cables could result in the disturbance of archaeological sites, and the associated structures could have visual effects on historic properties.
  - New Build – Submarine Fiber Optic Plant: The installation of cables in limited nearshore and inland bodies of water could impact cultural resources, as coastal areas of Louisiana where sea level was lower during glacial periods (generally the Middle Archaic Period and earlier) have the potential to contain archaeological sites. Impacts to cultural resources could also potentially occur as result of the construction of landings and/or facilities on shores or the banks of waterbodies that accept submarine cable, which could result in the disturbance of archaeological sites (archaeological deposits are frequently associated with bodies of water), and the associated structures could have visual effects on historic properties.
  - Installation of Optical Transmission or Centralized Transmission Equipment: If installation of transmission equipment would occur in existing boxes or huts and require no ground disturbance, there would be no impacts to cultural resources. If installation of transmission equipment required grading or other ground disturbance to install small boxes or huts, or access roads, there could potentially be impacts to cultural resources. Ground disturbance could impact archaeological sites, and the associated structures could have visual effects on historic properties.
  - Collocation on Existing Aerial Fiber Optic Plant: Soil excavation and excavated material placement during the replacement of poles and structural hardening could result in direct

and indirect effects to cultural resources, although any effects to access would be short-term. Heavy equipment use associated with these activities as well as with installing new fiber on existing poles could result in direct and indirect effects to cultural resources.

- Wireless Projects
  - New Wireless Communication Towers: Deployment of new wireless towers and associated structures (generators, equipment sheds, fencing, security and aviation lighting, electrical feeds, and concrete foundations and pads) or access roads could result in impacts to historic properties. Land/vegetation clearing, excavation activities, landscape grading, and other ground disturbance activities during the deployment of new wireless towers and associated structures or access roads, could result in the disturbance of archaeological sites. The deployment of new wireless communication towers and their associated structures could result in visual impacts to historic properties or the loss of access to historic properties.
  - Collocation on Existing Wireless Tower, Structure, or Building: Collocation would involve mounting or installing equipment (such as antennas or microwave dishes) on an existing tower could result in impacts to historic properties. Ground disturbance activities could result in the disturbance of archaeological sites, and the deployment of collocated equipment could result in visual impacts or physical damage to historic properties, especially in urban areas such as Louisiana City that have larger numbers of historic public buildings.
  - Deployable Technologies: Implementation of deployable technologies could result in potential impacts to cultural resources if deployment occurs in unpaved areas, or if the implementation results in paving of previously unpaved surfaces. In addition, impacts to historic properties could occur if the deployment is long-term, or if the deployment involves aerial technologies with the potential for visual or other indirect impacts.

In general, the abovementioned activities could potentially involve ground disturbance, construction of access roads and other impervious surfaces, landscape grading, and heavy equipment movement. Potential impacts to cultural resources associated with deployment could include physical damage to or destruction of historic properties, indirect impacts including visual effects, the loss of access to historic properties, or the loss of character-defining features of historic properties. These activities could affect, but not adversely affect, cultural resources as the potential adverse effects would be temporary and limited to the area near individual Proposed Action deployment site. Additionally, some equipment proposed to be installed on or near properties that are listed or eligible for listing on the NRHP could potentially be removed. Additionally, as appropriate, FirstNet would engage in consultation as required under Section 106 of the NHPA. Chapter 16, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, operation activities associated with the Preferred Alternative would consist of routine maintenance and inspection of the facilities. Any major communications infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the abovementioned deployment impacts. It is anticipated that there would be no effect to cultural resources associated with routine inspections of the Preferred Alternative. If usage of heavy equipment as part of routine maintenance or inspections occurs off established access roads or corridors, or if the acceptable load of the surface is exceeded, ground disturbance impacts on archaeological sites could result as explained above. These potential impacts would be associated with ground disturbance or modifications of properties; however, due to the small scale of expected activities, these actions could affect but would not likely adversely affect, cultural resources. In the event that maintenance and inspection activities occur off existing roads, FirstNet would engage in consultation as required under Section 106 of the NHPA. Chapter 16, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

8.2.11.5 Alternatives Impact Assessment

The following section assesses potential impacts to cultural resources associated with the Deployable Technologies Alternative and the No Action Alternative.

Deployable Technologies Alternative

Under the Deployable Technologies Alternative option, a nationwide fleet of mobile communications systems would provide temporary coverage in areas not covered by the existing, usable infrastructure. There would be no collocation of equipment and minimal new construction associated with wired or wireless projects discussed above under the Preferred Alternative. Some limited construction could be associated with implementation such as land clearing or paving for parking or staging areas. The specific infrastructure associated with the Deployable Technologies Alternative would be the same as the deployable technologies implemented as part of the Preferred Alternative but would likely be implemented in greater numbers, over a larger geographic extent, and used with greater frequency and duration. Therefore, potential impacts to cultural resources as a result of implementation of this Alternative could be as described below.

Deployment Impacts

As explained above, implementation of deployable technologies could result in impacts to cultural resources if deployment occurs in unpaved areas, or if the implementation results in paving of previously unpaved surfaces. Some staging or landing areas (depending on the type of technology) may require land/vegetation clearing, excavation, and paving. These activities could result in impacts to archaeological sites. These activities could affect, but not adversely affect, cultural resources due to the limited amount of expected ground disturbing activities and the short-term nature of deployment activities. However, in the event that land/vegetation clearing is required, FirstNet would engage in consultation as required under Section 106 of the NHPA. Chapter 16, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

As explained above, operation activities would consist of implementation/running of the deployable technology and routine maintenance and inspections. As with the deployment impacts, it is anticipated that there would be effects, but no adverse effects to historic properties associated with implementation/running of the deployable technology. No adverse effects would be expected to either site access or viewsheds due to the temporary nature of expected activities. As with the Preferred Alternative, it is anticipated that there would be no effects to cultural resources associated with routine inspections of the Preferred Alternative, assuming that the same access roads used for deployment are also used for inspections. If usage of heavy equipment as part of routine maintenance or inspections occurs off established access roads or corridors, impacts to archaeological sites could occur; however, in the event that this is required, FirstNet would engage in consultation as required under Section 106 of the NHPA. Chapter 16, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

No Action Alternative

Under the No Action Alternative, the NPSBN would not be deployed; therefore, there would be no associated construction or installation of wired, wireless, deployable infrastructure or satellites and other technologies. As a result, there would be no impacts to cultural resources as a result of deployment and operation of the Proposed Action. Environmental conditions would therefore be the same as those described in Section 8.1.11, Cultural Resources.

8.2.12 Air Quality

8.2.12.1 Introduction

This section describes potential impacts to Louisiana's air quality from deployment and operation of the Proposed Action and alternatives. Chapter 16, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

8.2.12.2 Impact Assessment Methodology and Significance Criteria

The impacts of the Proposed Action on Louisiana's air quality were evaluated using the significance criteria presented in Table 8.2.12-1. As described in Section 8.2, Environmental Consequences, the categories of impacts are defined as potentially significant, less than significant with mitigation incorporated, less than significant, or no impact. Characteristics of each impact type, including magnitude or intensity, geographic extent, and duration or frequency, were used to determine the impact significance rating associated with each potential impact.

Given the nature of this programmatic evaluation, and because the Proposed Action could potentially cover a wide variety of actions that would take place in various landscapes, the potential impacts to Louisiana’s air quality addressed in this section are presented as a range of possible impacts.

Table 8.2.12-1: Impact Significance Rating Criteria for Air Quality

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
Increased air emissions	Magnitude or Intensity	Pollutant concentrations would exceed one or more NAAQS in nonattainment and maintenance areas. Emissions in attainment areas would cause an area to be out of attainment for any NAAQS. Projects do not conform to the SIP covering nonattainment and maintenance areas.	Effect that is potentially significant, but with mitigation is less than significant.	Negligible emissions would occur for any criteria pollutants within an attainment area but would not cause a NAAQS exceedance.	Action would not cause pollutant concentrations to exceed the NAAQS in nonattainment and maintenance areas. Emissions in attainment areas would not cause air quality to go out of attainment for any NAAQS. Projects are *de minimis* or conform to the SIP covering nonattainment and maintenance areas.
	Geographic Extent/Context	NA		NA	NA
	Duration or Frequency	Permanent or long-term.		Short term.	Temporary.

NA = Not Applicable

8.2.12.3 Description of Environmental Concerns

Increased Air Emissions

The Proposed Action has the potential to generate air pollutant emissions. These emissions could be above and beyond what is typically generated in a given area and may alter ambient air quality. Deployment activities may involve the use of vehicles, heavy equipment, and other equipment that could emit exhaust and create fugitive dust in localized areas. During operations, routine maintenance and other use of generators at tower facilities may emit exhaust for specific durations (maintenance) or unpredictable timeframes (if power is lost to a site, for example). Impacts are likely to be less than significant at the programmatic level, due to the mobile nature of the sources and the temporary and short-term duration of deployment activities. Although unlikely, the emissions of criteria pollutants could impair the air quality of the region and potentially affect human health. Potential impacts to air quality from emissions may occur in areas where the current air quality exceeds, or has a history of exceeding, one or more NAAQS. Areas exist in Louisiana that are in maintenance or nonattainment for one pollutant, particularly, ozone (see Section 8.1.12, Air Quality and Figure 8.1.12-1). The majority of the parishes in Louisiana are designated as maintenance areas for one or more of the following pollutants: SO_2 and ozone (Table 8.1.12-5); Baton Rouge and New Orleans are designated nonattainment or maintenance for one NAAQS pollutant (Figure 8.1.12-1).

Based on the significance criteria presented in Table 8.2.12-1, air emission impacts would likely be less than significant at the programmatic level, given the size and nature of the majority of the proposed deployment activities. The majority of FirstNet's deployment activities would not be located in sensitive areas nor would a large number of emission sources be deployed/operated long-term in the same area from fixed or mobile sources or construction activities. At the programmatic level, less than significant emissions could occur for any of the criteria pollutants within attainment areas in Louisiana; however, NAAQS exceedances are not anticipated. Given that nonattainment areas are present within Louisiana (Table 8.1.12-1), FirstNet would try to minimize potential emissions where possible and would recommend the implementation of BMPs, where feasible and practicable, to avoid or minimize potential impacts.

8.2.12.4 Potential Impacts of the Preferred Alternative

The following section assesses potential impacts associated with implementation of the Preferred Alternative, including construction, deployment, and operation activities.

Deployment and Operation Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, implementing the Preferred Alternative could result in deploying various types of facilities or infrastructure. Depending on the physical nature and location of the facility/infrastructure and the specific deployment requirements, some activities would result in potential impacts to air quality and others would not. The potential impacts could range from no impacts to less than significant impacts at the programmatic level, depending on the deployment scenario or site-specific conditions. Chapter

16, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Activities Likely to Have No Impacts

Of the types of facilities or infrastructure deployment scenarios described in Section 2.1.2, Proposed Action Infrastructure, the following are likely to have no impacts to air quality under the conditions described below:

- Wired Projects
    - Use of Existing Conduit – New Buried Fiber Optic Plant: Activities associated with the installation of fiber optic cable in existing conduit would be limited to entry and exit points of the existing conduit. Gaining access to the conduit and installing the cable may result in minor disturbance at entry and exit points; however, this activity would be temporary and infrequent, and is not expected to produce any perceptible changes in air emissions.
    - Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting up dark fiber would require no construction and have no short- or long-term emissions to air quality because it would create no new sources of emissions.
- Satellites and Other Technologies
    - Satellite Enabled Devices and Equipment: The duration of construction activities associated with installing permanent equipment on existing structures would most likely be short-term. It is anticipated that insignificant concentrations of criteria pollutants would be emitted during installment of this equipment from the use of machinery. Deployment and operation of satellite-enabled devices and portable equipment are expected to have minimal to no impact on ambient air quality concentrations.
    - Deployment of Satellites: FirstNet does not anticipate launching satellites as part of the deployment of the NPSBN; however, it may include equipment on satellites that are already being launched for other purposes. As adding equipment to an existing launch vehicle would be very unlikely to impact air quality resources, it is anticipated that this activity would have no impact on those resources.

Activities with Potential Impacts to Air Quality

Construction, deployment, and operation activities related to the Preferred Alternative could impact air quality by generating various quantities of criteria and air pollutant emissions. It is expected that such impacts would be less than significant at the programmatic level, due to the shorter duration and localized nature of the activities. The types of infrastructure deployment scenarios or deployment activities that could be part of the Preferred Alternative and result in potential impacts to air quality include the following:

- Wired Projects
  - New Build – Buried Fiber Optic Plant: Plowing (including vibratory plowing), trenching, or directional boring and the construction of POPs, huts, or other associated facilities or hand-holes to access fiber as well as land/vegetation clearing, excavation activities, and landscape grading could result in fugitive dust and products of combustion from the use of vehicles and heavy equipment.
  - New Build – Aerial Fiber Optic Plant: The use of heavy equipment during the installation of new poles and hanging cables, as well as constructing access roads, POP huts, or other associated facilities to house plant equipment could result in products of combustion from the use of vehicles and machinery, as well as fugitive dust emissions from site preparation.
  - Collocation on Existing Aerial Fiber Optic Plant: Excavation equipment used during pole replacement, and other heavy equipment used for structural hardening or reinforcement, could result in products of combustion from the use of vehicles and heavy equipment, as well as fugitive dust from site preparation.
  - New Build – Submarine Fiber Optic Plant: The installation of cables in limited nearshore and inland bodies of water could generate products of combustion from vessels used to lay the cable. In addition, the construction of landings and/or facilities on shores or the banks of waterbodies that accept submarine cable could result in products of combustion and fugitive dust from heavy equipment used for grading, foundation excavation, or other ground disturbing activities.
  - Installation of Optical Transmission or Centralized Transmission Equipment: Emissions associated with the installation of optical transmission or centralized transmission equipment would be limited to the short-term, temporary use of vehicle and construction equipment. Long-term impacts are unlikely, as the power requirements for optical networks are relatively low.
- Wireless Projects
  - New Wireless Communication Towers: Activities associated with installing new wireless towers and associated structures (e.g., generators, equipment sheds, fencing, security and aviation lighting, electrical feeds, and concrete foundations and pads) or access roads could result in products of combustion. Operating vehicles and other heavy equipment, running generators while conducing excavation activities and landscape grading to install new wireless towers and associated structures or access roads could result in products of combustion and fugitive dust.
  - Collocation on Existing Wireless Tower, Structure, or Building: Vehicles and equipment used to mount or install equipment, such as antennas or microwave dishes, on an existing tower could impact air quality. However, if additional power units, structural hardening, and physical security measures required grading or excavation, then exhaust and fugitive dust from heavy equipment used for these activities could also result in increased air emissions.

- Deployable Technologies: The type of deployable technology used would dictate the types of air pollutants generated. For example, mobile equipment deployed via heavy trucks could generate products of combustion from the internal combustion engines associated with the vehicles and onboard generators. These units may also generate fugitive dust depending on the type of road traveled during deployment (i.e., paved versus unpaved roads). Aerial platforms (e.g., UASs or other aircraft) would generate pollutants during all phases of flight.

In general, the pollutants of concern from the abovementioned activities would be products of combustion from burning fossil fuels in internal combustion engines and fugitive dust from site preparation activities and vehicles traveling on unpaved road surfaces. Any major infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the construction impacts. These impacts are anticipated to be less than significant at the programmatic level, due to the limited nature of the deployment. Chapter 16, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, operation activities associated with the Preferred Alternative would consist of routine maintenance and inspection of the facilities. Any major communications infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the abovementioned deployment impacts. It is anticipated that there would be less than significance impacts to air quality associated with routine inspections of the Preferred Alternative due to the limited nature of the activity. If usage of heavy equipment as part of routine maintenance or inspections occurs off established access roads or corridors additional air quality impacts may occur; however, they would be less than significant at the programmatic level, as they would still be limited in nature. Chapter 16, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

8.2.12.5 Alternatives Impact Assessment

The following section assesses potential impacts to air quality associated with the Deployable Technologies Alternative and the No Action Alternative.

Deployable Technologies Alternative

Under the Deployable Technologies Alternative, a nationwide fleet of mobile communications systems would provide temporary coverage in areas not covered by the existing, usable infrastructure. There would be no collocation of equipment and minimal new construction associated with wired or wireless projects discussed above under the Preferred Alternative. Some limited construction could be associated with implementation such as land clearing or paving for parking or staging areas. The specific equipment associated with the Deployable Technologies Alternative could include heavy trucks with onboard generators, aerial vehicles (e.g., UASs or other aircraft), and ground support vehicles and other equipment for aerial deployment. The stand-alone Deployable Technologies Alternative differs from the Preferred Alterative in the number of mobile and aerial vehicles likely to deploy, the distances traveled from storage locations, and the duration of deployment. The potential impacts to air quality are as follows:

Deployment and Operation Impacts to Air Quality

Implementing deployable technologies could result in products of combustion from mobile equipment deployed via heavy trucks using internal combustion engines associated with the vehicles and onboard generators. While a single deployable vehicle may have an insignificant impact, multiple vehicles operating for longer periods, in close proximity, may have a greater cumulative impact, although this is expected to be less than significant at the programmatic level, based on the defined significance criteria, since activities would be temporary and short-term. These vehicles may also produce fugitive dust if traveling on unpaved roads. Some staging or landing areas (depending on the type of technology) may require excavation, site preparation, and paving. Heavy equipment used for these activities could emit products of combustion as a result of burning fossil fuels in internal combustion engines. The deployment and operation of aerial technology is anticipated to generate pollutants during all phases of flight, except for balloons. The products of combustion from ground support vehicles, as well as the duration of ground support operations and travel between storage and deployment locations would dictate the concentrations and associated impacts. Additionally, routine maintenance and inspections of the deployable technologies are anticipated to be less than significant at the programmatic level, given that these activities are of low-intensity and short duration. Chapter 16, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

No Action Alternative

Under the No Action Alternative, FirstNet would not deploy the NPSBN and there would be no impact to ambient air quality. By not deploying NPSBN, FirstNet would avoid generating emissions from construction, installation, or operation of wired, wireless, or deployable infrastructure or technologies; satellites; and other technologies.

8.2.13 Noise

8.2.13.1 Introduction

This section describes potential noise impacts from construction, deployment, and operation of the Proposed Action and alternatives in Louisiana. Chapter 16, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

8.2.13.2 Impact Assessment Methodology and Significance Criteria

The noise impacts of the Proposed Action were evaluated using the significance criteria presented in Table 8.2.13-1. As described in Section 8.2, Environmental Consequences, the categories of impacts are defined as potentially significant, less than significant with mitigation incorporated, less than significant, or no impact. Characteristics of each impact type, including magnitude or intensity, geographic extent, and duration or frequency, were used to determine the impact significance rating associated with each potential impact.

Given the nature of this programmatic evaluation, and because the Proposed Action could potentially cover a wide variety of actions that would take place in various landscapes, the potential noise impacts to Louisiana addressed in this section are presented as a range of possible impacts.

Table 8.2.13-1: Impact Significance Rating Criteria for Noise

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
Increased noise levels	Magnitude or Intensity	Noise levels would exceed typical noise levels from construction equipment and generators. Noise levels at noise sensitive receptors (such as residences, hotels/motels/inns, hospitals, and recreational areas) would exceed 55 dBA or specific state noise limits. Noise levels plus baseline noise levels would exceeds 10 dBA increase from baseline noise levels (i.e., louder). Project noise levels near noise receptors at National Parks would exceed 65 dBA.	Effect that is potentially significant, but with mitigation is less than significant.	Noise levels resulting from project activities would exceed natural sounds, but would not exceed typical noise levels from construction equipment or generators.	Natural sounds would prevail. Noise generated by the action (whether it be construction or operation) would be infrequent or absent, mostly immeasurable.
	Geographic Extent/Context	Parish or local.		Parish or local.	Parish or local.
	Duration or Frequency	Permanent or long-term.		Short term.	Temporary.

NA = Not Applicable

8.2.13.3 Description of Environmental Concerns

Increased Noise Levels

The Proposed Action has the potential to generate noise during construction and operation of various equipment used for deployment. These noise levels could be above what is typically generated in a given area and may alter the ambient acoustical environment. If significant, the noise could cause impacts on residential areas, or other facilities that are sensitive to noise, such as churches, hospitals, or schools. The construction activities for deploying some of the various equipment evaluated under the Proposed Action could cause short-term impacts to nearby populations. However, it is likely that there would be less long-term effects from operational use of the proposed equipment (see Section 7.1.13, Noise).

Based on the significance criteria presented in Table 8.2.13-1 noise impacts would likely be less than significant at the programmatic level, given the size and nature of the majority of the proposed deployment activities. The majority of FirstNet's deployment activities would not be in sensitive areas nor would a large number of noise sources be deployed/operated long-term in the same area. Noise levels from deployment activities are not expected to exceed typical noise levels for short-term/temporary construction equipment or generators.

To the extent practicable, FirstNet would attempt to mitigate or minimize noise effects during construction or operation. BMPs and mitigation measures could help to limit impacts on nearby noise-sensitive receptors. However, given that much of the concentration and setup of equipment would often occur in larger populated areas, FirstNet operations would not be able to avoid noise impacts completely due to construction and operations at various receptors.

8.2.13.4 Potential Impacts of the Preferred Alternative

The following section assesses potential impacts associated with implementation of the Preferred Alternative, including construction, deployment, and operation activities.

Deployment Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, implementing the Preferred Alternative could result in deploying various types of facilities or infrastructure. Depending on the physical nature and location of the facility/infrastructure and the specific deployment requirements, some activities would result in potential noise impacts and while others would not. In addition, the same type of Proposed Action Infrastructure could result in a range of no impacts to less than significant impacts depending on the deployment scenario or site-specific conditions. Chapter 16, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Activities Likely to Have No Impacts

Of the types of facilities or infrastructure deployment scenarios described in Section 2.1.2, Proposed Action Infrastructure, the following are likely to have no noise impacts under the conditions described below:

- Wired Projects
  - Use of Existing Conduit – New Buried Fiber Optic Plant: Disturbance associated with the installation of fiber optic cable in existing conduit would be limited to entry and exit points of the existing conduit in previously disturbed areas. Noise generated by equipment required to install fiber would be infrequent and of short duration, and is not expected to create perceptible impacts.
  - Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting up dark fiber would require no construction or installation activities, and therefore would have no noise impacts.
- Satellites and Other Technologies
  - Satellite Enabled Devices and Equipment: The duration of construction activities associated with installing permanent equipment on existing structures would most likely be short-term. It is anticipated that insignificant levels of noise would be emitted during installment of this equipment. Noise caused by these construction and installation activities would be similar to other construction activities in the area, such as the installation of cell phone towers or other communication equipment. Deployment and operation of satellite-enabled devices and equipment are expected to have minimal to no impact on the noise environment.
  - Deployment of Satellites: FirstNet does not anticipate launching satellites as part of the deployment of the NPSBN; however, it could include equipment on satellites that are already being launched for other purposes. As adding equipment to an existing launch vehicle would be very unlikely to impact noise resources, it is anticipated that this activity would have no impact on those resources.

Activities with the Potential for Noise Impacts

Construction, deployment, and operation activities related to the Preferred Alternative could create noise impacts from either the construction or operation of the infrastructure. The types of infrastructure deployment scenarios or deployment activities that could be part of the Preferred Alternative and result in potential impacts to air quality include the following:

- Wired Projects
  - New Build – Buried Fiber Optic Plant: Plowing (including vibratory plowing), trenching, or directional boring and the construction of POPs, huts, or other associated facilities or hand-holes to access fiber as well as land/vegetation clearing, excavation activities, and landscape grading could result in high noise levels from the use of heavy equipment and machinery.

- New Build – Aerial Fiber Optic Plant: The use of heavy equipment during the installation of new poles and hanging cables, as well as constructing access roads, POP huts, or other associated facilities to house plant equipment would be short-term and could result in increased noise levels from the use of vehicles and machinery.
- Collocation on Existing Aerial Fiber Optic Plant: Excavation equipment used during potential pole replacement, and other heavy equipment used for structural hardening or reinforcement, could result in temporary increases in noise levels from the use of heavy equipment and machinery.
- Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Installation of new associated huts or equipment, if required, could result in short-term and temporarily higher noise levels if the activity required the use of heavy equipment for grading or other purposes.
- New Build – Submarine Fiber Optic Plant: The installation of cables in limited nearshore and inland bodies of water could generate noise if vessels are used to lay the cable. In addition, the construction of landings and/or facilities on shores or banks of waterbodies that accept submarine cable could result in short-term and temporarily increased noise levels to local residents and other noise sensitive receptors from heavy equipment used for grading, foundation excavation, or other ground disturbing activities.
- Installation of Optical Transmission or Centralized Transmission Equipment: Noise associated with the installation of optical transmission or centralized transmission equipment would be limited to the short-term, temporary use of vehicle and construction equipment. Long-term impacts are unlikely, as the noise emissions from optical networks are relatively low. Heavy equipment used to grade and construct access roads could generate increased levels of noise over baseline levels temporarily.

- Wireless Projects
  - New Wireless Communication Towers: Activities associated with installing new wireless towers and associated structures (e.g., generators, equipment sheds, fencing, security and aviation lighting, electrical feeds, and concrete foundations and pads) or access roads could result in localized construction noise. Operating vehicles, other heavy equipment, and generators would be used on a short-term basis and could increase noise levels.
  - Collocation on Existing Wireless Tower, Structure, or Building: Vehicles and equipment used to mount or install equipment, or to grade or excavate additional land on sites for installation of equipment, such as antennas or microwave dishes on an existing tower, could impact the local noise environment temporarily.
  - Deployable Technologies: The type of deployable technology used would dictate the types of noise generated. For example, mobile equipment deployed via heavy trucks could generate noise from the internal combustion engines associated with the vehicles and onboard generators. With the exception of balloons, aerial platforms (e.g., UASs or other aircraft, except balloons) generate noise during all phases of flight, including

takeoff, landing, and flight operations over necessary areas that could impact the local noise environment.

In general, noise from the abovementioned activities would be products of site preparation, installation, and construction activities, as well as additional construction vehicles traveling on nearby roads and localized generator use. These impacts are expected to be less than significant at the programmatic level, due to the temporary duration of deployment activities. Additionally, pre-existing noise levels achieved after some months (typically less than a year but could be a few hours for linear activities such as pole construction). Chapter 16, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

At the programmatic level, operation activities associated with the Preferred Alternative would be less than significant and for routine maintenance and inspection of the facilities because of the temporary nature of the activities, which would not create new permanent sources of noise. Any major infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the abovementioned construction impacts. It is anticipated that potential noise impacts would be similar to or less than those described for the deployment activities. If usage of vehicles or heavy equipment as part of routine maintenance or inspections or onsite generator use occurs, potential noise impacts could result as explained above. Chapter 16, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

8.2.13.5 Alternatives Impact Assessment

The following section assesses potential noise impacts associated with the Deployable Technologies Alternative and the No Action Alternative.

Deployable Technologies Alternative

Under the Deployable Technologies Alternative option, a nationwide fleet of mobile communications systems would provide temporary coverage in areas not covered by the existing, usable infrastructure. There would be no collocation of equipment and minimal new construction associated with wired or wireless projects discussed above under the Preferred Alternative. Some limited construction could be associated with implementation such as land clearing or paving for parking or staging areas. The specific equipment associated with the Deployable Technologies Alternative would be heavy trucks with onboard generators, aerial vehicles (e.g., UASs or other aircraft), and ground support vehicles and equipment for aerial deployment. The stand-alone Deployable Technologies Alternative differs from the Preferred Alterative in the number of mobile and aerial vehicles likely to deploy, the distances traveled from storage locations and the duration of deployment. The potential noise impacts are as follows:

Deployment Impacts

Implementing deployable technologies could result in noise from mobile equipment deployed via heavy trucks, including not only onboard generators, but also the vehicles themselves. While a single deployable vehicle may have an insignificant impact, multiple vehicles operating for longer periods, in close proximity, may increase localized noise levels. Several vehicles traveling together could also create short-term noise impacts on residences or other noise-sensitive receptors as they pass by. With the exception of balloons, the deployment of aerial technology is anticipated to generate noise during all phases of flight. Aerial technologies would have the highest level of noise impact if they are required to fly above residential areas, areas with a high concentration of noise-sensitive receptors (i.e., schools or churches), or over national parks or other areas where there is an expectation of quiet and serenity on their way to their final destinations. Residences near deployment areas for aerial technologies (i.e., airports or smaller airfields) could also be affected during takeoff and landing operations. Additionally, routine maintenance and inspections of the deployable technologies are anticipated to be less than significant at the programmatic level, given that these activities are of low-intensity and short duration. Chapter 16, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

Operation activities associated with the Deployable Technologies Alternative would be similar to several of the deployment activities related to routine maintenance and inspection of the facilities. Operation of generators could also generate noise in the area. However, deployable technologies could be deployed to areas with few existing facilities, so noise impacts could be minimal in those areas. Any major infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the abovementioned construction impacts. It is anticipated that potential noise impacts would be the same as those described for the deployment activities. If usage of vehicles or heavy equipment as part of routine maintenance or inspections occurs, potential noise impacts could result as explained above.

Operational impacts from aerial technologies would include repeated flyovers by UAS vehicles while they are needed in the area. At the programmatic level, this could generate, less than significant short-term impacts on any residential areas or other noise-sensitive receptors under the flight path of these vehicles. However, once these operations cease, noise levels would quickly return to baseline levels. Chapter 16, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

No Action Alternative

Under the No Action Alternative, FirstNet would not deploy the NPSBN and there would be no impact to ambient noise. By not deploying the NPSBN, FirstNet would avoid generating noise from construction, installation, or operation of wired, wireless, deployable infrastructure or satellites and other technologies.

8.2.14 Climate Change

8.2.14.1 Introduction

This section describes potential impacts to climate and climate change-vulnerable resources in Louisiana associated with deployment and operation of the Proposed Action and alternatives. Chapter 16, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

8.2.14.2 Impact Assessment Methodology and Significance Criteria

The impacts of the Proposed Action on climate and potential climate change impacts on the Proposed Action's installations and infrastructure were evaluated using the significance criteria presented in Table 8.2.14-1. As described in Section 8.2, Environmental Consequences, the categories of impacts are defined as potentially significant, less than significant with mitigation incorporated, less than significant, or no impact. Characteristics of each impact type, including magnitude or intensity, geographic extent, and duration or frequency, were used to determine the impact significance rating associated with each potential impact.

Given the nature of this programmatic evaluation, and because the Proposed Action could potentially cover a wide variety of actions that would take place in various landscapes, the potential impacts to climate and climate change-vulnerable resources addressed in this section are presented as a range of possible impacts.

CEQ requires the consideration of climate change from two perspectives. The first is the potential for impacts on climate change through GHG emissions resulting from the Proposed Action or alternatives. The second is related to the implications and possible effects of climate change on the environmental consequences of the Proposed Action or alternatives. This extends to the impacts of climate change on facilities and infrastructure that would be part of the Proposed Action or alternatives (CEQ, 2014).

CEQ has established the significance criteria for GHG emissions at 25,000 MT CO_2e on an annual basis, with the requirement that if projected emissions exceed this threshold, a GHG emissions quantitative analysis is warranted (CEQ, 2014). Although 25,000 MT is a very small fraction (one 266,920th) of the total U.S. emissions of 6,673 MMT CO_2e in 2013 (USEPA, 2015n), the sum of additional emissions as a consequence of the deployment of FirstNet, combined with multiple new sources of CO_2 and other GHGs from other projects and human activities, could be significant.

CEQ guidance for the consideration of effects of climate change on the environmental consequences of the proposed action is more general. In addition to the consideration of climate change's effects on environmental consequences, it also includes the impact that climate change may have on the projects themselves (CEQ, 2014). Projects in areas that are vulnerable to the effects of climate change (e.g., sea level rise) may be at risk. Analysis of these risks through the NEPA process could provide useful information to the project planning to ensure these projects are resilient to the impacts of climate change.

Table 8.2.14-1: Impact Significance Rating Criteria for Climate Change

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
Contribution to climate change through GHG emissions	Magnitude or Intensity	Exceedance of 25,000 metric tons of CO_2e/year, and global level effects observed.	Effect that is potentially significant, but with mitigation is less than significant.	Only slight change observed.	No increase in GHG emissions or related changes to the climate as a result of project activities.
	Geographic Extent	Global impacts observed.		Global impacts observed.	NA
	Duration or Frequency	Long-term changes. Changes cannot be reversed in a short term.		Changes occur on a longer time scale. Changes cannot be reversed in the short term.	NA
Effect of climate change on FirstNet installations and infrastructure	Magnitude or Intensity	Climate change effects (such as sea level rise or temperature change) negatively impact FirstNet infrastructure.	Effect that is potentially significant, but with mitigation is less than significant.	Only slight change observed.	No measurable impact of climate change on FirstNet installations or infrastructure.
	Geographic Extent	Local and regional impacts observed.		Local and regional impacts observed.	NA
	Duration or Frequency	Long-term changes. Changes cannot be reversed in a short term.		Changes occur on a longer time scale. Changes cannot be reversed in the short term.	NA

NA=Not Applicable.

8.2.14.3 Projected Future Climate

There have been increasing numbers of days above 95 °F and nights above 75°F, and decreasing numbers of extremely cold days since 1970 in the Southeast. Temperatures across this section of the United States are expected to increase during this century. Major consequences of warming include significant increases in the number of hot days, defined as 95 °F or above, and decreases in freezing events. (USGCRP, 2014a)

Air Temperature

Figure 8.2.14-1 and Figure 8.2.14-2 illustrate the anticipated temperature changes for low and high GHG emission scenarios for Louisiana from a 1969 to 1971 baseline.

Figure 8.2.14-1 shows that by mid-century (2040 to 2059), temperatures in Louisiana under a low emissions scenario would increase by approximately 4 °F in the northern portion of the state and 3 °F in the southern portion of the state, and by the end of the century (2080 to 2099) under a low emissions scenario temperatures in Louisiana would increase by approximately 4° F around the coast and 5 °F in the majority of the state. (USGCRP, 2009)

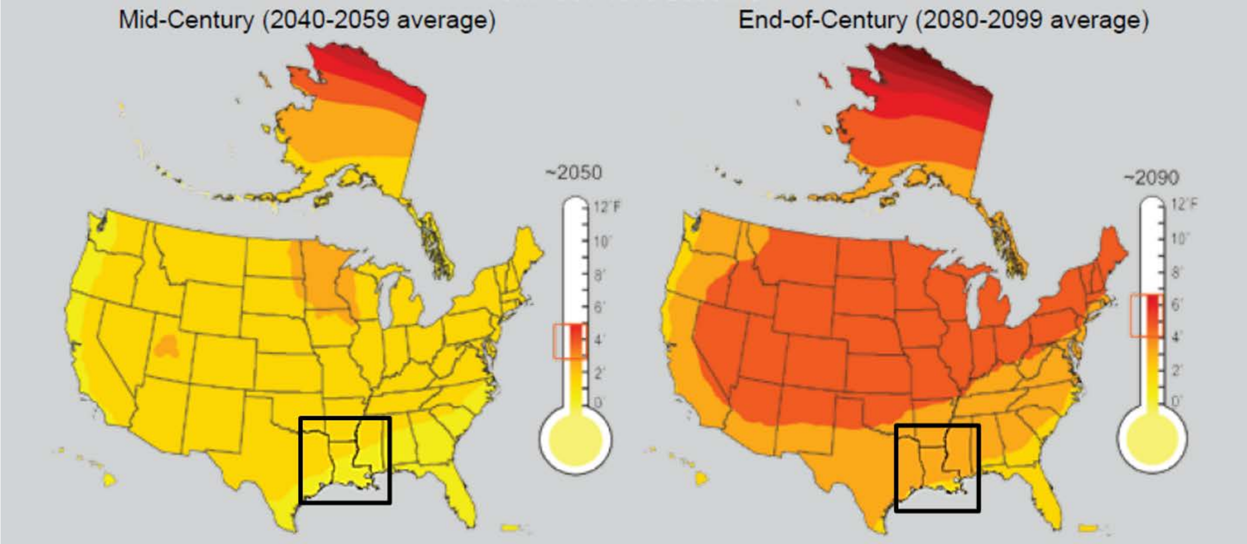

Figure 8.2.14-1: Louisiana Low Emission Scenario Projected Temperature Change

Source: (USGCRP, 2009)

Figure 8.2.14-2 shows that under a high emissions scenario for the 2040 to 2059 period, Louisiana temperatures increase by approximately 5 °F for the majority of the state and 6 °F in a small northern portion of the state. Under a high emissions scenario for the 2080 to 2099 period, Louisiana temperatures increase by approximately 8 °F in the majority of the state and 7 °F along the southern coast. (USGCRP, 2009)

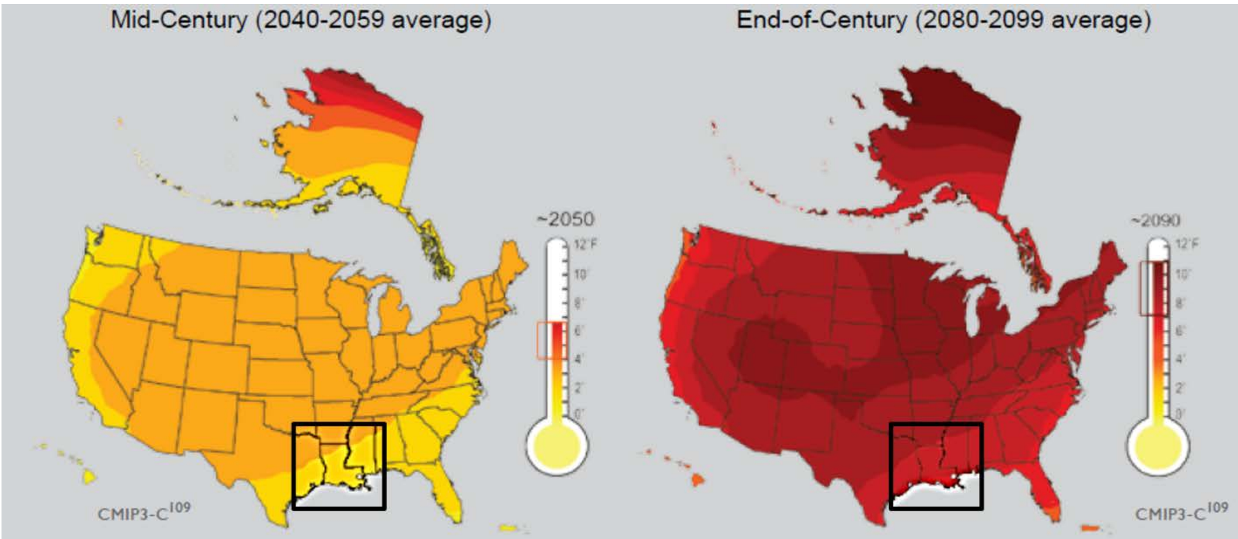

Figure 8.2.14-2: Louisiana High Emission Scenario Projected Temperature Change

Source: (USGCRP, 2009)

Precipitation

Predicting future precipitation patterns in the Southeast are much less certain than projections for temperature. The Southeast is in the transition zone between areas of projected wetter conditions to the north and drier conditions to the southwest. Therefore, many of the model projections show only small changes relative to natural variations. However, many models do project drier conditions in the far southwest portion of the region and wetter conditions in the far northeast portion of the region. (USGCRP, 2014a)

Total seasonal snowfall has generally decreased in southern and some western areas, although snow is melting earlier in the year and more precipitation is falling as rain versus snow. Overall snow cover has decreased in the Northern Hemisphere, due in part to higher temperatures that shorten the time snow spends on the ground. (USGCRP, 2014b)

In the majority of Louisiana, there is an expected increase of about 20 percent in the number of consecutive dry days under a high emissions scenario by mid-century (2041 to 2070) as compared to the period (1971 – 2000). An increase in consecutive dry days could lead to drought. (USGCRP, 2014c)

Figure 8.2.14-3 and Figure 8.2.14-4 show predicted seasonal precipitation change for an approximate 30-year period of 2071 to 2099 compared to a 1970 to 1999 approximate 30-year baseline. Figure 8.2.14-3 shows seasonal changes in a low emissions scenario, which assumes rapid reductions in emissions where rapid reductions means more than 70 percent cuts from current levels by 2050. (USGCRP, 2014c)

Figure 8.2.14-3 shows a high emissions scenario, which assumes continued increases in emissions, with associated large increases in warming and major precipitation changes. (Note: white areas in the figures indicate that the changes are not projected to be larger than could be expected from natural variability.) (USGCRP, 2014c)

Figure 8.2.14-3 shows that in a low emissions scenario in the 30-year period for 2071 to 2099, precipitation would remain constant in winter, spring and summer. Figure 8.2.14-4 shows that if emissions continue to increase, winter precipitation is expected to remain constant in the majority of the state, but precipitation is expected to decrease 10 percent along the southern border. In spring, precipitation is expected to decrease 10 percent in a majority of the state while precipitation is expected to remain constant in a small portion of the southeast border. Summer precipitation is expected to decrease 20 percent in the majority of the state while precipitation in a small northeastern portion along the border is expected to decrease 10 percent. Fall precipitation is expected to remain constant in the majority of the state with an expected increase of 10 percent in the “boot” of the state. (USGCRP, 2014c)

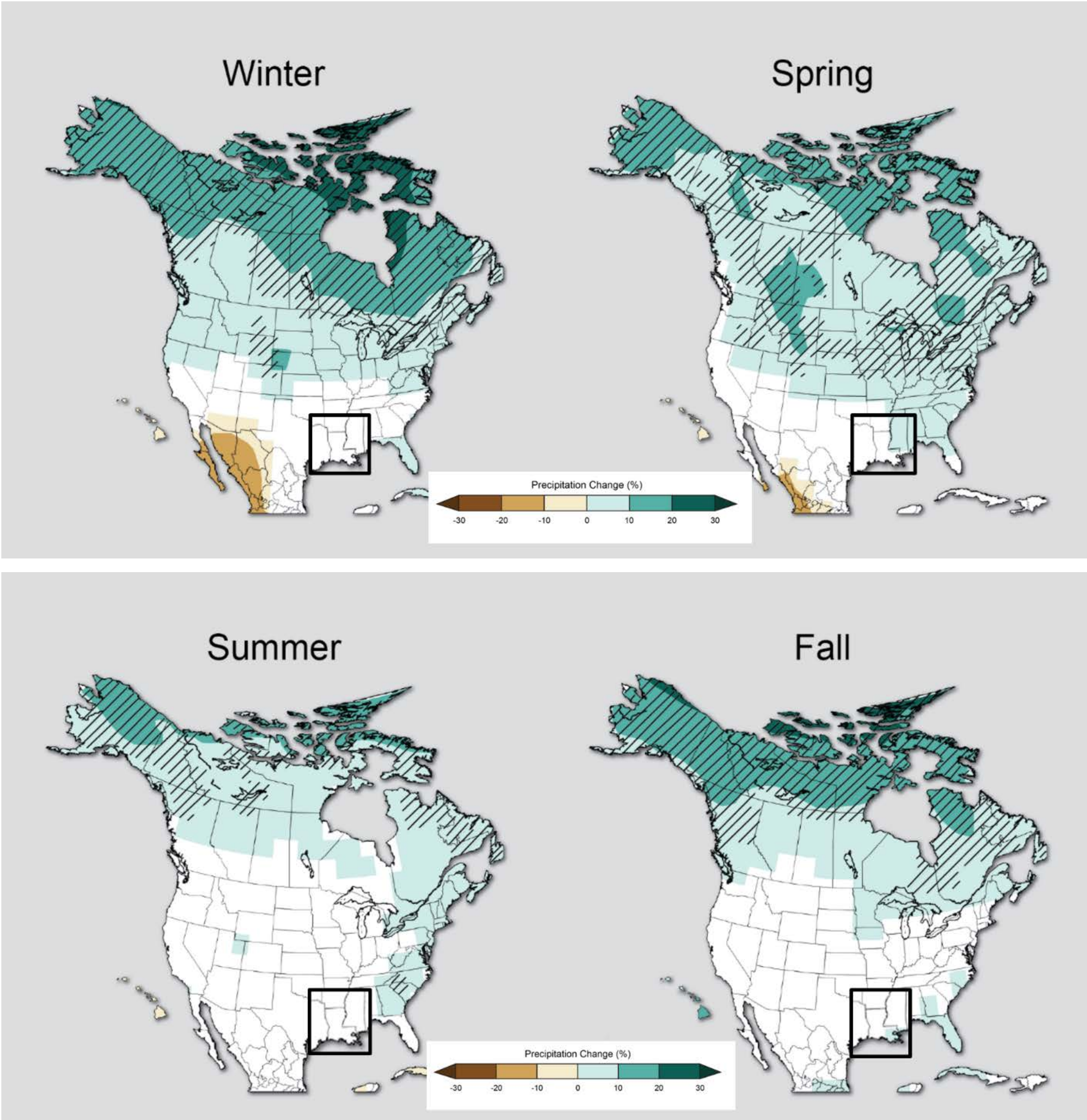

Figure 8.2.14-3: Predicted Seasonal Precipitation Change for 2071 to 2099 Compared to 1970 to 1999 Baseline in a Low Emissions Scenario

Source: (USGCRP, 2014c)

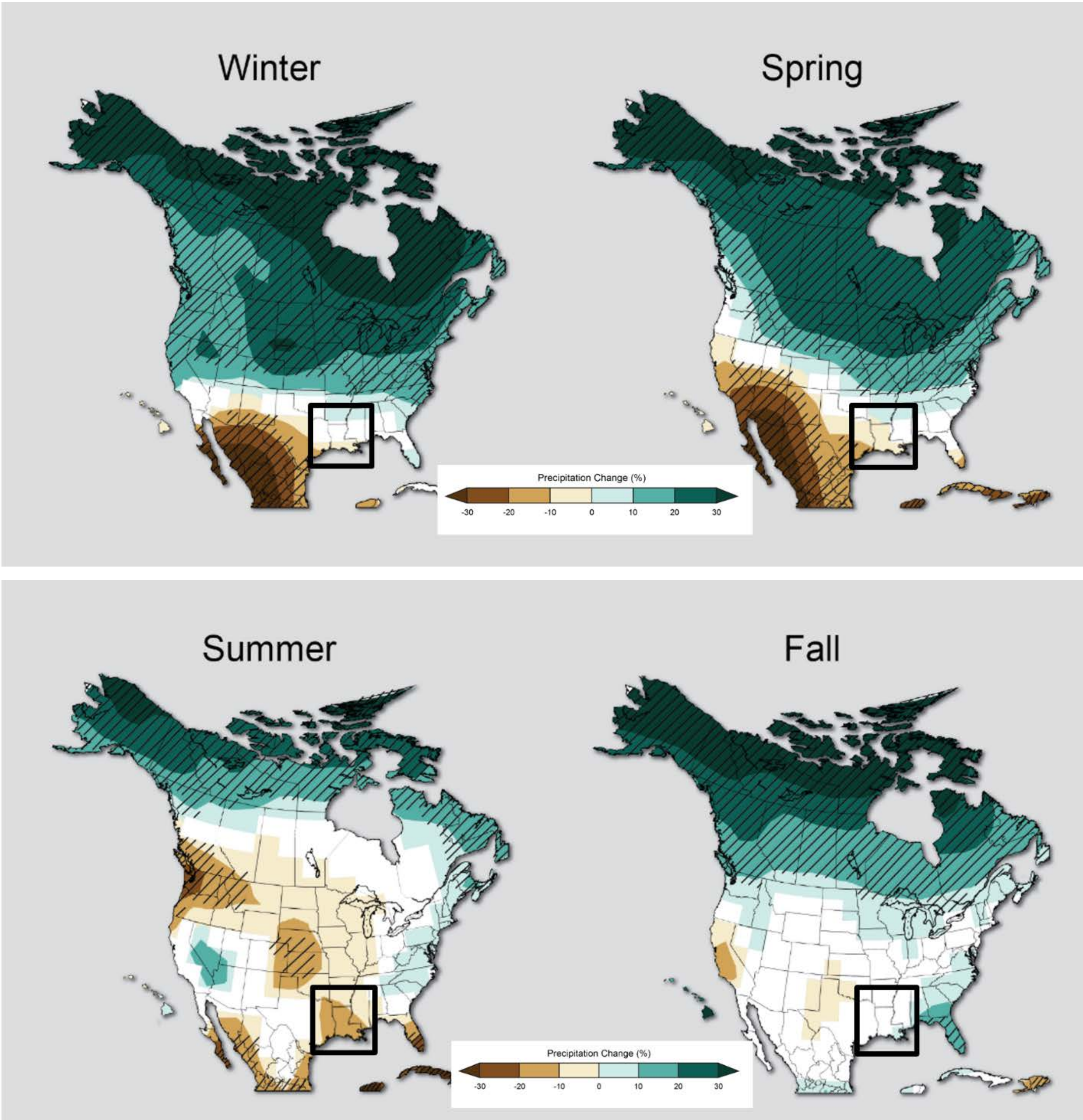

Figure 8.2.14-4: Predicted Seasonal Precipitation Change for 2071 to 2099 Compared to 1970 to 1999 Baseline in a High Emissions Scenario

Source: (USGCRP, 2014c)

Sea Level

Several factors would continue to affect sea level rise in the future. Glacier melt adds water to the ocean, and increasing ocean temperatures result in thermal expansion. Worldwide, "glaciers have generally shrunk since the 1960s, and the rate at which glaciers are melting has accelerated over the last decade. The loss of ice from glaciers has contributed to the observed rise in sea level" (USEPA, 2012c). When water warms, it also expands, which contributes to sea level rise in the world's oceans. "Several studies have shown that the amount of heat stored in the ocean has increased substantially since the 1950s." (USEPA, 2012c). Sea level and currents could be influenced by the amount of heat stored in the ocean. (USEPA, 2012c).

The amount of sea level rise would vary in the future along different stretches of the U.S. coastline and under different absolute global sea lever rise scenarios. Variation in sea level rise along different stretches of coast is mostly due to varying rates of land subsidence (also known as relative sea level rise). In the National Climate Assessment (NCA) potential sea level rise scenarios were reported. These scenarios were developed based on varying degrees of ocean warming and ice sheet loss as estimated by organizations like IPCC (NOAA, 2012). Figures 8.2.14-5 and 8.2.14-6 show feet of sea level above 1992 levels at different tide gauge stations. Figure 8.2.14-5 shows an 8 inch global sea level rise above 1992 levels by 2050 and Figure 8.2.14-6 shows a 1.24 foot global sea level rise above 1992 levels by 2050 (USGCRP, 2014d).

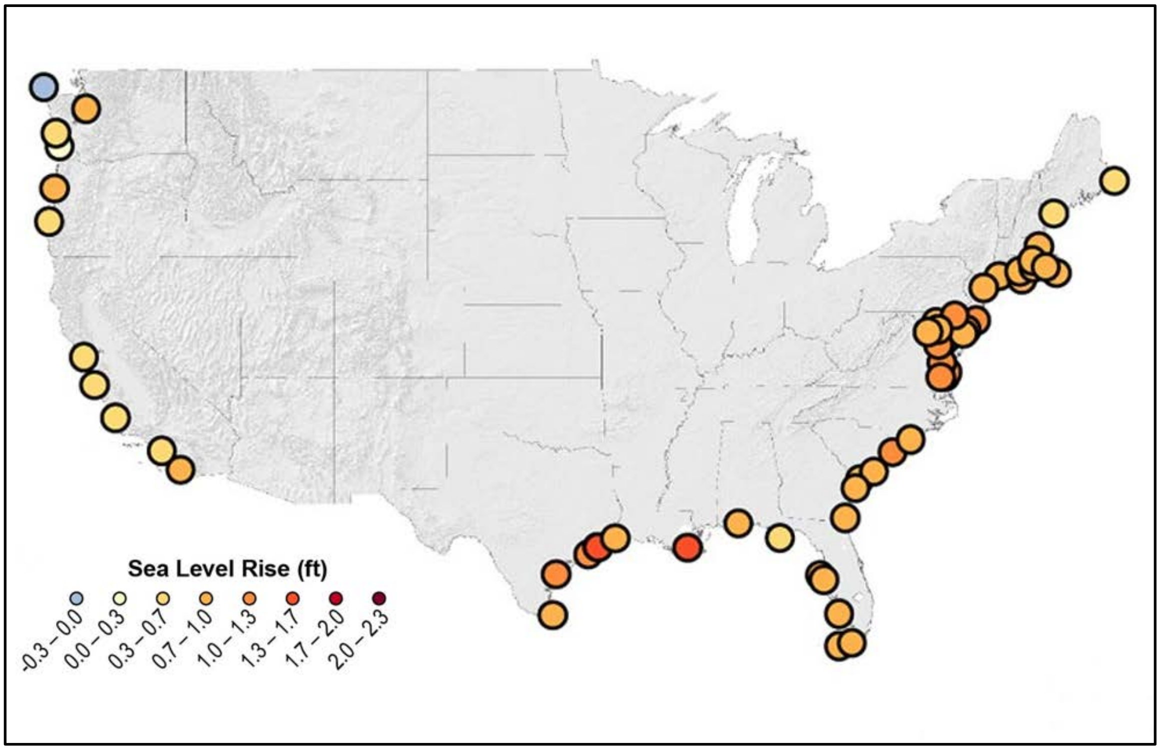

Figure 8.2.14-5: 8-inch Sea Level Rise Above 1992 Levels by 2050

Source: (USGCRP, 2014d)

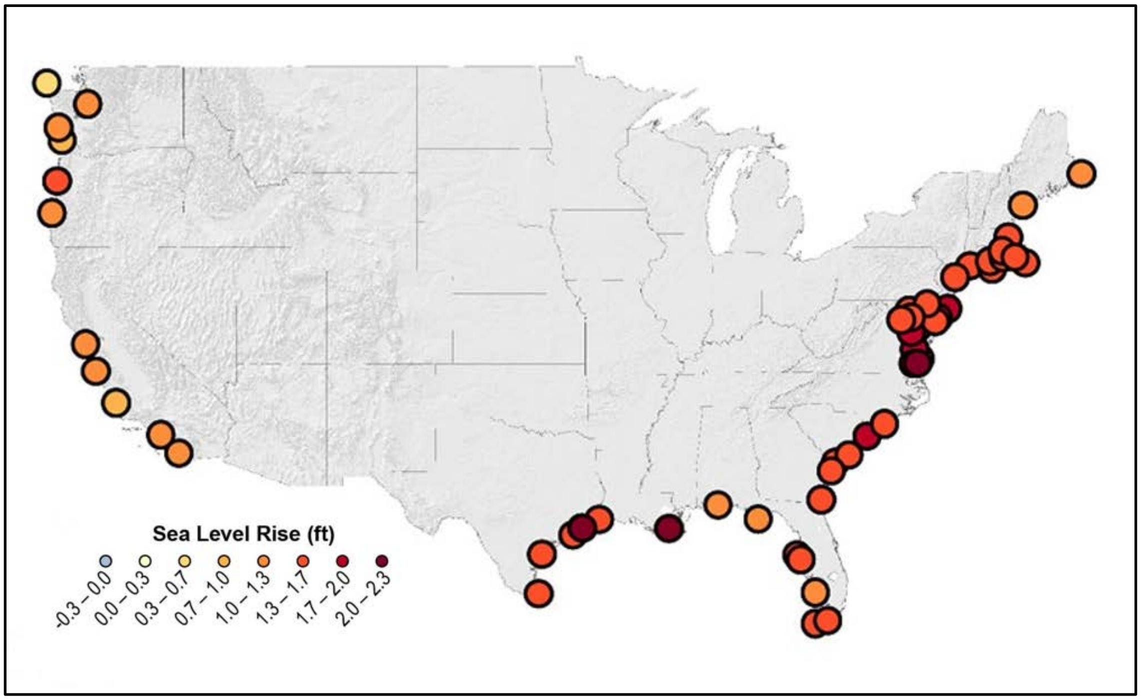

Figure 8.2.14-6: 1.24-foot Sea Level Rise Above 1992 Levels by 2050

Source: (USGCRP, 2014d)

Severe Weather Events

It is difficult to forecast the impact of climate change on severe weather events such as thunderstorms and hurricanes. Trends in thunderstorms and hurricanes are subject to greater uncertainties than trends in temperature and associated variables directly related to temperature such as sea level rise. Climate scientists are studying the influences of climate change on severe storms such as hurricanes. Recent research has yielded insights into the connections between warming and factors that cause severe storms. For example, atmospheric instability and increases in wind speed with altitude link warming with tornadoes and thunderstorms. Additionally, research has found a link between warming and conditions favorable for severe thunderstorms. However, more research is required to make definitive links between severe weather events and climate change. (USGCRP, 2014b)

United States coastal waters are expected to experience more intense hurricanes with related increases in wind, rain, and storm surges (but not necessarily an increase in the number of storms that make landfall) (USGCRP, 2014b). Changes in hurricane intensity are difficult to project because there are contradictory effects at work. Warmer oceans increase storm strength with higher winds and increased precipitation. However, variations in wind speed and direction with height are also projected to increase in some regions; this tends to inhibit storm formation and growth. Current research suggests stronger, more rain-producing tropical storms and hurricanes are generally more likely, though such storms may form less frequently; ultimately, more research would provide greater certainty (USGCRP, 2009).

8.2.14.4 Description of Environmental Concerns

Greenhouse Gas Emissions

Increases in GHG emissions have altered the global climate, leading to generalized temperature increases, weather disruption, increased droughts and heatwaves, and may have potentially catastrophic long-term consequences for the environment. Although GHGs are not yet regulated by the federal government, many states have set various objectives related to reducing GHG emissions, particularly CO_2 emissions from fossil fuels.

Based on the impact significance criteria presented in Table 8.2.14-1, climate change impacts as a result of GHG emissions could be significant and require a quantitative analysis if FirstNet's deployment of technology was responsible for increased emissions of 25,000 MT/year or more. The GHG emissions resulting from FirstNet activities fall into two categories: short-term and long-term. Short-term emissions could be associated with deployment activities (vehicles and other motorized construction equipment) and would have no long-term or permanent impact on GHG emissions or climate change. Long-term (both temporary and permanent) emission increases could result from operations, including the use of grid-provided electricity by FirstNet equipment such as transmitters and optical fiber, and from the temporary use of portable or onsite electric generators (a less efficient, more carbon-intensive source of electricity), during emergency situations when the electric grid was down, for example after a hurricane.

A single large cell tower would typically require 20-60kW of power to operate (Balshe, 2011). The CO_2 emissions associated with the operation of the tower would depend on whether it was supplied by a stand-alone power source, such as a generator, or from the grid, and whether it was operating at full power on a continuous basis. A standard 60kW 3-phase diesel generator consumes approximately 5.0 gallons of diesel per hour (Diesel Service & Supply, 2016). Diesel fuel combustion emits 22.38 lbs of CO_2 per gallon (EIA, 2015e). A 60kW transmitter running on a generator would therefore be responsible for 1,221 kg of CO_2/day. Running continuously, the tower would cause the emission of 446 MT of CO_2 per year.

However, grid-provided electricity would result in less CO_2 emissions than onsite provided energy. Using the average carbon intensity of grid-provided electricity of 1,136.53 lbs/MWh (USEPA, 2015o), the same transmitter would be responsible for approximately 271 MT of CO_2 per year running continuously. Actual emissions would depend on the fuel mix and efficiency of the systems from which electricity was generated. Furthermore, the components of the system would not necessarily all be this large, running all the time, or at full power. Some may even run on low/no-emissions renewable energy. Therefore, this scenario is a "worst-case" for GHG emissions. If the system deployment resulted in the operation of more than 50 60 kW towers operating at maximum power in remote locations on diesel generators on a continuous basis, the 25,000 MT/year threshold may be exceeded and a quantitative analysis required. By comparison optical fiber is considerably more energy efficient and consumes considerably less power than transmitters (Vereecken, et al., 2011), and would not impact GHG emissions in such a way as to require a quantitative analysis.

Effects of Climate Change on Project Related Impacts

Climate change may increase project-related impacts by magnifying or otherwise altering impacts in other resources areas. For example, climate change may impact air quality, water resource availability, and recreation. These effects would vary from state to state depending on the resources in question and their relationship to climate change. These impacts will be considered fully in Chapter 18, Cumulative Impacts. No BMPs will be described for this aspect of the resource.

Sea level rise, combined with land subsidence, is already having an impact on coastal Louisiana, which has seen its relative sea level rise by more than eight inches in the last 50 years (USEPA, 2015p), resulting in the permanent loss of coastal wetlands, negatively impacting these important ecosystems both from the perspective of plant and animal life, their dependent economies, and the protection these wetlands offer inland areas from coastal storms (USGCRP, 2015).

Impacts of Climate Change on FirstNet Installations and Infrastructure

Climate change impacts on FirstNet installations and infrastructure will vary from state to state, depending on the placement and vulnerability of the installations and infrastructure, and the impacts that climate change is anticipated to have in that particular location.

Coastal and inland Louisiana are at risk for stronger hurricanes as a result of climate change. Sea level rise would increase the height, areal extent, and persistence of coastal flooding during these events (USGCRP, 2015). Stronger storms may also increase the potential for damage to FirstNet infrastructure from high winds and wind-borne debris. Inland areas of Louisiana out of the immediate path of coastal storm surge are nevertheless at risk of flooding. Climate change is projected to increase the frequency and severity of torrential downpours, which in turn may increase the potential for flash floods as well as severe flooding during hurricanes (USGCRP, 2015). Urban areas in particular will be at risk of increased intensity and duration of heat waves, particularly in urban areas such as New Orleans where heat waves would be magnified by the urban heat island (USGCRP, 2014e). Extended periods of extreme heat may impede the operation of the regional electricity grid and overwhelm the capacity of onsite equipment needed to keep microwave and other transmitters cool (DOE, 2015).

Based on the impact significance criteria presented in Table 8.2.14-1, climate change effects on FirstNet installations and infrastructure would be significant if they negatively affected the operation of these facilities.

8.2.14.5 Potential Impacts of the Preferred Alternative

Greenhouse Gas Emissions

The following section assesses potential GHG emission impacts associated with implementation of the Preferred Alternative in Louisiana, including deployment and operation activities.

As described in Section 2.1.2, Proposed Action Infrastructure, implementation of the Preferred Alternative could result in the deployment and operation of various types of facilities or infrastructure. Depending on the physical nature and location of the facility/infrastructure and the specific deployment requirements, some activities would result in potential impacts to GHG emissions, climate impacts in other resource areas, and FirstNet infrastructure and operations, and others would not. In addition, and as explained in this section, at the programmatic level, the same type of Proposed Action Infrastructure could result in a range of no impacts to less than significant impacts depending on the deployment scenario or site-specific conditions.

Activities Likely to Have No Impacts

Of the types of facilities or infrastructure deployment scenarios described in Section 2.1.2, Proposed Action Infrastructure, the following are likely to have no impacts to climate change under the conditions described below:

- Wired Projects
  - Use of Existing Conduit – New Buried Fiber Optic Plant: There would be no short-term emissions associated with construction, as construction would not take place. The equipment required to blow or pull fiber through existing conduit would be used temporarily and infrequently, resulting in no perceptible generation of GHG emissions.
  - Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting up dark fiber would require no construction and have no short- or long-term emissions. This would create no perceptible change in GHG emissions.
- Satellites and Other Technologies
  - Distribution of Satellite Enabled Devices and Equipment: The installation of satellite-enabled equipment on existing structures, or the use of portable satellite-enabled devices would not create any perceptible changes in GHG emissions because they would not create any new emissions sources.
  - Deployment of Satellites: FirstNet does not anticipate launching satellites as part of the NPSBN; however, it could include equipment on satellites that are already being launched for other purposes. Therefore, it is anticipated that there would be no GHG emissions or any climate change effects on the project because of these activities.

Activities with the Potential to Have Impacts

The deployment and use of energy-consuming equipment as a result of the implementation of the Preferred Alternative would result in GHG emissions whose significance would vary depending on their power requirements, duration and intensity of use, and number. The types of infrastructure deployment scenarios that could be part of the Preferred Alternative and result in potential impacts to GHG emissions and climate change include the following:

- Wired Projects
  - New Build - Buried Fiber Optic Plant: This activity would include plowing (including vibratory plowing), trenching, and directional boring, and could involve construction of POPs, huts, or other facilities to house outside plant equipment or hand holes to access fiber. These activities could generate GHG emissions.

- New Build Aerial Fiber Optic Plant: These projects would require construction equipment for installing or replacing new poles and hanging cables as well as excavation and grading for new or modified right-of-ways or easements. It could also include construction of POPs, huts, or other facilities to house outside plant equipment. These activities could generate GHG emissions.
- Collocation on Existing Aerial Fiber Optic Plant: These projects would require equipment for replacement of existing wiring and poles. GHG emissions associated with these projects would arise from use of machinery and vehicles to complete these activities.
- New Build – Submarine Fiber Optic Plant: The deployment of small workboats with engines similar to recreational vehicle engines may be required to transport and lay small wired cable. The emissions from these small marine sources would contribute to GHGs.
- Installation of Optical Transmission or Centralized Transmission Equipment: The construction of small boxes or huts or other structures would require construction equipment, which could generate GHG emissions.

- Wireless Projects
  - New Wireless Tower Construction: Installation of new wireless towers and associated structures (generators, equipment sheds, fencing, security and aviation lighting, electrical feeds, and concrete foundations and pads) or access roads could result in short-term, temporary GHG emissions from vehicles and construction equipment. Long-term, permanent or temporary increases in GHG emissions would result from the electricity requirements of the towers (both grid-provided and backup), and would depend on their size, number, and the frequency and duration of their use.
  - Collocation on Existing Wireless Tower, Structure, or Building: Collocation would involve mounting or installing equipment (such as antennas or microwave dishes) on existing towers. There would be no short-term GHG emissions associated with construction, as it would not occur. Minor, short-term, temporary GHG emissions may result from any associated equipment used for installation, such as cranes or other equipment. Long-term, permanent or temporary increases in GHG emissions would result from the electricity requirements of the towers (both grid-provided and backup), and would depend on their size, number, and the frequency and duration of their use.
- Deployable Technologies
  - COWs, COLTs, SOWs: The long-term operations of these mobile systems have the potential to have GHG emission impacts in excess of 25,000 MT if operated in large numbers over the long-term. However, this would be highly dependent on their size, number, and the frequency and duration of their use.
  - Emissions associated with the deployment and maintenance of a complete network solution of this type may be significant if large numbers of piloted or unmanned aircraft were used for a sustained period of time (i.e., months to years). Emissions would depend

on the type of platforms used, their energy consumption, and the duration of the network's operation.

Potential climate change impacts associated with deployment activities as a result of implementation of the Preferred Alternative include increased GHG emissions. GHG emissions would arise from the combustion of fuel used by equipment during construction and changes in land use. Emissions occurring as a result of soil disturbance and loss of vegetation are expected to be less than significant at the programmatic level, due to the limited and localized nature of deployment activities. Chapter 16, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Climate Change Impacts on FirstNet Infrastructure or Operations

Coastal and inland Louisiana are at risk for stronger hurricanes as a result of climate change. Sea level rise would increase the height, areal extent, and persistence of coastal flooding during these events (USGCRP, 2015). Stronger storms may also increase the potential for damage to FirstNet infrastructure from high winds and wind-borne debris. Inland areas of Louisiana out of the immediate path of coastal storm surge are nevertheless at risk of flooding. Climate change is projected to increase the frequency and severity of torrential downpours, which in turn may increase the potential for flash floods as well as severe flooding during hurricanes (USGCRP, 2015). Urban areas in particular will be at risk of increased intensity and duration of heat waves, particularly in urban areas such as New Orleans where heat waves would be magnified by the urban heat island (USGCRP, 2014e). Extended periods of extreme heat may impede the operation of the regional electricity grid (DOE, 2015), and overwhelm the capacity of onsite equipment needed to keep microwave and other transmitters cool.

8.2.14.6 Alternatives Impact Assessment

The following section assesses potential impacts to climate associated with the Deployable Technologies Alternative and the No Action Alternative.

Deployable Technologies Alternative

Under the Deployable Technologies Alternative, a nationwide fleet of mobile communications systems would provide temporary coverage in areas not covered by the existing, usable infrastructure. There would be no collocation of equipment and minimal new construction associated with wired or wireless projects discussed above under the Preferred Alternative. Some limited construction could be associated with implementation such as land clearing or paving for parking or staging areas. The specific infrastructure associated with the Deployable Technologies Alternative would be the same as the deployable technologies implemented as part of the Preferred Alternative but would likely be implemented in greater numbers, over a larger geographic extent, and used with greater frequency and duration.

Deployment Impacts

As explained above, implementation of deployable technologies could involve use of fossil-fuel-powered vehicles, powered generators, and/or aerial platforms. There could be some emissions and soil and vegetation loss as a result of excavation and grading for staging and/or landing areas depending on the type of technology. GHG emissions are expected to be less than significant at the programmatic level, based on the defined significance criteria, since activities would be temporary and short-term. Chapter 16, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Operations Impacts

Implementing land-based deployable technologies (COW, COLT, SOW) could result in emissions from mobile equipment on heavy trucks using internal combustion engines associated with the vehicles and onboard generators. While a single deployable vehicle may have an insignificant impact, multiple vehicles operating for longer periods, in close proximity, may have a cumulative impact, although this impact is expected to be less than significant at the programmatic level, due to the temporary nature of the operation of deployables. Some staging or landing areas (depending on the type of technology) may require excavation, site preparation, and paving. Heavy equipment used for these activities could produce emissions as a result of burning fossil fuels in internal combustion engines. The operation of aerial technology is anticipated to generate pollutants during all phases of flight, except for balloons. These activities are expected to be less than significant at the programmatic level, due to the limited duration of deployment activities. Chapter 16, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Additionally, routine maintenance and inspections of the deployable technologies are anticipated to be less than significant at the programmatic level, given that these activities are of low-intensity and short duration.

Climate Change Impacts on FirstNet Deployable Infrastructure or Operations

Climate change effects have the most noticeable impacts over a long period. Climate change effects such as temperature, precipitation changes, and extreme weather during operations would be expected but could have little to no impact on the deployed technology due to the temporary nature of deployment. However, if these technologies are deployed continuously (at the required location) for an extended period, climate change effects on deployables could be similar to the Proposed Action, as explained above. Chapter 16, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

No Action Alternative

Under the No Action Alternative, the NPSBN would not be deployed; therefore, there would be no associated construction or installation of wired, wireless, deployable infrastructure, or satellites and other technologies. As a result, there would be no impacts to GHG emissions or climate as a result of deployment and operation of the Proposed Action. Environmental conditions would therefore be the same as those described in Section 8.1.14, Climate Change.

8.2.15 Human Health and Safety

8.2.15.1 Introduction

This section describes potential impacts to human health and safety in Louisiana associated with deployment of the Proposed Action and alternatives. Chapter 16, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

8.2.15.2 Impact Assessment Methodology and Significance Criteria

The impacts of the Proposed Action on human health and safety were evaluated using the significance criteria presented in Table 8.2.15-1. As described in Section 8.2, Environmental Consequences, the categories of impacts are defined as potentially significant, less than significant with mitigation incorporated, less than significant, or no impact. Characteristics of each impact type, including magnitude or intensity, geographic extent, and duration or frequency, were used to determine the impact significance rating associated with each potential impact.

Given the nature of this programmatic evaluation, and because the Proposed Action could potentially cover a wide variety of actions that would take place in various landscapes, the potential impacts to human health and safety addressed in this section are presented as a range of possible impacts.

Table 8.2.15-1: Impact Significance Rating Criteria for Human Health and Safety

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	Less than Significant with BMPs and Mitigation Measures Incorporated	Less than Significant	No Impact
Exposure to Worksite Occupational Hazards as a Result of Activities at Existing or New FirstNet Sites	Magnitude or Intensity	Exposure to concentrations of chemicals above occupational regulatory limits and time weighted averages (TWAs). A net increase in the amount of hazardous or toxic materials or wastes generated, handled, stored, used, or disposed of, resulting in unacceptable risk, exceedance of available waste disposal capacity and probable regulatory violations. Exposure to recognized workplace safety hazards (physical and chemical). Violations of various regulations including OSHA, RCRA, CERCLA, Toxic Substances Control Act (TSCA), EPCRA.	Effect is potentially significant, but with mitigation is less than significant.	No exposure to chemicals above health-protective screening levels. Hazardous or toxic materials or wastes could be safely and adequately managed in accordance with all applicable regulations and policies, with limited exposures or risks. No exposure to unsafe working conditions or other workplace safety hazards.	No exposure to chemicals, unsafe working conditions, or other workplace safety hazards.
	Geographic Extent	Regional impacts observed ("regional" assumed to be at least a parish or parish-equivalent geographical extent, could extend to state/territory).		Impacts only at a local/neighborhood level.	NA
	Duration or Frequency	Occasional frequency during the life of the project.		Rare event.	NA

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
Exposure to Hazardous Materials, Hazardous Waste, and Mine Lands as a Result of FirstNet Site Selection and Site-Specific Land Disturbance Activities	Magnitude or Intensity	Exposure to concentrations of chemicals above regulatory limits, or USEPA chemical screening levels protective of the public. A net increase in the amount of hazardous or toxic materials or wastes generated, handled, stored, used, or disposed of, resulting in unacceptable risk, exceedance of available waste disposal capacity and probable regulatory violations. Site contamination conditions could preclude development of sites for the proposed use. Violations of various regulations including: OSHA, RCRA, CERCLA, TSCA, EPCRA. Unstable ground and seismic shifting.	Effect is potentially significant, but with mitigation is less than significant.	No exposure to chemicals above health-protective screening levels. Hazardous or toxic materials or wastes could be safely and adequately managed in accordance with all applicable regulations and policies, with limited exposures or risks. No exposure to unstable ground conditions or other workplace safety hazards.	No exposure to chemicals, unstable ground conditions, or other workplace safety hazards.
	Geographic Extent	Regional impacts observed ("regional" assumed to be at least a parish or parish-equivalent geographical extent, could extend to state/territory).		Impacts only at a local/neighborhood level.	NA
	Duration or Frequency	Occasional frequency during the life of the project.		Rare event.	NA

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	Less than Significant with BMPs and Mitigation Measures Incorporated	Less than Significant	No Impact
Exposure to Hazardous Materials, Hazardous Waste, and Occupational Hazards as a Result of Natural And Manmade Disasters	Magnitude or Intensity	Exposure to concentrations of chemicals above regulatory limits, or USEPA chemical screening levels protective of the public. Site contamination conditions could preclude development of sites for the proposed use. Physical and biologic hazards. Loss of medical, travel, and utility infrastructure.	Effect is potentially significant, but with mitigation is less than significant.	No exposure to chemicals above health-protective screening levels. Hazardous or toxic materials or wastes could be safely and adequately managed in accordance with all applicable regulations and policies, with limited exposures or risks. No exposure to unsafe conditions. No loss of medical, travel, or utility infrastructure.	No exposure to chemicals, unsafe conditions, or other safety and exposure hazards.
	Geographic Extent	Regional impacts observed ("regional" assumed to be at least a parish or parish-equivalent geographical extent, could extend to state/territory).		Impacts only at a local/neighborhood level.	NA
	Duration or Frequency	Occasional frequency during the life of the project.		Rare event.	NA

NA = Not Applicable

8.2.15.3 Description of Environmental Concerns

Worksite Physical Hazards, Hazardous Materials, and Hazardous Waste

The human health and safety concern having the greatest likelihood to occur during FirstNet deployment activities is occupational injury to telecommunication workers. The nature of telecommunication work requires workers to execute job responsibilities that are inherently dangerous. Telecommunication work activities present physical and chemical hazards to workers. The physical hazards have the potential to cause acute injury, long-term disabilities, or in the most extreme incidents, death. Other occupational activities such as handling hazardous materials and hazardous waste often do not result in acute injuries, but may compound over multiple exposures, resulting in increased morbidity. Based on the impact significance criteria presented in Table 8.2.15-1, occupational injury impacts could be potentially significant if the FirstNet deployment locations require performing occupational activities that have the highest relative potential for physical injury and/or chemical exposure. Examples of activities that may present increased risk and higher potential for injury include working from heights (i.e., from towers and roof tops), ground-disturbing activities like trenching and excavating, confined space entry, operating heavy equipment, and the direct handling of hazardous materials and hazardous waste. Predominately, these hazards are limited to occupational workers, but may impact the general public if there are trespassers or if any physical of chemical hazard extends beyond the restricted access of proposed FirstNet work sites.

To protect occupational workers, OSHA mandates that employers be required to protect their employees from occupational hazards that could result in injury. Depending on the source of the hazard and the site-specific work conditions, OSHA generally recommends the following hierarchy for protecting onsite workers (OSHA, 2015).

- Engineering controls;
- Work practice controls;
- Administrative controls; and
- Personal protective equipment (PPE).

Engineering controls are often physical barriers that prevent access to a worksite, areas of a worksite, or from idle and operating equipment. Physical barriers take many forms like perimeter fences, trench boxes,[132] chain locks, bollards, storage containers (for storing equipment and chemicals), or signage and caution tape. Other forms of engineering controls could include machinery designed to manipulate the quality of the work environment, such as ventilation blowers. Whenever practical, engineering controls may result in the complete removal of the hazard from the work site, an example of which would be the transport and offsite disposal of hazardous waste or asbestos containing materials.

Work practice controls could be implemented as abiding by specific OSHA industry standards, such as the Confined Space Entry standard (29 CFR 1910.146) or thru the development of

[132] Trench boxes are framed metal structures inserted into open trenches to support trench faces, to protect workers from cave-ins and similar incidents. (OSHA, 2016d)

employer specific workplace rules and operational practices (OSHA, 2015). To the extent practicable, FirstNet partner(s) would likely implement and abide by work practice controls through employee safety training and by developing site-specific health and safety plans (HASP). The HASPs would identify all potential hazardous materials and hazardous wastes, potential physical hazards, and applicable mitigation steps. Other components of a HASP identifying appropriate PPE for each task and the location of nearby medical facilities. Safety Data Sheets (SDS) describing the physical and chemical properties of hazardous materials used during FirstNet deployment and maintenance activities, as well as the physical and health hazards, routes of exposure, and precautions for safe handling and use would be kept and maintained at all FirstNet project sites. In addition to HASPs and SDSs, standard operating procedures (SOPs) would be developed and implemented by FirstNet partner(s) for critical and/or repetitive tasks that require attention to detail, specialized knowledge, or clear step-wise directions to prevent worker injury and to ensure proper execution.

Administrative controls are employer-initiated methods to reduce the potential for injury and physical fatigue (OSHA, 2015). Administrative controls may take the form of limiting the number of hours an employee is allowed to work per day, requiring daily safety meetings before starting work, utilizing the buddy system for dangerous tasks and any other similar activity or process that is designed to identify and mitigate unnecessary exposure to hazards. When engineering controls, work practice controls, and administrative controls are not feasible or do not provide sufficient protection, employers must also provide appropriate PPE to their employees and ensure its proper use. PPE is the common term used to refer to the equipment worn by employees to minimize exposure to chemical and physical hazards. Examples of PPE include gloves, protective footwear, eye protection, protective hearing devices (earplugs, muffs), hard hats, fall protection, respirators, and full body suits. PPE is the last line of defense to prevent occupational injuries and exposure.

Hazardous Materials, Hazardous Waste, and Mine Lands

The presence of environmental contamination and mine lands at FirstNet deployment sites has the potential to impact the health and safety of workers and the public negatively. Past or present contaminated media, such as soil and groundwater, may be present and become disturbed as a result of site activities. Mines may cause unstable surface and subsurface conditions because of underground shaft collapses or seismic shifting. Based on the impact significance criteria presented in Table 8.2.15-1, human health impacts could be significant if FirstNet deployment sites are near contaminated properties. Prior to the start of any FirstNet deployment project, potential site locations should be screened for known environmental contamination and/or mining activities using federal resources such as the USEPA Cleanups in My Community database and U.S. Department of Interior’s Abandoned Mine Lands inventory, through the LDEQ, or through an equivalent commercial resource.

By screening sites for environmental contamination, mining activities, and reported environmental liabilities, the presence of historic contamination and unsafe ground conditions could be evaluated and may influence the site selection process. In general, the lower the density of environmental contamination or mining activities, the more favorable the site will be for

FirstNet deployment projects. If sites containing known environmental contamination (or mine lands) are selected for proposed FirstNet deployment activities it may be necessary to implement additional controls (e.g., engineering, work practice, administrative, and/or PPE) to ensure workers, and the general public, are not unnecessarily exposed to the associated hazards. Additionally, for any proposed FirstNet deployment site, it is possible undocumented environmental contamination is present.

During FirstNet deployment activities, if any soil or groundwater is observed to be stained or emitting an unnatural odor, it may be an indication of environmental contamination. When such instances are encountered, it may be necessary to stop work until the anomaly is further assessed through record reviews or environmental sampling. Proposed FirstNet deployment would attempt to avoid known contaminated sites. However, in the event that FirstNet is unable to avoid a contaminated site, then site analysis and remediation would be required under RCRA, CERCLA, and applicable Louisiana state laws to protect workers and the public from direct exposure or fugitive contamination.

Exposure assessments identify relevant site characteristics, temporal exposure parameters, and toxicity data to determine the likelihood of adverse health effects. More formally known as a human health risk assessment (HHRA), these studies provide mathematical justification for implementing controls at the site to protect human health. If the HHRA determines the potential for adverse health effects is too great DHH may require FirstNet to perform environmental clean-up actions at the site to lower the existing levels of contamination. HHRAs help determine which level of PPE (i.e., Level D, Level C, Level B, or Level A) is necessary for a work activity. HHRAs take into account all exposure pathways: absorption, ingestion, inhalation, and injection. Therefore, specific protective measures (e.g., controls and PPE) that disrupt the exposure pathways could be identified, prioritized, and implemented.

Natural and Manmade Disasters

The impacts of natural and manmade disasters are likely to present unique health and safety hazards, as well as exacerbate pre-existing hazards, such as degrading occupational work conditions and disturbing existing environmental contamination. The unique hazards presented by natural and manmade disasters may include, fire, weather incidents (e.g., floods, tornadoes, hurricanes, etc.), earthquakes, vandalism, large- or small-scale chemical releases, utility disruption, community evacuations, or any other event that abruptly and drastically denudes the availability or quality of transportation infrastructure, utility infrastructure, medical infrastructure, and sanitation infrastructure. Additionally, such natural and manmade disasters could directly impact public safety communication infrastructure assets through damage or destruction.

Based on the impact significance criteria presented in Table 8.2.15-1, human health impacts could be significant if FirstNet deployment sites are located in areas that are directly impacted by natural and manmade disasters that could lead to exposure to hazardous wastes, hazardous materials, and occupational hazards. FirstNet's emphasis on public safety-grade communications infrastructure may result in a less than significant beneficial impact at the programmatic level, as new infrastructure could be deployed with additional structural hardening, and existing infrastructure may be hardened, as appropriate and feasible, in an effort to reduce the possibility of infrastructure damage or destruction to some degree.

Potential mitigation measures for natural disasters is to be aware of current weather forecasts, forest fire activities, seismic activities, and other news worthy events that may indicate upcoming disaster conditions. Awareness provides time and opportunity to plan evacuation routes, to relocate critical equipment and parts, and to schedule appropriate work activities preceding and after the natural disaster. These mitigation steps reduce the presence of workers and dangerous work activities to reduce the potential for injury or death. Manmade disasters could be more difficult to anticipate due to the unexpected or accidental nature of the disaster. Though some manmade disasters are due to malicious intentions, many manmade disasters result from human error or equipment failure. The incidence of manmade disasters affecting FirstNet deployment sites would be difficult to predict and diminish because the source of such disasters is most likely to originate from sources independent of FirstNet activities. Chapter 16, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

8.2.15.4 Potential Impacts of the Preferred Alternative

The following section assesses potential impacts associated with implementation of the Preferred Alternative, including deployment and maintenance activities.

Deployment Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, implementation of the Preferred Alternative could result in the deployment of various types of facilities or infrastructure. Depending on the physical nature and location of the facility/infrastructure and the specific deployment requirements, some activities would result in potential impacts to human health and safety and others would not. In addition, and as explained in this section, at the programmatic level, the same type of Proposed Action Infrastructure could result in a range of no impacts to less than significant with mitigation, depending on the deployment scenario or site-specific activities. Chapter 16, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Activities Likely to Have No Impacts

Of the types of facilities or infrastructure deployment scenarios described in Section 2.1.2, Proposed Action Infrastructure, the following are likely to have no impacts to human health and safety under the conditions described below:

- Wired Projects
    - Use of Existing Conduit – New Buried Fiber Optic Plant: the pulling or blowing of fiber optic cable would be performed through existing conduit. Use of mechanical equipment would be limited to pulley systems and blowers. Some locations with no existing power

supply may require the use of electrical generators. Hazardous materials needed for this work would include fiber optical cable lubricants, mechanical oil/grease, and fuel for electrical generators although these materials are expected to be used infrequently and in small quantities. These activities are not likely to result in serious injury or chemical exposure, or surface disturbances since work would be limited to existing entry and exit points, would be temporary, and intermittent. It is anticipated that there would be no impacts to human health and safety.

- Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting up of dark fiber would have no impacts to human health and safety because there would be no ground disturbance or heavy equipment used.

- Satellites and Other Technologies
  - Deployment of Satellites: FirstNet does not anticipate launching satellites as part of the deployment of the NPSBN; however, it could include equipment on satellites that are already being launched for other purposes. As adding equipment to an existing launch vehicle would be very unlikely to impact human health and safety resources, it is anticipated that this activity would have no impact on those resources.

Activities with the Potential to Have Impacts

Potential deployment-related impacts to human health and safety as a result of implementation of the Preferred Alternative would encompass a range of impacts that occur as a result of ground disturbance activities, construction activities, equipment upgrade activities, management of hazardous materials and/or hazardous waste, and site selection. The types of infrastructure development scenarios or deployment activities that could be part of the Preferred Alternative and result in potential impacts to human health and safety include the following:

- Wired Projects
  - New Build – Buried Fiber Optic Plant: Plowing (including vibratory plowing), trenching, or directional boring and the construction of POPs, huts, or other associated facilities or hand-holes to access fiber would require the use of heavy equipment and hazardous materials. The additional noise and activity at the site would require workers to demonstrate a high level of situational awareness. Failure to follow OSHA and industry controls could result in injuries. Excavation of soil at proposed sites known to contain environmental contamination has the potential to expose workers to harmful chemicals or releases that could impact the general public in the immediate vicinity. Additionally, some of this work would likely be performed along road ROWs, increasing the potential for vehicle traffic to collide with site workers or equipment. If a proposed deployment activity involves the operation of heavy equipment, managing hazardous materials and hazardous waste management, or other site location challenges, there could be potential human health and safety impacts to consider.
  - New Build – Aerial Fiber Optic Plant: Installation of new poles and fiber optic lines could require excavation activities, working from heights, use of hazardous materials, and

site locations in ROWs. Hazards associated with the site work include injury from heavy equipment, fall hazards, chemical hazards, and the potential for vehicle traffic to collide with site workers or equipment. Excavation of soil at proposed sites known to contain environmental contamination has the potential to expose workers to harmful chemicals or releases that could impact the general public in the immediate vicinity. If a proposed deployment activity involves the operation of heavy equipment, hazardous materials and hazardous waste management, or other site location challenges, there could be potential human health and safety impacts to consider.

- Collocation on Existing Aerial Fiber Optic Plant: Installation of overhead fiber optic lines would require work from height. In some instances, new poles would be installed requiring excavation activities with heavy equipment. Hazards associated with the site work include injury from heavy equipment, fall hazards, chemical hazards, and the potential for vehicle traffic to collide with site workers or equipment. Excavation of soil at proposed sites known to contain environmental contamination has the potential to expose workers to harmful chemicals or releases that could impact the general public in the immediate vicinity. If a proposed deployment activity involves the operation of heavy equipment, hazardous materials and hazardous waste management, or other site location challenges, there could be potential human health and safety impacts to consider.
- New Build – Submarine Fiber Optic Plant: The installation of fiber optic cables in limited nearshore and inland bodies of water requires workers to operate over aquatic and/or marine environments, which presents opportunities for drowning. When working over water exposure to sun, high or low temperatures, wind, and moisture could impact worker safety. Construction of landings and/or facilities on shore to accept submarine cable would require site preparation, construction, and management of hazardous materials and hazardous waste. Excavation of soils or sediments at proposed sites known to contain environmental contamination may result in workers being exposed to harmful chemicals or releases that could impact the public in the immediate vicinity. If a proposed deployment activity involves the operation of heavy equipment, hazardous materials and hazardous waste management, or other site location challenges, there could be potential human health and safety impacts to consider.
- Installation of Optical Transmission or Centralized Transmission Equipment: Installation of transmission equipment would require site preparation, construction activities, and management of hazardous materials and hazardous waste. Excavation of soils at proposed sites known to contain environmental contamination may result in workers being exposed to harmful chemicals or releases that could impact the public in the immediate vicinity. If a proposed deployment activity involves the operation of heavy equipment, hazardous materials and hazardous waste management, or other site location challenges, there could be potential human health and safety impacts to consider.

- Wireless Projects
  - New Wireless Communication Towers: Installation of new wireless towers and associated structures (generators, equipment sheds, fencing, security and aviation

lighting, electrical feeds, and concrete foundations and pads) or access roads would require site preparation, construction activities, and management of hazardous materials and hazardous waste. Communication towers would be erected, requiring workers to perform their duties from heights sufficient to result in serious injury or death in the event of falling. Working from heights may also result in additional overhead hazards and falling objects. Excavation of soils at proposed sites known to contain environmental contamination may result in workers being exposed to harmful chemicals or releases that could impact the public in the immediate vicinity. If a proposed deployment activity involves the operation of heavy equipment, hazardous materials and hazardous waste management, or other site location challenges, there could be potential human health and safety impacts to consider. For a discussion of radio frequency emissions, refer to Section 2.4, Radio Frequency Emissions.

  - Collocation on Existing Wireless Tower, Structure, or Building: Collocation would involve mounting or installing equipment (such as antennas or microwave dishes) on an existing tower. This would require workers to perform their duties from heights sufficient to result in serious injury or death in the event of falling not result in impacts to soils. Working from heights may also result in additional overhead hazards and falling objects. Excavation of soils at proposed sites known to contain environmental contamination may result in workers being exposed to harmful chemicals or releases that could impact the public in the immediate vicinity. If a proposed deployment activity involves the operation of heavy equipment, hazardous materials and hazardous waste management, or other site location challenges, there could be potential human health and safety impacts to consider. For a discussion of radio frequency emissions, refer to Section 2.4, Radio Frequency Emissions.

- Deployable Technologies
  - The use of deployable technologies could result in soil disturbance if land-based deployables are deployed on unpaved areas or if the implementation results in paving of previously unpaved surfaces. The use of heavy machinery presents the possibility for spills and soil and water contamination, and noise emissions could potentially impact human health; and vehicles and heavy equipment present the risk of workplace and road traffic accidents that could result in injury. Set-up of a cellular base station contained in a trailer with a large expandable antenna mast is not expected to result in impacts to human health and safety. However, due to the larger size of the deployable technology, site preparation or trailer stabilization may be required to ensure the self-contained unit is situated safely at the site. Additionally, the presence of a dedicated electrical generator would produce fumes and noise. The possibility of site work and the operation of a dedicated electrical generator have the potential for impacts to human health and safety. For a discussion of radio frequency emissions, refer to Section 2.4, Radio Frequency Emissions. Use of aerial vehicles would not involve telecommunication site work. Prior to deployment and when not in use, the aerial vehicles would likely require preventive maintenance. Workers responsible for these activities may handle hazardous materials, not limited to fuel, solvents, and adhesives.

- Satellites and Other Technologies
  - Satellite-Enabled Devices and Equipment: The use of portable devices that utilize satellite technology would not impact human health and safety because there is no construction activities or use of hazardous materials. The installation of permanent equipment on existing structures may require workers to operate from heights or in sensitive environments. As a result, the potential for falling, overhead hazards, and falling objects is greater and there is a potential to impact human health and safety.

In general, the abovementioned FirstNet activities could potentially involve site preparation work, construction activities, work in potentially harmful environments (road ROWs, work over water, and environmental contamination, and mine lands), management of hazardous materials and hazardous waste, and weather exposure. Potential impacts to human health and safety associated with deployment of the Proposed Project could include injury from site preparation and operating heavy equipment, construction activities, falling/overhead hazards/falling objects, exposure and release of hazardous chemicals and hazardous waste, and release of historic contamination to the surrounding environment. It is anticipated that potential health impacts associated with human exposure to environmental hazardous materials in air, water, or soil, the risk of road traffic, workplace accidents and injuries, noise exposure, and risk of infectious disease transmission would be less than significant at the programmatic level, due to the small-scale of likely FirstNet activities that would be temporary and of short duration. Chapter 16, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, operation activities associated with the Preferred Alternative would consist of routine maintenance and inspection of the facilities. Any major infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the abovementioned construction impacts. At the programmatic level, it is anticipated that there would be less than significant impacts to human health and safety associated with routine inspections of the Preferred Alternative. Use of PPE or other mitigation measures could be necessary to protect workers adequately. If usage of heavy equipment is part of routine maintenance, the potential for impacts to human health and safety would also increase. It is anticipated that potential health impacts associated with human exposure to environmental hazardous materials in air, water, or soil, the risk of road traffic, workplace accidents and injuries, noise exposure, and risk of infectious disease transmission would be less than significant at the programmatic level, due to the small-scale of likely FirstNet activities that would be temporary and of short duration. Chapter 16, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

8.2.15.5 Alternatives Impact Assessment

The following section assesses potential impacts to human health and safety associated with the Deployable Technologies Alternative and the No Action Alternative.

Deployable Technologies Alternative

Under the Deployable Technologies Alternative option, a nationwide fleet of mobile communications systems would provide temporary coverage in areas not covered by the existing, usable land-based infrastructure. There would be no collocation of equipment and minimal new construction associated with wired or wireless projects discussed above under the Preferred Alternative. Some limited construction could be associated with implementation such as land clearing or paving for parking or staging areas. The specific infrastructure associated with the Deployable Technologies Alternative would be the same as the deployable technologies implemented as part of the Preferred Alternative but would likely be implemented in greater numbers, over a larger geographic extent, and used with greater frequency and duration. Therefore, potential impacts to human health and safety as a result of implementation of this alternative could be as described below.

Deployment Impacts

As explained above, implementation of deployable technologies could result in less than significant impacts to human health and safety at the programmatic level. The largest of the land-based deployable technologies may require site preparation work or stabilization work to ensure the self-contained trailers are stable. Heavy equipment may be necessary to complete the site preparation work. However, in general, the deployable technologies are small mobile units that could be transported as needed. While in operation, the units are parked and operate off electrical generators or existing electrical power sources. Connecting deployable technology to a power supply may present increased electrocution risk during the process of connecting power. If the power source were an electrical generator, then there would likely be a need to manage fuel onsite. These activities could result in less than significant impacts to human health and safety at the programmatic level. It is anticipated that potential health impacts associated with human exposure to environmental hazardous materials in air, water, or soil, the risk of road traffic, workplace accidents and injuries, noise exposure, and risk of infectious disease transmission would be less than significant at the programmatic level, due to the small-scale of likely FirstNet activities that would be temporary and of short duration. Chapter 16, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

As explained above, operation activities would consist of implementation/running of the deployable technology and routine maintenance and inspections. As with the Preferred Alternative, it is anticipated that there would be no impacts to human health and safety associated with routine inspections of the Preferred Alternative. Use of PPE or other mitigation measures may be necessary to protect workers adequately. If usage of heavy equipment is part of routine maintenance, the potential for impacts to human health and safety would also increase. These impacts would be less than significant at the programmatic level, because of the small-scale of likely FirstNet activities; activities associated would routine maintenance, inspection, and deployment of deployable technologies would be temporary and often of limited duration. Chapter 16, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

No Action Alternative

Under the No Action Alternative, the NPSBN would not be deployed; therefore, there would be no associated construction or installation of wired, wireless, deployable infrastructure or satellites and other technologies. As a result, there would be no impacts to human health and safety as a result of construction and operation of the Proposed Action. Environmental conditions would therefore be the same as those described in Section 8.1.15 Human Health and Safety.

LA APPENDIX A – WATER RESOURCES

Table A-1: Louisiana Federal Wild, Scenic, and Recreational Rivers

River Name	River Description	Designation
Abita River	St. Tammany Parish	Natural and scenic
Amite River	East Feliciana - From the Louisiana-Mississippi state line to La. Hwy. 37.	Natural and scenic
Barnes Creek	From La. Hwy. 27 to the Calcasieu River in Allen and Beauregard parishes.	Natural and scenic
Bashman Bayou	St. Bernard - From its origin to Bayou Dupre.	Natural and scenic
Bayou Bartholomew	Morehouse - From the Louisiana-Arkansas state line to Dead Bayou.	Natural and scenic
Bayou Bienvenue	St. Bernard - From Bayou Villere to Lake Borgne.	Natural and scenic
Bayou Cane	St. Tammany - From its headwaters to Lake Pontchartrain.	Natural and scenic
Bayou Chaperon	St. Bernard - From its origin to its end.	Natural and scenic
Bayou Chinchuba	St. Tammany - From the West Causeway approach south to Lake Pontchartrain.	Natural and scenic
Bayou Cocodrie	Concordia - From Wild Cow Bayou to Little Cross Bayou, and Rapides, Evangeline - From U.S. Hwy. 167 to the Bayou Boeuf-Cocodrie Diversion Canal.	Natural and scenic
Bayou D'Arbonne	Union, Ouachita - From the Lake D'Arbonne dam to its entrance into the Ouachita River.	Natural and scenic
Bayou D'Loutre (L'Outre)	Ouachita, Union - From the Louisiana-Arkansas state line to its entrance into the Ouachita River.	Natural and scenic
Bayou Des Allemands	Lafourche, St. Charles - From Lac Des Allemands to Lake Salvador.	Natural and scenic
Bayou Dupre	St. Bernard - From the Lake Borgne Canal to Terre Beau Bayou.	Natural and scenic
Bayou Kisatchie	Natchitoches - From its entrance into Kisatchie National Forest to its entrance into Old River.	Natural and scenic
Bayou La Branche	St. Charles - From its source to where it drains into Lake Pontchartrain.	Natural and scenic
Bayou LaCombe	St. Tammany - From its headwaters to Lake Pontchartrain.	Natural and scenic
Bayou Liberty	Bayou Liberty - St. Tammany Parish.	Natural and scenic
Bayou Trepagnier	St. Charles - From Norco to where it joins Bayou La Branche.	Natural and scenic
Beckwith Creek	From its headwaters to the west fork of the Calcasieu River in Beauregard and Calcasieu parishes.	Natural and scenic
Big Creek	Grant - From Hwy. 167 to its entrance into Little River.	Natural and scenic
Black Lake Bayou	Red River, Winn, Bienville - From the Webster-Bienville parish line to Black Lake in Natchitoches Parish.	Natural and scenic
Blind River	St. James, Ascension, Livingston, St. John - From its origin in St. James Parish to its entrance into Lake Maurepas.	Natural and scenic
Bogue Chitto River	Washington, St. Tammany - From the Louisiana-Mississippi state line to its entrance into the Pearl River Navigation Canal.	Natural and scenic
Bogue Falaya River	St. Tammany - the river from its headwaters to La. Hwy. 437 in the parish of St. Tammany.	Natural and scenic
Bradley Slough (Bayou)	St. Tammany - All of that portion of the slough lying within the boundaries of St. Tammany Parish.	Natural and scenic
Bundicks Creek	Vernon, Beauregard, and Allen - From its headwaters to Bundicks Lake and from Bundicks Lake to Whiskey (Ouiska) Chitto Creek.	Natural and scenic

River Name	River Description	Designation
Calcasieu River	Vernon, Rapides - From La. Hwy. 8 east through Vernon Parish and all of that portion of said river lying within the boundaries of Rapides Parish, and Allen, Jefferson Davis, and Calcasieu - From the mouth of the Whiskey (Ouiska) Chitto River in Allen Parish, south through Jefferson Davis Parish, and to its intersection with the Ward Eight Park in Calcasieu Parish.	Natural and scenic
Comite River	East Feliciana, East Baton Rouge - From the Wilson-Clinton Hwy. in East Feliciana Parish to the entrance of White Bayou in East Baton Rouge Parish.	Natural and scenic
Corney Bayou	Claiborne, Union - From the Louisiana-Arkansas state line to Corney Lake and Corney Lake Dam to Lake D’Arbonne.	Natural and scenic
Dorcheat (Dauchite) Bayou	Webster - From the Arkansas state line to its entrance into Lake Bistineau.	Natural and scenic
Drake’s Creek	Vernon - From Lookout Road to its confluence with Whiskey (Ouiska) Chitto Creek located within Vernon Parish.	Natural and scenic
Fish Creek	Grant - From its origin near Williana to its entrance into Little River.	Natural and scenic
Hickory Branch	Beauregard, Calcasieu - From its headwaters to the west fork of the Calcasieu River.	Natural and scenic
Holmes Bayou	St. Tammany - All of that portion of the bayou lying within the boundaries of St. Tammany Parish.	Natural and scenic
Lake Borgne Canal	St. Bernard - From the Forty Arpent Canal to Bayou Dupre.	Natural and scenic
Little River	Rapides, Grant, Catahoula, LaSalle - From the juncture of Dugdemona and Castor Creek to its entrance into Catahoula Lake.	Natural and scenic
Middle Fork of Bayou D’Arbonne	Claiborne, Union From its origin near La. Hwy. 2 alternate to Lake D’Arbonne.	Natural and scenic
Morgan River	St. Tammany - From its juncture with the Porters River to its reentry into the West Pearl River.	Natural and scenic
Ouachita River	Morehouse, Union - From the north bank of Bayou Bartholomew at its intersection with the Ouachita River to the Arkansas state line.	Natural and scenic
Pearl Creek	Vernon - From La. Hwy. 111 to its entrance into Sabine River.	Natural and scenic
Pirogue Bayou	St. Bernard - From Bayou Dupre to New Canal.	Natural and scenic
Pushepatapa Creek	Washington - From where East Fork and West Fork join near state line to where it breaks up prior to its entrance into the Pearl River.	Natural and scenic
Saline Bayou	October 30, 1986. From Saline Lake upstream to the Kisatchie National Forest.	Scenic — 19.0 miles
Six Mile Creek	Allen, Vernon - Includes the East and West Forks and beginning at the boundary of Fort Polk Military Reservation (Lookout Road) and extending south through Vernon and Allen Parishes to its entrance into Whiskey (Ouiska) Chitto Creek.	Natural and scenic
Spring Creek	Rapides - From Otis to Cocodrie Lake in Rapides Parish.	Natural and scenic
Tangipahoa River	Tangipahoa - From the Louisiana-Mississippi state line to its entrance into Lake Pontchartrain.	Natural and scenic
Tchefuncte River and its tributaries	Washington, Tangipahoa, St. Tammany - From its origin in Tangipahoa Parish to its juncture with the Bogue Falaya River. Tributaries include, but are not limited to, Beech, Champagne, Clark, Cowpen, Cypress, Hornsby, Horse, Mary, McClothlin, Mile, Rattlesnake, Savannah, Smith, Soap and Tallow and Timber branches, Flowers Bayou, Pruden, St. Pauls, Simpson and Tantella creeks in St. Tammany Parish; Black, Bull and Reedy branches, Snow and Taylor creeks in Tangipahoa Parish; Catca, Gorman, North Carson and South Carson creeks in Washington Parish; and all other direct tributaries of the Tchefuncte River.	Natural and scenic

River Name	River Description	Designation
Tchefuncte River (excluding any tributaries)	St. Tammany - From the Bogue Falaya River to Lake Pontchartrain	Natural and scenic
Ten Mile Creek	Rapides, Allen, Vernon - From the boundary of Fort Polk Military Reservation (Lookout Road) through Vernon Parish and all of that portion of said creek lying within the boundaries of Rapides and Allen Parishes.	Natural and scenic
Terre Beau Bayou	St. Bernard - From Bayou Dupre to the New Canal.	Natural and scenic
Tickfaw River	St. Helena - From the Louisiana-Mississippi state line to La. Hwy. 42.	Natural and scenic
Trout Creek	LaSalle - From its origin near Hwy. 8 to its entrance into Little River.	Natural and scenic
West Pearl River	Washington, St. Tammany - From the state line to its entrance into Lake Borgne.	Natural and scenic
Whiskey (Ouiska) Chitto Creek	Vernon, Beauregard, Allen - From the boundary of Fort Polk Military Reservation (Lookout Road) to its entrance into Calcasieu River.	Natural and scenic
Wilson Slough (Bayou)	St. Tammany - All of that portion of the slough lying within the boundaries of St. Tammany Parish.	Natural and scenic
Bayou Manchac	From the Amite River to the Mississippi River.	Historic and scenic
Bayou St. John	Within the boundaries of Orleans Parish.	Historic and scenic

Sources: (LDWF, 2015m) (NWSRS, 2015)

LA APPENDIX B – BIOLOGICAL RESOURCES

Table B-1: S1-Ranked Terrestrial Communities in Louisiana

Vegetative Community Type	USEPA Ecoregion(s)	Description	Distribution
Coastal Dune Grassland	Western Gulf Coast Plain and Mississippi Alluvial Plain	Beach dunes and ridges on barrier islands and mainland; dry soils exposed to moderate to high amounts of salt spray, limited nutrients, and unstable substrate (due to storms and hurricanes)	Southwestern and southeastern Louisiana, adjacent to the gulf coast
Cook Mountain Calcareous Prairie	South Central Plains	Small, naturally treeless areas occurring on unique calcareous soils, occurring in a mosaic with calcareous forests; soils have high shrink-swell characteristics and host a variety of herbaceous flora as well as woody species; specifically associated with the geological formation called the Cook Mountain Formation (Tertiary-Eocene)	Central and western Louisiana
Jackson Calcareous Prairie	South Central Plains	Small, naturally treeless areas occurring on unique calcareous soils, occurring in a mosaic with calcareous forests; soils have high shrink-swell characteristics and host a variety of herbaceous flora as well as woody species; specifically associated with the geological formation called the Jackson Formation (Tertiary-Eocene)	Central Louisiana
Fleming Calcareous Prairie	South Central Plains	Small, naturally treeless areas occurring on unique calcareous soils, occurring in a mosaic with calcareous forests; soils have high shrink-swell characteristics and host a variety of herbaceous flora as well as woody species; specifically associated with the geological formation called the Fleming Formation (Tertiary-Miocene)	Central-western Louisiana
Morse Clay Calcareous Prairie	South Central Plains	Small, naturally treeless areas occurring on unique calcareous soils, occurring in a mosaic with calcareous forests; soils have high shrink-swell characteristics and host a variety of herbaceous flora as well as woody species; specifically associated with geological formation called the Pleistocene Red River terraces	Northwest Louisiana

Vegetative Community Type	USEPA Ecoregion(s)	Description	Distribution
Coastal Dune Shrub Thicket	Western Gulf Coast Plain and Mississippi Alluvial Plain	Thickets appear as a relatively dense stand of shrubs and occur on established sand dunes and beach ridges on barrier islands and mainland; sites are dry and moderately exposed to salt spray; shrubs are often covered with a dense growth of lichens; susceptible to being destroyed by sand dune migration or erosion and may be replaced by Coastal Dune Grassland; often serve as important nesting areas for colonial waterbirds	Southwestern and southeastern Louisiana, adjacent to the gulf coast
Prairie Terrace Loess Forest	Mississippi Valley Loess, Mississippi Alluvial Plain, Southern Coastal Plains, and Southeastern Plains	Restricted to silt loam soils overlying loess deposits associated with the Mississippi River with a diverse vegetation dominated by hardwood species with spruce pine as an occasional associate	Endemic to western Florida Parishes in Louisiana
Salt Dome Hardwood Forest	Mississippi Alluvial Plain	Restricted to salt domes in coastal Louisiana called the "Five Islands," the upland hardwood forests have developed on fertile, loessial deposits over salt dome cap rock that is highly erodible and has worn over thousands of years to form a characteristic, well dissected landscape of high, narrow ridges, steep slopes, and deep ravines that create a relatively cool, moist micro-climate on the slopes and in the ravines	Central coastal Louisiana on the "Five Islands"
Coastal Live Oak-Hackberry Forest	Western Gulf Coast Plain	Established on beach ridges 4 to 5 feet above sea level, which were created by sedimentation of the constantly shifting Mississippi River; composed primarily of fine sandy loams of medium fertility and high permeability, these forests serve as important storm barriers, limiting saltwater intrusion into freshwater habitats, and are important resting habitat for trans-gulf-migrating birds	Primarily in southwest Louisiana
Barrier Island Live Oak Forest	Mississippi Alluvial Plains	Appears to be distinct from other live oak communities occurring to the east and west, but little is known about this habitat type; trees can exhibit the effects of saltwater spray and wind, having a stunted appearance and leaning away from the prevailing wind	One known occurrence in Grand Isle, Jefferson Parish, Louisiana, where it occupies a small area (less than 1,000 acres)

Vegetative Community Type	USEPA Ecoregion(s)	Description	Distribution
Shortleaf Pine/Oak-Hickory Forest	South Central Plains, Mississippi Valley Loess Plains, Southeastern Plains, and Southern Coastal Plains	Found in uplands along slopes and ridges on dry hills with acidic silt or sandy loams underlain by clay; shortleaf pine dominates on drier sites, with wetter sites dominated by hardwoods	Northwest and northeast Louisiana
Saline Oak Woodland	South Central Plains	Open grassy understory that occurs on low flat terraces on saline-sodic soils of alluvial origin and of poor quality with stunted growth of tree species; woodlands grow on terraces adjacent to small streams, often in a mosaic with saline prairies; scattered pimple mounds and shallow ponds or sloughs with no direct connection to adjacent streams or waterways are often present	Upper West Gulf Coastal Plain on northwest Louisiana
Live Oak-Pine-Magnolia	Mississippi Alluvial Plain	Characterized by sandy soils and a suite of factors influenced by distance from the lake, including soil moisture, fire history, salt spray, local relief and tidal activity; community may be a transitional type between mesic Mixed Hardwood-Loblolly Forest and/or Beech-Magnolia Forest and more typical maritime forests that occur in coastal states east of Louisiana (further investigation is needed)	Two miles north of Lake Pontchartrain to its shores, where the Pleistocene prairie terrace meets the lake
Spruce Pine-Hardwood Flatwood	Mississippi Valley Loess Plains, Southern Coastal Plain, and Mississippi Alluvial Plain	Composed of hydric, acidic silt loam soils with higher-than-typical nutrient levels; two variants, a wetland and a non-wetland, occur, the former on poorly drained flats within a mosaic of higher, mesic non-wetlands	Narrow range in Livingston, East Baton Rouge and perhaps Ascension Parishes
Eastern Upland Longleaf Pine Forest	Southeastern Plains and Southern Coastal Plain	Occurs on hilly uplands with acidic loamy sands or clays and typically dissected by streams; fire-maintained community	Northeastern portion of Louisiana
Cedar Woodland	South Central Plains	Associated with calcareous prairies in fire-protected areas or at the prairie/woodland interface; occur on soils that stiff calcareous clays with very high shrink-swell characteristics	Jackson formation of northcentral Louisiana

Vegetative Community Type	USEPA Ecoregion(s)	Description	Distribution
Fleming Glade	South Central Plains	Open area in wooded areas with rock at or near the surface; soils are Anococo and are underlain by siltstone, with acidic and calcareous soils interspersed; vegetation is drought-tolerant glade species, wet savannah species, species characteristic of upland longleaf pine forests, and a few lime-loving plants	Dough Hills in northeast Rapides Parish
Cave	South Central Plains	Large air-filled cavities, with openings to the surface; associated with sandstone strata; known caves are very poorly developed and of limited extent	Central Louisiana

Source: (LDWF 2015b; LNHP 2009)

Table B-2. S1-Ranked Palustrine Communities in Louisiana

Vegetative Community Type	USEPA Ecoregion(s)	Description	Distribution
Coastal Prairie	Western Gulf Coastal Plains, Mississippi Alluvial Plains, and South Central Plains	Diverse grassland underlain by impervious clay pan and with soils circum-neutral to alkaline, saturated in winter, and often very dry in late spring and fall; soil conditions and frequent fire minimize woody species; trees were confined to elevated and better-drained stream sides or ridges, dividing this habitat into many subunits	Coastal southwest and central Louisiana
Mississippi Terrace Prairie	Mississippi Alluvial Plain	Small, pocket grasslands on terraces within the Mississippi River alluvial floodplain; likely extirpated, however a very few relicts of this natural community may remain but very little is known about this prairie type; frequent fire and soil type would have prevented invasion of woody species	Northeast Louisiana
Eastern Hillside Seepage Bog	Southeastern Plains and Southern Coastal Plains	Wetlands that are open, and dominated by herbaceous vegetation and historically associated with longleaf pine ecosystems; located on mid- to low slopes on saturated and very acidic, nutrient-poor substrates on fine sandy loams with relatively high organic matter content and underlain by an impervious clay layer that causes groundwater to constantly seep to the soil surface; Fire dependent systems from 1 to 10 acres in size	Occur on the Pleistocene high terraces in Washington and St. Tammany Parishes

Vegetative Community Type	USEPA Ecoregion(s)	Description	Distribution
Western Hillside Seepage Bog	South Central Plains and Western Gulf Coast Plain	Wetlands that are open, and dominated by herbaceous vegetation and historically associated with longleaf pine ecosystems; located on mid- to low slopes on saturated and very acidic, nutrient-poor substrates on fine sandy loams with relatively high organic matter content and underlain by an impervious clay layer that causes ground water to constantly seep to the soil surface; Fire dependent systems from 1 to 10 acres in size	Lower West Gulf Coastal Plain ecoregion in the southwest and west central portions of the state from Calcasieu north to Natchitoches and Winn Parishes
Interior Salt Flat	South Central Plains	Monotypic herbaceous area on flood-prone terraces adjacent to streams on soils with high levels of exchangeable sodium, high alkalinity, and a dense clay pan which restricts tree root penetration and water movement	Upper West Gulf Coastal Plain in northcentral and northwest Louisiana
Pond cypress Swamp/Blackgum Swamp	Mississippi Valley Loess Plains, Southern Coastal Plain, and Mississippi Alluvial Plain	Occupying the backwaters of swamps in areas removed from active stream channels with inundated or saturated soils on a nearly permanent basis	Confined to the lower Pearl River and adjoining north shore of Lake Pontchartrain and Lake Maurepas. Currently known in one site in Tangipahoa Parish
Live Oak Natural Levee Forest	Mississippi Alluvial Plain	Occurs 4 to 6 feet above sea level on natural levees and "islands" within marshes and swamps; similar to Coastal Live Oak-Hackberry forest, but has a greater species richness and diversity; sandy loams and clays Composed primarily of sandy loams and clays, with neutral pH and high organic matter content; serves as vital resting habitat for trans-gulf-migratory birds	Extreme southeastern Louisiana from Orleans and St. Bernard Parishes westward to St. Mary Parish
Macon Ridge Green Ash Pond	Mississippi Alluvial Plain and South Central Plains	Traditionally found within hardwood flatwood forests, these ponds occur in small, depressional upland areas with seepage from surrounding land and stormwater as their source of water; potential habitat for endangered pondberry	Restricted to northeast Louisiana, primarily on the Macon Ridge

Vegetative Community Type	USEPA Ecoregion(s)	Description	Distribution
Eastern Longleaf Pine Savannah	Southeastern Plains, Southern Coastal Plain, and Mississippi Alluvial Plain	Diverse, fire-maintained wetland dominated by herbaceous plants with sparsely distributed longleaf pine as the dominant overstory plan; occurs in poorly drained low areas that experience seasonal flooding; wet, very strongly acidic, nutrient poor, fine sandy loams and silt loams that are low in organic matter; commonly associated with mesic pine flatwoods in upland areas that slope down to forest streams or swamps	Northeast Louisiana
Western Saline Longleaf Pine Savannah	Western Gulf Coast Plains and South Central Plains	Diverse, fire-maintained wetland dominated by herbaceous plants with sparsely distributed longleaf pine as the dominant overstory plan; occurs in poorly drained low areas that experience seasonal flooding, and in non-wetland areas in the Western Gulf Coast Plain, occurs in “pimple mounds”; soils are saline, a western LA variant called Brimstone silt loam, and are wet, very strongly acidic, nutrient poor, fine sandy loams and silt loams that are low in organic matter	Lower West Gulf Coastal Plain ecoregion in the southwest and west central portions of the state

Source: (LDWF 2015b; LNHP 2009)

Table B-3. Essential Fish Habitat for Mid-Atlantic and South Atlantic Species of Louisiana

Common Name	Eggs	Larvae/YOY[133]	Juveniles	Adults
Albacore Tuna (highly migratory)	No EFH egg life stage.	No EFH defined.	Not present off the coast of Louisiana. Offshore on the U.S. east coast from north of Cape Hatteras to Cape Cod. Mid-east coast of Florida.	Offshore in Louisiana. Central Gulf of Mexico, mid-east coast of Florida, and Puerto Rico. Atlantic east coast from North Carolina, south of Cape Hatteras to Cape Cod.
Angel Shark (highly migratory)	No EFH egg life stage.	No EFH defined.	Localized areas off eastern Louisiana, and from Mississippi to the Florida Panhandle in the Gulf of Mexico. Atlantic east coast from Cape Lookout to the mid-coast of New Jersey. Offshore in Mississippi.	Localized areas off of eastern Louisiana, and from Mississippi to the Florida Panhandle in the Gulf of Mexico. Atlantic east coast from Cape Lookout to the mid-coast of New Jersey. Offshore in Mississippi.
Atlantic Bigeye Tuna	No EFH egg life stage.	No EFH egg life stage.	In the Gulf of Mexico south of Louisiana and Mississippi, off the southern west coast of Florida, and south of the Florida Keys; as well as in the Atlantic off the Florida east coast through South Carolina, and from North Carolina, south of Cape Hatteras, to Cape Cod. Puerto Rico and the Virgin Islands.	In the central Gulf of Mexico and the mid-east coast of Florida. Atlantic east coast from Cape Hatteras to Cape Cod.
Atlantic Bluefin Tuna (highly migratory)	In the Gulf of Mexico from the 100 meter depth contour to the exclusive economic	In the Gulf of Mexico from the 100 meter depth contour to the EEZ, continuing to	In waters off North Carolina, south of Cape	In pelagic waters of the central Gulf of Mexico and the mid-east coast of Florida. North Carolina from Cape Lookout to Cape Hatteras,

133 YOY (Young of the year): "All of the fish of a species that were born in the past year, from transformation to juvenile until January 1." (EPA 2015m)

Common Name	Eggs	Larvae/YOY[133]	Juveniles	Adults
	zone (EEZ), continuing to the mid-east coast of Florida.	the mid-east coast of Florida.	Hatteras, to Cape Cod (no EFH in Mississippi).	and New England from Connecticut to the mid-coast of Maine.
Atlantic Sharpnose Shark (highly migratory)	No EFH egg life stage.	Gulf of Mexico coastal areas from Texas through the Florida Keys. In the Atlantic from the mid-coast of Florida to Cape Hatteras.	Gulf of Mexico coastal areas from Texas through the Florida Keys. In the Atlantic from the mid-coast of Florida to Cape Hatteras, and a localized area off Delaware.	Gulf of Mexico from Texas through the Florida Keys out to a depth of 200 meters. In the Atlantic from the mid-coast of Florida to Maryland.
Atlantic Yellowfin Tuna (highly migratory)	In offshore waters in the Gulf of Mexico to the EEZ and portions of the Florida Straits.	In offshore waters in the Gulf of Mexico to the EEZ and portions of the Florida Straits.	In the central Gulf of Mexico from Florida Panhandle to southern Texas. Mid-east coast of Florida and Georgia to Cape Cod. South of Puerto Rico.	In the central Gulf of Mexico from the Florida Panhandle to southern Texas. Mid-east coast of Florida and Georgia to Cape Cod. South of the Virgin Islands.
Bigeye Thresher Shark (highly migratory)	No EFH egg life stage.	Offshore along the central Gulf of Mexico and off Key West, Florida. Offshore along the Atlantic east coast from southern to the mid-Florida coast, and from Georgia to southern New England.	Offshore along the central Gulf of Mexico and off Key West, Florida. Offshore along the Atlantic east coast from southern to the mid-Florida coast, and from Georgia to southern New England.	Offshore along the central Gulf of Mexico and off Key West, Florida. Offshore along the Atlantic east coast from southern to the mid-Florida coast, and from Georgia to southern New England.
Bignose Shark (highly migratory)	No EFH egg life stage.	No EFH defined.	Localized areas from Louisiana through the west coast Florida to the Florida Keys in the Gulf of Mexico, and the east coast of Florida and South Carolina in the Atlantic. Continuous offshore EFH from North Carolina to New Jersey.	Localized areas from Louisiana through the west coast Florida to the Florida Keys in the Gulf of Mexico, and the east coast of Florida and South Carolina in the Atlantic. Continuous offshore EFH from North Carolina to New Jersey.

Common Name	Eggs	Larvae/YOY[133]	Juveniles	Adults
Blacknose Shark (highly migratory)	No EFH defined.	No EFH in Louisiana.	Localized areas off Texas and western Louisiana, and coastal areas from Mississippi through the Florida Keys in the Gulf of Mexico. Atlantic east coast from the mid-coast of Florida to Cape Hatteras.	Localized areas off Texas and central Louisiana, and coastal areas from eastern Louisiana through the Florida Keys in the Gulf of Mexico Atlantic east coast from the mid-coast of Florida to Cape Hatteras.
Blacktip Shark (highly migratory)	No EFH egg life stage.	Coastal areas in the Gulf of Mexico from Texas through the Florida Keys. In Atlantic coastal areas from northern Florida through Georgia, and the mid-coast of South Carolina.	Coastal areas in the Gulf of Mexico from Texas through the Florida Keys. In Atlantic coastal areas localized off the southeast Florida coast and from West Palm Beach, Florida to Cape Hatteras.	Coastal areas in the Gulf of Mexico from Texas through the Florida Keys. In Atlantic coastal areas southeast Florida to Cape Hatteras.
Blue Marlin (highly migratory)	No EFH in Louisiana.	No EFH in Louisiana.	In the central Gulf of Mexico from southern Texas to the Florida Panhandle through the Florida Keys to southern Cape Cod.	In the central Gulf of Mexico, from southern Texas to the Florida Panhandle, through the Florida Keys to southern Cape Cod.
Bonnethead Shark (highly migratory)	No EFH egg life stage.	No EFH in Louisiana.	Offshore in Louisiana. Coastal areas in the Gulf of Mexico along Texas, and from eastern Mississippi through the Florida Keys. Atlantic east coast from the midcoast of Florida to South Carolina.	Offshore in Louisiana. Coastal areas in the Gulf of Mexico along Texas, and from eastern Mississippi through the Florida Keys. Atlantic east coast from the mid-coast of Florida to Cape Lookout.
Bull Shark (highly Migratory)	No EFH egg life stage.	Gulf of Mexico coastal areas along Texas, near the Mississippi River Delta in Louisiana, and localized areas off Mississippi, the Florida Panhandle, and west	Gulf of Mexico coastal areas along the Texas coast, eastern Louisiana to the Florida Panhandle, and the west coast of Florida through the Florida Keys.	Gulf of Mexico along the southern and mid-coast of Texas to western Louisiana, eastern Louisiana to the Florida Keys. East coast of Florida to South Carolina in the Atlantic.

Common Name	Eggs	Larvae/YOY[133]	Juveniles	Adults
		coast of Florida; as well as the Atlantic mid-east coast of Florida.	Atlantic coastal areas localized from the mid-east coast of Florida to South Carolina.	
Common Thresher Shark (highly migratory)	No EFH egg life stage.	Localized areas in the central Gulf of Mexico and Florida Keys. In the Atlantic, localized areas off the mid-east coast of Florida, Georgia, South Carolina, and the Gulf of Maine, and from North Carolina through Cape Cod.	Localized areas in the central Gulf of Mexico and Florida Keys. In the Atlantic, localized areas off the mid-east coast of Florida, Georgia, South Carolina, and the Gulf of Maine, and from North Carolina through Cape Cod.	Localized areas in the central Gulf of Mexico and Florida Keys. In the Atlantic, localized areas off the mid-east coast of Florida, Georgia, South Carolina, and the Gulf of Maine, and from North Carolina through Cape Cod.
Dusky Shark	No EFH egg life stage.	No EFH in Louisiana.	Localized areas in the central Gulf of Mexico, southern Texas, the Florida Panhandle, mid-west coast of Florida, and Florida Keys.	Localized areas in the central Gulf of Mexico, southern Texas, the Florida Panhandle, mid-west coast of Florida, and Florida Keys.
Finetooth Shark (highly migratory)	No EFH egg life stage.	Along the Gulf of Mexico coast of Texas, eastern Louisiana, Mississippi, Alabama, and the Florida Panhandle. Atlantic east coast along Georgia and South Carolina.	Localized coastal areas along southern Texas and Key West, Florida, and from eastern Louisiana through the Florida Panhandle in the Gulf of Mexico. Atlantic east coast from the mid-coast of Florida to Cape Hatteras.	Localized coastal areas along southern Texas and Key West, Florida, and from eastern Louisiana through the Florida Panhandle in the Gulf of Mexico. Atlantic east coast from the mid-coast of Florida to Cape Hatteras.
Great Hammerhead Shark (highly migratory)	No EFH defined.	Coastal areas throughout the west coast of Florida and scattered in the Gulf of Mexico from Alabama to Texas. Atlantic east coast from the Florida Keys to New Jersey.	Coastal areas throughout the west coast of Florida and scattered in the Gulf of Mexico from Alabama to Texas. Atlantic east coast from the Florida Keys to New Jersey.	Coastal areas throughout the west coast of Florida and scattered in the Gulf of Mexico from Alabama to Texas. Atlantic east coast from the Florida Keys to New Jersey.

Common Name	Eggs	Larvae/YOY[133]	Juveniles	Adults
Lemon Shark	No EFH defined.	No EFH for Louisiana.	Gulf of Mexico coastal areas along Texas, eastern Louisiana, and the Florida Panhandle through the Florida Keys. Coastal areas along the Atlantic east coast of Florida.	No EFH for Louisiana.
Longbill Spearfish (highly migratory)	No EFH designated.	No EFH designated.	In the central Gulf of Mexico through eastern Louisiana to the Florida Panhandle. In the Atlantic from Florida Keys to the mid-east coast of Florida and localized areas from northern Florida to Cape Cod, with concentrations from North Carolina to Delaware, and Puerto Rico and the U.S. Virgin Islands.	In the central Gulf of Mexico through eastern Louisiana to the Florida Panhandle. In the Atlantic from Florida Keys to the mid-east coast of Florida and localized areas from northern Florida to Cape Cod, with concentrations from North Carolina to Delaware, and Puerto Rico and the U.S. Virgin Islands.
Longfin Mako Shark (highly migratory)	No EFH egg life stage.	Offshore central Gulf of Mexico through the Florida Keys. In the Atlantic from southern Florida through South Carolina, off North Carolina, and Cape Hatteras to Cape Cod.	Offshore central Gulf of Mexico through the Florida Keys. In the Atlantic from southern Florida through South Carolina, off North Carolina, and Cape Hatteras to Cape Cod.	Offshore central Gulf of Mexico through the Florida Keys. In the Atlantic from southern Florida through South Carolina, off North Carolina, and Cape Hatteras to Cape Cod.
Oceanic Whitetip Shark	No EFH egg life stage.	Localized areas in the central Gulf of Mexico and Florida Keys. In the Atlantic in depths greater than 200 meters from Florida to southern New England.	Localized areas in the central Gulf of Mexico and Florida Keys. In the Atlantic in depths greater than 200 meters from Florida to southern New England.	Localized areas in the central Gulf of Mexico and Florida Keys. In the Atlantic in depths greater than 200 meters from Florida to southern New England.
Roundscale Spearfish (highly	No EFH designated.	No EFH designated.	Offshore in the central Gulf of Mexico from	Offshore in the central Gulf of Mexico from southern Texas to the Florida Panhandle.

Common Name	Eggs	Larvae/YOY[133]	Juveniles	Adults
migratory, similar to white marlin)			southern Texas to the Florida Panhandle. Florida Keys to mid-east coast of Florida, and Georgia to Cape Cod.	Florida Keys to the mid-east coast of Florida, and South Carolina to Cape Cod.
Sailfish	Off the southeast coast of Florida to Key West, FL, associated with waters of the Gulf Stream and Florida Straits from 5 mi offshore out to the EEZ boundary.	Off the southeast coast of Florida to Key West, FL, associated with waters of the Gulf Stream and Florida Straits from 5 mi offshore out to the EEZ boundary.	In the central Gulf of Mexico, and off southern Texas, Louisiana, and the Florida Panhandle. Atlantic east coast from the Florida Keys to mid-coast of South Carolina, the Outer Banks of North Carolina and Maryland. Eastern Puerto Rico and Virgin Islands.	In the central Gulf of Mexico, and off southern Texas, Louisiana, and the Florida Panhandle. Atlantic east coast from the Florida Keys to northern Florida, off Georgia, and Cape Hatteras. Also around the Virgin Islands.
Scalloped Hammerhead Shark (highly migratory)	No EFH egg life stage.	Coastal areas in the Gulf of Mexico from Texas to the southern west coast of Florida. Atlantic east coast from the mid-east coast of Florida to southern North Carolina.	Coastal areas in the Gulf of Mexico from the southern to mid-coast of Texas, eastern Louisiana to the southern west coast of Florida, and the Florida Keys. Offshore from the mid-coast of Texas to eastern Louisiana. Atlantic east coast of Florida through New Jersey.	Coastal areas in the Gulf of Mexico along the southern Texas coast, and eastern Louisiana through the Florida Keys. Offshore from southern Texas to eastern Louisiana.
Shortfin Mako Shark (highly migratory)	No EFH egg life stage.	Localized areas in the central Gulf of Mexico and the Florida Keys. In the Atlantic, localized areas off Florida, South Carolina, and Maine, and from Cape Lookout though southern New England.	Localized areas in the central Gulf of Mexico and the Florida Keys. In the Atlantic, localized areas off Florida, South Carolina, and Maine, and from Cape Lookout though southern New England.	Localized areas in the central Gulf of Mexico and the Florida Keys. In the Atlantic, localized areas off Florida, South Carolina, and Maine, and from Cape Lookout though southern New England.

Common Name	Eggs	Larvae/YOY[133]	Juveniles	Adults
Silky Shark (highly migratory)	No EFH egg life stage.	In the Gulf of Mexico from the southern coast of Texas across the central Gulf of Mexico, and from eastern Louisiana to the Florida Keys. Atlantic east coast from Florida to New Jersey, with localized areas in southern New England.	In the Gulf of Mexico from the southern coast of Texas across the central Gulf of Mexico, and from eastern Louisiana to the Florida Keys. Atlantic east coast from Florida to New Jersey, with localized areas in southern New England.	In the Gulf of Mexico from the southern coast of Texas across the central Gulf of Mexico, and from eastern Louisiana to the Florida Keys. Atlantic east coast from Florida to New Jersey, with localized areas in southern New England.
Skipjack Tuna (highly migratory)	In offshore waters in the Gulf of Mexico to the EEZ and portions of the Florida Straits.	In offshore waters in the Gulf of Mexico to the EEZ and portions of the Florida Straits.	Localized areas in the central Gulf of Mexico from Louisiana through the Florida Panhandle. Localized areas in the Atlantic off Georgia, South Carolina, and North Carolina to Maryland, and from Delaware to Cape Cod and the southern east coast of Florida through the Florida Keys.	In the central Gulf of Mexico, off of Texas through Florida. Localized areas in the Atlantic off South Carolina and the northern east coast of Florida, and from Cape Hatteras to Cape Cod and the southern east coast of Florida through the Florida Keys.
Smooth dogfish (highly migratory)	No EFH egg life stage.	Offshore areas within the Gulf of Mexico from Texas through Florida. In the Atlantic, nearshore and offshore areas from South Carolina north to Cape Cod and Georges Bank.	Offshore areas within the Gulf of Mexico from Texas through Florida. In the Atlantic, nearshore and offshore areas from South Carolina north to Cape Cod and Georges Bank.	Offshore areas within the Gulf of Mexico from Texas through Florida. In the Atlantic, nearshore and offshore areas from South Carolina north to Cape Cod and Georges Bank.
Spinner shark (highly migratory)	No EFH egg life stage.	Localized coastal areas in the Gulf of Mexico along Texas, eastern Louisiana, the Florida Panhandle, Florida west coast, and the Florida Keys; and in the Atlantic along the east coast of Florida to southern North Carolina.	Gulf of Mexico coastal areas from Texas to the Florida Panhandle, and the mid-west coast of Florida to the Florida Keys. Atlantic east coast of Florida through North Carolina.	Localized areas in the Gulf of Mexico off southern Texas, Louisiana through the Florida Panhandle, and from the mid-coast of Florida through the Florida Keys. In the Atlantic along the east coast of Florida, and localized areas from South Carolina to Virginia.

Common Name	Eggs	Larvae/YOY[133]	Juveniles	Adults
Swordfish (highly migratory)	From off Cape Hatteras, North Carolina extending south around peninsular Florida through the Gulf of Mexico to the U.S./Mexico border from the 200 m isobath to the EEZ boundary; associated with the Loop. Current boundaries in the Gulf and the western edge of the Gulf Stream in the Atlantic; also, all U.S. waters of the Caribbean from the 200 m isobath to the EEZ boundary.	From off Cape Hatteras, North Carolina extending south around peninsular Florida through the Gulf of Mexico to the U.S./Mexico border from the 200 m isobath to the EEZ boundary; associated with the Loop. Current boundaries in the Gulf and the western edge of the Gulf Stream in the Atlantic; also, all U.S. waters of the Caribbean from the 200 m isobath to the EEZ boundary.	In the central Gulf of Mexico from southern Texas through the Florida Keys and Atlantic east coast from south Florida to Cape Cod. Puerto Rico and the Virgin Islands.	In the central Gulf of Mexico from southern Texas to the Florida Panhandle and western Florida Keys. Atlantic east coast from southern Florida to the mid-east coast of Florida, and Georgia to Cape Cod. Puerto Rico and the Virgin Islands.
Tiger Shark (highly migratory)	No EFH designated.	Off Texas, western Louisiana, and the Florida Panhandle in the Gulf of Mexico. In the Atlantic from the mid-east coast of Florida to Virginia.	In the central Gulf of Mexico and off Texas and Louisiana, and from Mississippi through the Florida Keys. Atlantic east coast from Florida to New England.	In the Gulf of Mexico, from Texas to the west coast of Florida, and the Florida Keys. Atlantic east coast from Florida to southern New England.
Whale Shark	No EFH egg life stage.	Central Gulf of Mexico from Texas to the Florida Panhandle.	Central Gulf of Mexico from Texas to the Florida Panhandle.	Central Gulf of Mexico from Texas to the Florida Panhandle.

Common Name	Eggs	Larvae/YOY[133]	Juveniles	Adults
White Marlin (highly migratory)	No EFH designated.	No EFH designated.	In the central Gulf of Mexico from southern Texas to the Florida Panhandle. Florida Keys to mid-east coast of Florida, and Georgia to Cape Cod.	In the central Gulf of Mexico from southern Texas to the Florida Panhandle. Florida Keys to the mid-east coast of Florida, and South Carolina to Cape Cod.

Source: (NOAA 2009)

ACRONYMS

Acronym	Definition
AARC	Average Annual Rate of Change
ACHP	Advisory Council on Historic Preservation
ACS	American Community Survey
AGL	Above Ground Level
AIM	Aeronautical Information Manual
AIRFA	American Indian Religious Freedom Act
AML	Abandoned Mine Lands
APA	Adirondack Park Agency
APE	Area of Potential Effect
AQCR	Air Quality Control Region
ARPA	Archaeological Resources Protection Act
ATC	Air Traffic Control
ATO	Air Traffic Organization
ATSDR	Agency for Toxic Substances and Disease Registry
BGEPA	Bald and Golden Eagle Protection Act
BLM	Bureau of Land Management
BLS	Bureau of Labor Statistics
BMP	Best Management Practice
BNSF	Burlington Northern Santa Fe
BTR	Baton Rouge Metropolitan Airport
CAA	Clean Air Act
CBR	Center for Bioenvironmental Research
CCMP	Comprehensive Conservation Management Plan
CCR	Consumer Confidence Reports
CDC	Centers for Disease Control and Prevention
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFA	Controlled Firing Area
CFR	Code of Federal Regulations
CGP	Construction General Permit
CH_4	Methane
CIMC	Cleanups In My Community
CIO	Chief Information Officer
CO	Carbon Monoxide
CO_2	Carbon Dioxide
COLT	Cell on Light Truck
COW	Cell on Wheels
CPRA	Coastal Protection and Restoration Authority of Louisiana

Acronym	Definition
CRS	Community Rating System
CSC	Connecticut Siting Council
CWA	Clean Water Act
CWCS	Comprehensive Wildlife Conservation Strategy
CWPPRA	Coastal Wetlands Planning, Protection, and Restoration Act
DEQ	Louisiana Department of Environmental Quality
DHH	Louisiana Department of Health and Hospitals
DHP	Louisiana Division of Historic Preservation
DNR	Louisiana Department of Natural Resources
DoD	Department of Defense
DOE	Department of Energy
DOTD	Department of Transportation and Development
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EIA	Energy Information Administration
EMR	electromagnetic radiation
EMS	Emergency Medical Services
EO	Executive Order
EPCRA	Emergency Planning and Community Right to Know Act
ESA	Endangered Species Act
EVR	EVR-Wood Treating/Evangeline Refining Company
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulation
FCC	Federal Communications Commission
FEMA	Federal Emergency Management Agency
FGDC	Federal Geographic Data Committee
FHWA	Federal Highway Administration
FL	Flight Level
FLM	Federal Land Manager
FR	Federal Register
FSDO	Flight Standards District Office
FSS	Flight Service Station
FWC	Florida Fish and Wildlife Conservation Commission
GAO	Government Accountability Office
GAP	Gap Analysis Program
GED	General Educational Development/Diploma
GHG	Greenhouse Gas
GPO	U.S. Government Publishing Office
GWP	Global Warming Potential
HAP	Hazardous Air Pollutants

Acronym	Definition
HAPC	Habitat Areas of Particular Concern
HASP	Health and Safety Plans
HHRA	Human Health Risk Assessment
IBA	Important Bird Area
IFR	Instrument Flight Rules
IP	Internet Protocol
IPCC	Intergovernmental Panel on Climate Change
JEINC	Johnston Enterprises, Inc.
LA	Louisiana
LAAAQS	Louisiana Ambient Air Quality Standards
LAC	Louisiana Administrative Code
LAISC	Louisiana Aquatic Invasive Species Council
LBS	Locations-Based Services
LDWF	Louisiana Department of Wildlife and Fisheries
LID	low impact development
LLC	Limited Liability Company
LMR	Land Mobile Radio
LNHP	Louisiana Natural Heritage Program
LOHIS	Louisiana Occupational Health and Injury Surveillance Program
LOOP	Louisiana Offshore Oil Port
LPDES	Louisiana Pollutant Discharge Elimination System
LPSC	Louisiana Public Service Commission
LRR	Land Resource Regions
LRS	Louisiana Revised Statute
LSU	Louisiana State University
LTE	Long Term Evolution
LWIN	Louisiana Wireless Information Network
MBTA	Migratory Bird Treaty Act
MHI	Median Household Income
MHz	Megahertz
MLRA	Major Land Resource Areas
MMPA	Marine Mammal Protection Act
MMT	Million Metric Tonnes
MOA	Military Operations Area
MSFCMA	Magnuson Stevens Fishery Conservation and Management Act
MSL	Mean Sea Level
MSY	Louis Armstrong New Orleans International Airport
MT	Metric Ton
MTR	Military Training Route
MYA	Million Years Ago

Acronym	Definition
N_2O	Nitrous Oxide
NA	Not Applicable
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act
NAICS	North American Industry Classification System
NAS	National Airspace System
NASAO	National Association of State Aviation Officials
NCA	National Climate Assessment
NCED	National Conservation Easement Database
NEP	National Estuary Program
NEPA	National Environmental Policy Act
NFIP	National Flood Insurance Program
NHA	National Heritage Area
NHL	National Historic Landmark
NHPA	National Historic Preservation Act
NIST	National Institute of Standards and Technology
NM	Nautical Miles
NO_2	Nitrogen Dioxide
NOAA	National Oceanic and Atmospheric Administration
NOTAM	Notices to Airmen
NO_X	Nitrogen Oxides
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NPS	National Park Service
NPSBN	Nationwide Public Safety Broadband Network
NRC	National Response Center
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSA	National Security Areas
NTFI	National Task Force on Interoperability
NTIA	National Telecommunications and Information Administration
NWI	National Wetlands Inventory
NWR	National Wildlife Refuge
NWS	National Weather Service
OE/AAA	Obstruction Evaluation and Airport Airspace Analysis
OSHA	Occupational Safety and Health Administration
OTR	Ozone Transport Region
PEIS	Programmatic Environmental Impact Statement
PGA	Peak Ground Acceleration
PM	Particulate Matter

Acronym	Definition
POP	Point of Presence
POW	prisoner of war
PPE	Personal Protective Equipment
PSAP	Public Safety Answering Point
PSCR	Public Safety Communications Research
PSD	Prevention of Significant Deterioration
RCRA	Resource Conservation and Recovery Act
RF	Radio Frequency
ROW	Right-of-way
RS	Revised Statute
SAA	Sense and Avoid
SAIPE	Small Area Income and Poverty Estimates
SASP	State Aviation System Plan
SCEC	State Climate Extremes Committee
SDS	Safety Data Sheets
SDWA	Safe Drinking Water Act
SDWP	Safe Drinking Water Program
SEET	Section of Environmental Epidemiology and Toxicology
SF_6	Sulfur Hexafluoride
SGCN	Species of Greatest Conservation Need
SHPO	State Historic Preservation Office
SIEC	Statewide Interoperability Executive Committee
SIP	State Implementation Plan
SO_2	Sulfur Dioxide
SOC	Standard Occupational Classification
SOP	Standard Operating Procedure
SOW	Site on Wheels
SO_X	Sulfur Oxides
SPL	Sound Pressure Level
SSA	sole source aquifer
SUA	Special Use Airspace
SWPPP	Stormwater Pollution Prevention Plan
TDMA	Time Division Multiple Access
TFR	Temporary Flight Restriction
TMDL	Total Maximum Daily Load
TPY	Tons per year
TRI	Toxics Release Inventory
TSCA	Toxic Substances Control Act
TWA	Time Weighted Average
U.S.	United States

Acronym	Definition
U.S.C.	U.S. Code
UA	Unmanned Aircraft
UAS	Unmanned Aerial Systems
UHF	Ultra High Frequency
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USDOC	Department of Commerce
USDOT	U.S. Department of Transportation
USEPA	U.S. Environmental Protection Agency
USFA	U.S. Fire Administration
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGCRP	U.S. Global Change Research Program
USGS	U.S. Geological Survey
UVA	University of Virginia
VFR	Visual Flight Rules
VHF	Very High Frequency
VOC	Volatile Organic Compound
VRP	Voluntary Remediation Program
WAP	Wildlife Action Plan
WCS	Wetlands Classification Standard
WMA	Wildlife Management Area
WONDER	Centers for Disease Control and Prevention Wide-ranging Online Data for Epidemiologic Research
WWI	World War I
WWII	World War II
YOY	Young of the year

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