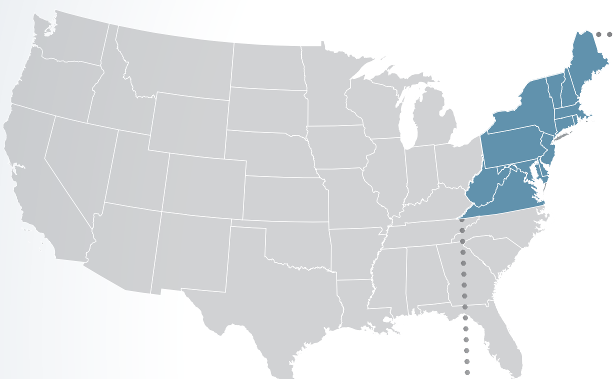
Nationwide Public Safety Broadband Network

Draft Programmatic Environmental Impact Statement for the Eastern United States

VOLUME 7 - CHAPTER 9



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First Responder Network Authority

FirstNet®

Nationwide Public Safety Broadband Network

Draft Programmatic Environmental Impact Statement for the Eastern United States

VOLUME 7 - CHAPTER 9

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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
U.S. Department of Homeland Security

April 2016

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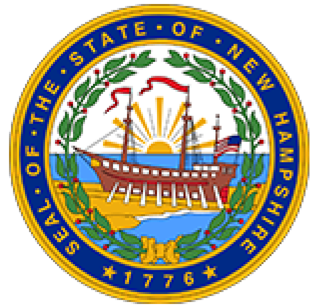
9. NEW HAMPSHIRE



New Hampshire was originally settled in 1623 by Englishmen looking to establish a fishing colony. The colony was the first to declare independence from Britain and the ninth to ratify the Constitution and become a state (State of New Hampshire, 2012). New Hampshire is located in the northeastern United States and is bordered by Canada to the north, Vermont to the west, Maine and the Atlantic Ocean to the east, and Massachusetts to the south. This chapter provides details about the existing environment of New Hampshire as it relates to the Proposed Action.

General facts about New Hampshire are provided below.

- **State Nickname**: The Granite State
- **Land Area:** 8,953 square miles; **U.S. Rank**: 46 (U.S. Census Bureau, 2015a)
- **Capital:** Concord
- **Counties:** 10 (U.S. Census Bureau, 2015b)
- **Estimated Population:** Over 1.3 million people; **U.S. Rank:** 40 (U.S. Census Bureau, 2015a)
- **Most Populated Cites:** Manchester, Nashua, and Concord (U.S. Census Bureau, 2015b)
- **Main Rivers:** Connecticut River, Androscoggin River, Merrimack River, Saco River, and Piscataqua River
- **Bordering Waterbodies:** Atlantic Ocean and Connecticut River
- **Mountain Ranges:** White Mountains, and a portion of the Appalachian Mountains
- **Highest Point:** Mt. Washington (6,288 feet) (USGS, 2015a)

9.1. AFFECTED ENVIRONMENT

9.1.1. Infrastructure

9.1.1.1. Definition of the Resource

This section provides information on key New Hampshire 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 9.1.1.3 provides an overview of the traffic and transportation infrastructure in New Hampshire, including road and rail networks, harbors and ports, and airport facilities. New Hampshire public safety infrastructure could include any infrastructure utilized by a public safety entity[1] as defined in 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 New Hampshire are presented in more detail in Section 9.1.1.4. Section 9.1.1.5 describes specific public safety communications infrastructure and commercial telecommunications infrastructure in New Hampshire. An overview of utilities in New Hampshire, such as power, water, and sewer, are presented in Section 9.1.1.6.

9.1.1.2. Specific Regulatory Considerations

Multiple New Hampshire laws and regulations pertain to the state's public utility and transportation infrastructure and its public safety community. Table 9.1.1-1 identifies the relevant laws and regulations related to infrastructure. Appendix C, Environmental Laws and Regulations, identifies applicable federal laws and regulations.

[1] The term "public safety entity" means an entity that provides public safety services. (7 U.S. Code [U.S.C.] § 140126))

Table 9.1.1-1: Relevant New Hampshire Infrastructure Laws and Regulations

State Laws and Regulations	Regulatory Agency	Applicability
New Hampshire Statutes: Title XII: Public Safety and Welfare; New Hampshire Code of Administrative Rules: Chapter Pln 100, Organization (Office Energy and Planning); Chapter Pln 400, Requirements for Description of the Surface Water Resource for Local Water Resource Management and Protection Plans; Chapter Pln 500, Local Water Resource Management and Protection Plan Requirements for Both Surface and the Groundwater Resources	Office of Energy and Planning (Governor's Office); New Hampshire Site Evaluation Committee	Encourages smart growth and preserves farmland, open space land, and traditional village centers; prepares state development plan as well as 10-year energy strategy to ensure the reliability, safety, fuel diversity, and affordability of energy sources while protecting natural, historic, and aesthetic resources; encourages local and renewable energy resources; issues facility certificates and oversees the planning, siting, construction, and operation of energy facilities
	Department of Resources and Economic Development (DRED); Department of Environmental Services (DES)	Oversees environmental protection, natural resources, and growth management; promotes continued multiple use management of White Mountain National Forest land; issues mining permits and ensures compliance; governs water supply, air and water pollution, and waste disposal; handles flood control and manages state-owned dams; governs wetlands and protected shorelands; regulates solid and hazardous waste; protects, propagates, and preserves fish, game, and wildlife resources; conserves, protects, and manages wildlife populations and habitats and marine resources; enforces fish and game laws; acquires, develops, and maintains public access to lands and waters for recreational use; protects threatened or endangered species; maintains, protects, conserves, and rehabilitates forests
	DRED, Division of Parks and Recreation; Department of Cultural Resources; Division of Historical Resources	Manages state's historic sites collaboratively with the Division of Historical Resources; develops sustainable funding mechanisms and maintains existing historical sites; promotes preservation and administers the state historic preservation program

State Laws and Regulations	Regulatory Agency	Applicability
Title I, The State and Its Government; Title XII: Public Safety and Welfare; Title XXI: Motor Vehicles; Title XXII: Navigation; Harbors; Coast Survey; New Hampshire Code of Administrative Rules: Chapter Fire 100, Organizational Rules (Fire Standards and Training); Chapter Fire 400, Minimum Standards for Training; Chapter Fire 600, Mandatory Standards and Notification Requirements for Full-Time Career Fire Personnel; Chapter Fire 700, Fire Fighter Mandatory Standards	Department of Safety; Division of Homeland Security and Emergency Management; Division of State Police; Division of Emergency Services and Communications; Division of Fire Safety; Division of Fire Standards and Training and Emergency Medical Services; Division of Motor Vehicles; Advisory Council on Emergency Preparedness and Security; State Advisory Board of Fire Control; Emergency Medical and Trauma Services Coordinating Board; Enhanced 9-1-1 Commission	Enforces criminal law; ensures compliance with laws pertaining to motor vehicles, drivers, toll roads, and emergency medical services; promotes vehicle and highway safety; assures fire, building, and equipment safety; operates firefighter training programs; certifies private firefighting units; oversees homeland security, emergency management, enhanced 9-1-1, and emergency telecommunications services; supervises the planning, preparation, exercise, response to, and mitigation of terrorist threats and incidents and natural and human-caused disasters; coordinates with other agencies and the federal Department of Homeland Security in response to terrorist events, disasters, and wide-scale threats to public safety and public health; coordinates emergency medical and adult and pediatric trauma services among local, county, and state agencies including provisions for mass casualty incidents; licenses emergency medical care providers, emergency medical service units, emergency medical service instructor/coordinators, emergency medical service training agencies, emergency medical services dispatchers, and emergency medical service vehicles; regulates the safe transportation of hazardous materials
Title I, The State and Its Government; Title XX: Transportation; Title XXII: Navigation; Harbors; Coast Survey; Title XXXIV: Public Utilities; Title XXXIX, Aeronautics; New Hampshire Code of Administrative Rules: Chapter Tra 100, Organizational Rules (DOT); Chapter Tra 300, Permits; Chapter Tra 500, Construction Aid and Relocation Services; Chapter Tra 900, Aircraft, Commercial Aviation Operator and Aircraft Dealer Registration	NHDOT; New Hampshire Rail Transit Authority; Cooperative Alliance for Seacoast Transportation; Greater Derry-Salem Cooperative Alliance for Regional Transportation; Pease Development Authority; Division of Ports and Harbors Advisory Council	Develops and maintains the state transportation network including highways, railroads, air service, mass transit, and other modes of transportation; constructs, maintains, and operates airport facilities, passenger and freight terminals, control towers, piers, navigation aids, and all related facilities; governs air navigation facilities available for public use; regulates tall structures including towers in the vicinity of airports; establishes and manages passenger rail service; promotes redevelopment of former Pease Air Force Base and the ports of New Hampshire to ensure they remain working ports; appoints harbor masters; secures the services of port terminal operating firms; sets and collects fees for mooring and state-owned slip permits; oversees state-owned commercial piers and associated facilities

State Laws and Regulations	Regulatory Agency	Applicability
Title I, The State and Its Government; Title XXXIV: Public Utilities; New Hampshire Code of Administrative Rules: Chapter Puc 100, Organizational Rules (Public Utilities Commission); Chapter Puc 300, Rules for Electric Service; Chapter Puc 400, Rules for Telephone Utilities; Chapter Puc 500, Rules for Gas Service; Chapter Puc 600, Rules for Water Service; Chapter Puc 700, Rules for Sewer Utilities; Chapter Puc 900, Net Metering for Customer-Owned Renewable Energy Generation Resources of 1,000 Kilowatts or Less; Chapter Puc 1100, Rules for Steam Utilities; Chapter Puc 1200, Uniform Administration of Utility Customer Relations; Chapter Puc 1300, Utility Pole Attachments; Chapter Puc 1400, Rules for Pipeline Public Utilities[d]	Public Utilities Commission; Department of Safety, Division of Motor Vehicles; New Hampshire Department of Transportation (NHDOT); Telecommunications Planning and Development Advisory Committee	Regulates firms involved in the conveyance of telephone or telegraph messages (except cellular mobile and voice over Internet Protocol (IP); in furnishing light, heat, sewage disposal, power, or water to the public; in generating, transmitting, or selling electricity; in owning or operating any pipeline including pumping stations, storage depots, and other facilities for the transportation, distribution, or sale of gas, crude petroleum, refined petroleum products or combinations; or in owning or operating any railroad or motor carrier for common carriage of passengers or freight; oversees all bridges; assures the provision of safe and reliable service; oversees public utilities' capitalization, franchises, investments, lines and property; regulates the safety, vegetation management, emergency response, and storm restoration requirements for poles, conduits, ducts, pipes, pole attachments, wires, cables, and related plant and equipment located within public rights-of-way and on state lands and waterbodies
Title I, The State and Its Government; Title L: Water Management and Protection; New Hampshire Code of Administrative Rules: Chapter We 100, Organizational Rules (Well Water Board); Chapter We 300, License Application Procedure and Requirements; Chapter We 400, Continued Status; Chapter We 600, Standards For the Construction, Maintenance and Abandonment of Wells	DES, Division of Water; Well Water Board; Office of Energy and Planning (Governor's Office)	Oversees water resources including the conservation and distribution of water, the regulation of the flow of rivers and streams, and the development and promotion of hydro-energy resources; operates and otherwise issues permits for public water systems; regulates the installation of pipes, fixtures, and other apparatus which are used to connect water systems and users; governs facilities used for storing surplus water and for controlling and distributing surplus water

9.1.1.3. Transportation

This section describes the traffic and transportation infrastructure in New Hampshire, including specific information related to the road networks, airport facilities, rail networks, harbors, and ports (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 can range from multilane road networks with asphalt surfaces to unpaved gravel or private roads. The information regarding existing transportation systems in

New Hampshire are based on a review of maps, aerial photography, and federal and state data sources.

The New Hampshire Department of Transportation (NHDOT) has jurisdiction over freeways and major roads, airports, railroads, mass transit, and ports in the state; local counties have jurisdiction for local streets and roads. NHDOT's mission is "transportation excellence enhancing the quality of life in New Hampshire;" the agency's purpose is to "provide safe and secure mobility and travel options for all of the state's residents, visitors, and goods movement, through a transportation system and services that are well maintained, efficient, reliable, and provide seamless interstate and intrastate connectivity" (NHDOT, 2015a).

New Hampshire has an extensive and complex transportation system across the entire state. The state's transportation network consists of:

- Over 16,000 miles of highways and 3,789 bridges (NHDOT, 2012);
- 459 miles of rail network that includes passenger rail and freight (NHDOT, 2015b);
- 142 aviation facilities that includes both public and private airports (FAA, 2015a);
- 9 harbors (U.S. Harbors, 2015); and
- 1 major port that includes both public and private facilities (DPH, 2015a).

Road Networks

As identified in Figure 9.1.1-1, the major urban centers of the state are located in the south-central and southeast, in the cities of Concord, Manchester, Nashua, and Portsmouth. New Hampshire has three major interstates connecting its major metropolitan areas to one another, as well as to other states. Table 9.1.1-2 lists the interstates and their start/end points in New Hampshire. 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 (USDOT, 2015a). Travel to local towns is conducted mainly via state and county routes.

Table 9.1.1-2: New Hampshire Interstates

Interstate	Southern or western terminus in NH	Northern or eastern terminus in NH
I-89	I-93 in Bow	VT line at West Lebanon
I-93	MA line at Salem	VT line at Littleton
I-95	MA line at Seabrook	ME line at Portsmouth

In addition to the Interstate system, New Hampshire has both National Scenic Byways and State Scenic Byways. Both National and State Scenic Byways are roads that are recognized for one or more archaeological, cultural, historic, natural, recreational, and scenic qualities. Figure 9.1.1-1 illustrates the major roadways in New Hampshire. National Scenic Byways are roads with nationwide interest; these byways are designated and managed by the U.S. Department of Transportation's (DOT) Federal Highway Administration (FHA). New Hampshire has three National Scenic Byways: the Connecticut River Byway, Kancamagus Scenic Byway, and White Mountain Trail (FHA, 2015b). Section 9.1.8, Visual Resources, discusses the National and State Scenic Byways found in New Hampshire from an aesthetic perspective.

Airports

Air service to the state is provided by New Hampshire's largest airport, Manchester-Boston Regional Airport (MHT), and the nearby major airport of Logan International Airport, in Boston, Massachusetts. In 2014, MHT served 2,095,674 passengers and transported 159,371,572 pounds of cargo with approximately 51,000 operations annually (Figure 9.1.1-1) (Manchester-Boston Regional Airport, 2015) (FAA, 2015b). Section 9.1.7, Land Use, Airspace, and Recreation, provides greater detail on airports and airspace in New Hampshire.

Rail Networks

New Hampshire's rail network that includes passenger rail (Amtrak) and freight rail. Figure 9.1.1-1 illustrates the major rail lines in New Hampshire. Amtrak runs two lines through New Hampshire. The Downeaster line runs between Brunswick, ME, and Boston, MA in about 3.5 hours. The Vermonter line runs between St. Albans, VT and Washington, DC in almost 14 hours (Amtrak, 2015). Amtrak serves over 500,000 passengers in New Hampshire annually, with 200,000 of those passengers starting or ending their trips in the state (NHDOT, 2012). Table 9.1.1-3 provides a complete list of Amtrak lines that run through New Hampshire.

Table 9.1.1-3: Amtrak Train Routes Serving New Hampshire

Route	Starting Point	Ending Point	Length of Trip	Cities Served in New Hampshire
Downeaster	Brunswick, ME	Boston, MA	3 hours 25 minutes	Dover, Durham, Exeter
Vermonter	St. Albans, VT	Washington, DC	13 hours 45 minutes	Claremont

Source: (Amtrak, 2015)

Commuter rail service to Boston is provided by the Massachusetts Bay Transportation Authority. Even though the Massachusetts Bay Transportation Authority does not run a line into New Hampshire, commuters travel from New Hampshire into northern Massachusetts to catch the commuter train to Boston. The Massachusetts Bay Transportation Authority stations closest to New Hampshire are Newburyport, Lawrence, Haverhill, and Lowell (NHDOT, 2011). The New Hampshire Rail Transit Authority was created in 2007 to oversee the development of commuter rail in New Hampshire (NHDOT, 2015d). The Authority's strategic plan outlines activities to develop passenger rail activities for the state (NHDOT, 2015d).

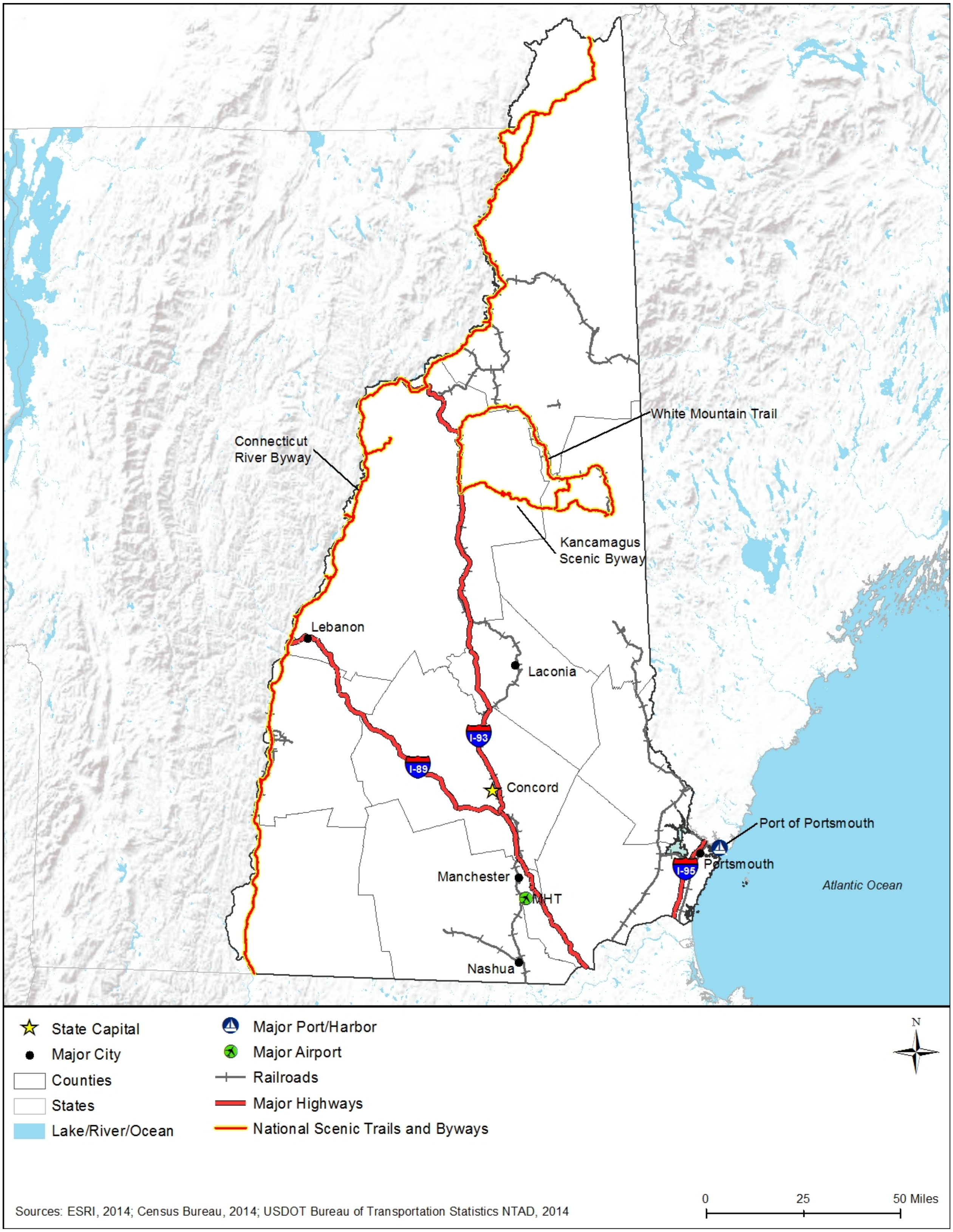


Figure 9.1.1-1: New Hampshire Transportation Networks

Of the 459 miles of active railroad in New Hampshire, the state owns over 200 miles of tracks (NHDOT, 2015b). The state hosts several freight railroads: Claremont-Concord Railroad, Green Mountain Railroad, Guilford Rail Service, New England Central Railroad, and St. Lawrence & Atlantic (NHDOT, 2015e). In 2009, 37.4 million tons of freight, excluding through traffic, were shipped in New Hampshire (NHDOT, 2012). Products shipped by freight rail to or from the state include coal and petroleum products, sand, gravel, aggregate, electronics, textiles, food products, machinery, plastics, and chemical products (NHDOT, 2012).

Harbors and Ports

The majority of the state is largely landlocked, with the exception of the southeast corner of the state which borders the Atlantic Ocean. New Hampshire's State Statute RSA 12-G: 23, I (a) states that the "The Division of Ports and Harbors (DPH), of the Pease Development Authority, shall 'plan for the maintenance and development of the ports, harbors, and navigable tidal rivers of the State of New Hampshire…within the jurisdiction of the state…" (DPH, 2015a). This gives the DPH jurisdiction over the New Hampshire's single trading port, the Port of Portsmouth, which sits on the Piscataqua River (Figure 9.1.1-1). The DPH also oversees accommodations for fishing and boating on the Piscataqua River and operates fishing charter boats from three locations in the state: Hampton Harbor in Hampton, NH; Rye Harbor in Rye, NH; and the Market Street Marine Terminal-Burge Wharf in Portsmouth, NH. Facilities in Hampton and Rye Harbor also offer whale watching and fishing vessels (DPH, 2015a) (DPH, 2015b). The Market Street Marine Terminal, a public terminal, offers more than 50,000 sq. ft. of storage space and railway access (DPH, 2015c). In 2013, the Port of Portsmouth brought in $536 million worth of trade goods, weighing 1,736 tons (U.S. Census Bureau, 2015c).

9.1.1.4. Public Safety Services

New Hampshire public safety services generally consist of public safety infrastructure and first responder personnel throughout the state. The general abundance and distribution of public safety services may roughly follow key state demographic indicators. Table 9.1.1-4 presents New Hampshire's key demographics including population; land area; population density; and number of counties, cities/towns, and municipal governments. More information about these demographics is presented in Section 9.1.9, Socioeconomics.

Table 9.1.1-4: Key New Hampshire Indicators

New Hampshire Indicators	
Population (2014)	1,326,813
Land Area (square miles) (2010)	8,952.65
Population Density (persons per sq. mile) (2010)	147.0
Municipal Governments (2013)	13

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

Table 9.1.1-5 presents New Hampshire's public safety infrastructure, including fire and police stations. Table 9.1.1-6 identifies first responder personnel including dispatch, fire and rescue, law enforcement, and emergency medical personnel in the state.

Table 9.1.1-5: Public Safety Infrastructure in New Hampshire by Type

Infrastructure Type	Number
Fire and Rescue Stations	526
Law Enforcement Agencies	197
Fire Departments	314

Source: (National Fire Department Census, 2015)

Table 9.1.1-6: First Responder Personnel in New Hampshire by Type

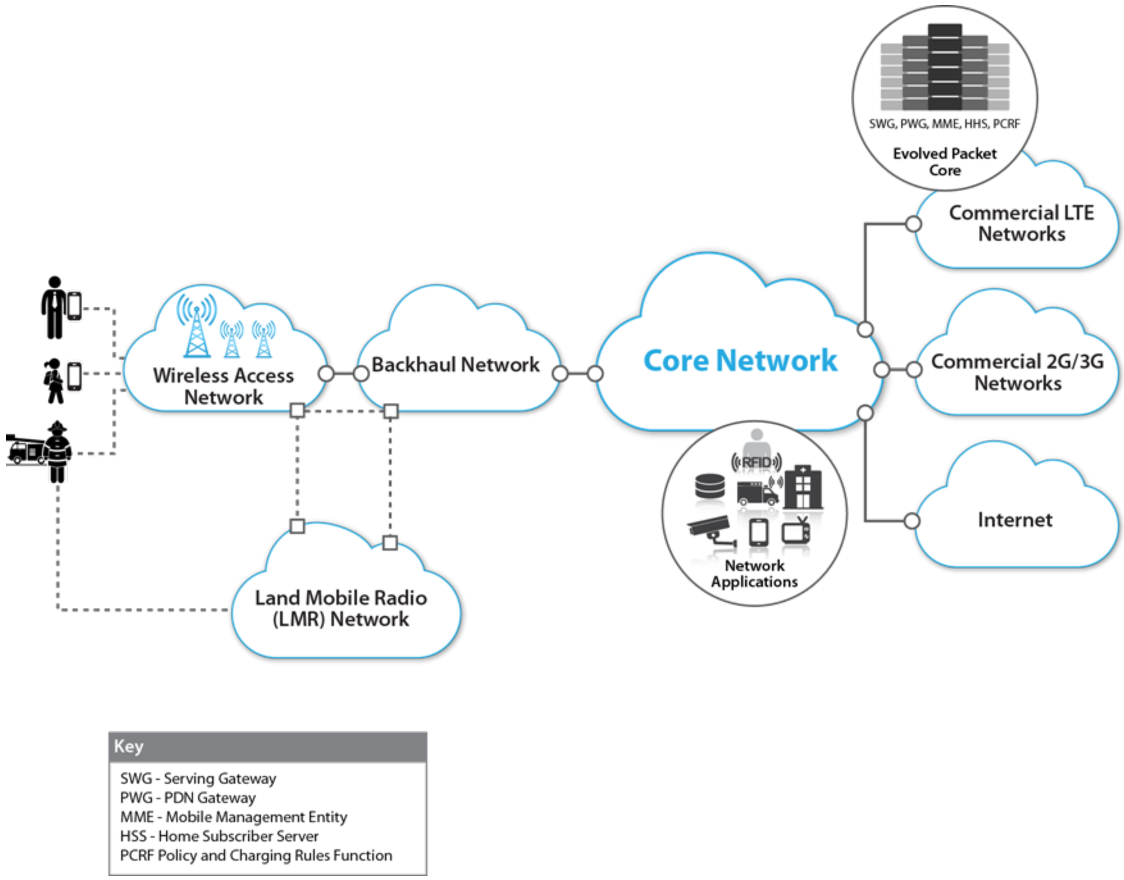
First Responder Personnel	Number
Police, Fire and Ambulance Dispatchers	680
First and Rescue Personnel	2,965
Law Enforcement Personnel	8,063
Emergency Medical Technicians and Paramedics	970

Sources: (National Fire Department Census, 2015) (BLS, 2015a)

9.1.1.5. Telecommunications Resources

Telecommunication resources in New Hampshire can be divided into two primary categories: specific public safety communications infrastructure and commercial telecommunications infrastructure (FCC, 2015a) (BLS, 2016). There is no central repository of information for either category; therefore, the following information and data are combined from a variety of sources, as referenced.

In general, the deployment of telecommunications resources in New Hampshire is widespread and similar to other states in the U.S. 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 9.1.1-2 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)



Prepared by: Booz Allen Hamilton

Figure 9.1.1-2: Wireless Network Configuration

Public Safety Communications

In order 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, including jurisdictional challenges, funding challenges, the pace of technology evolution, and communication interoperability. 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 U.S. and at the state level, including in New Hampshire.

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 into a nationwide public safety LTE broadband network, the U.S. Department of Commerce (DOC) Public Safety Communications Research (PSCR), 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 (PSCR, 2015).

Public safety network communications in New Hampshire reflect a combination of older Very High Frequency (VHF)[2] and Ultra High Frequency (UHF)[3] analog[4] radios operating across multiple frequency bands and 800 MHz Project-25 (P-25)[5] digital[6] wireless radios and infrastructure.

In 2009, the University System of New Hampshire received a Broadband Technologies Opportunity Program (BTOP) grant which funded the statewide Network New Hampshire Now project, a fiber optic middle mile/last mile and microwave infrastructure project. The microwave infrastructure portion of the project, New Hampshire SafeNet Public Safety Microwave Network (NHSafeNet), provided tower connectivity for the New Hampshire Department of Safety, the NHDOT, other state agencies, the New Hampshire National Guard, and New Hampshire Public Television. Figure 9.1.1-3 presents a map of the Network New Hampshire microwave tower locations. NHSafeNet covers 3,800 square miles (Network New Hampshire Now, 2015). The BTOP grant project, completed in 2013, resulted in improved connectivity and higher speeds to 67 Public Safety Community Anchor Institutions (CAIs) in New Hampshire. The NHSafeNet microwave network also resulted in a consolidation of the twenty legacy microwave network sites to nine microwave higher capacity sites with greater bandwidth capacity. The nine NHSafeNet microwave towers are shown in Figure 9.1.1-3 (Network New Hampshire Now, 2015). Towers range in height from 50 to 180 feet with the majority being 180 feet high.

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[2] VHF band covers frequencies ranging from 30 MHz to 300 MHz (NTIA, 2005)

[3] UHF band covers frequencies ranging from 300 MHz to 3000 MHz (NTIA, 2005)

[4] Analog networks are those based on circuit-switching, which establishes a connection and then maintains it through the whole communication. Although now digitized, the nation's original telephone system is an example of an analog network.

[5] Project-25 (P-25) is a suite of standards for digital radio communications for use by federal, state, and local public safety agencies in North America to enable them to communicate with other agencies and mutual aid response teams in emergencies.

[6] Digital networks are those that allow for simultaneous digital transmission of voice, data, video, and other network services over the traditional public-switched telephone network, or over new 3G, 4G, or LTE wireless networks.

In New Hampshire, the Department of Safety is the agency which oversees the management of NHSafeNet; the New Hampshire State Police is a unit within the DOS.

Public Safety Networks

The New Hampshire State Police used Statewide Mutual Aid, a combination of Frequency Modulation (FM) VHF networks, for Law Talk and Interoperability, and digital 800 MHz networks for statewide talk and aircraft communications. At the county level, 800 MHz is also used for dispatch/patrol needs for the six geographically segmented State Police regions in New Hampshire (Radio Reference.com, 2015a). Statewide fire tactical communication needs, as well as Emergency Medical Services (EMS) ambulance to hospital, dispatch, and mutual aid communications, are supported in the 155 MHz VHF frequency band.

The three primary statewide public safety networks are LawNet, FireNet, and EMS Net supported in the 800 MHz frequency with the digital Association of Public Safety Communications Officials (APCO)-25 system to provide both intra- and inter-agency communications. These networks interconnect with the 2013 NHSafeNet microwave tower infrastructure as described above and presented in Figure 9.1.1-3 (Radio Reference.com, 2015a).

Table 9.1.1-7 presents the NHSafeNet microwave tower locations from north to south across New Hampshire with corresponding heights (Network New Hampshire Now, 2015).

Table 9.1.1-7: NHSafeNet Microwave Tower Locations and Heights

Tower Location	Height (Feet)
Holden Hill	180
Mt. Washington	50
Cannon Mtn.	50
Mt. Belknap	180
Oak Hill	160
Mt. Kearsarge	180
Concord	180
Pitcher Mtn.	60
Hyland Hill	180

Source: (Network New Hampshire Now, 2015)

The microwave network has four microwave to fiber interconnection points at Littleton, Manchester, Durham, and Derry Hill.

Figure 9.1.1-3 presents the location of NHDOT fiber and Network New Hampshire Now fiber network in relationship to the location of the NHSafeNet microwave network (Network New Hampshire Now, 2015).

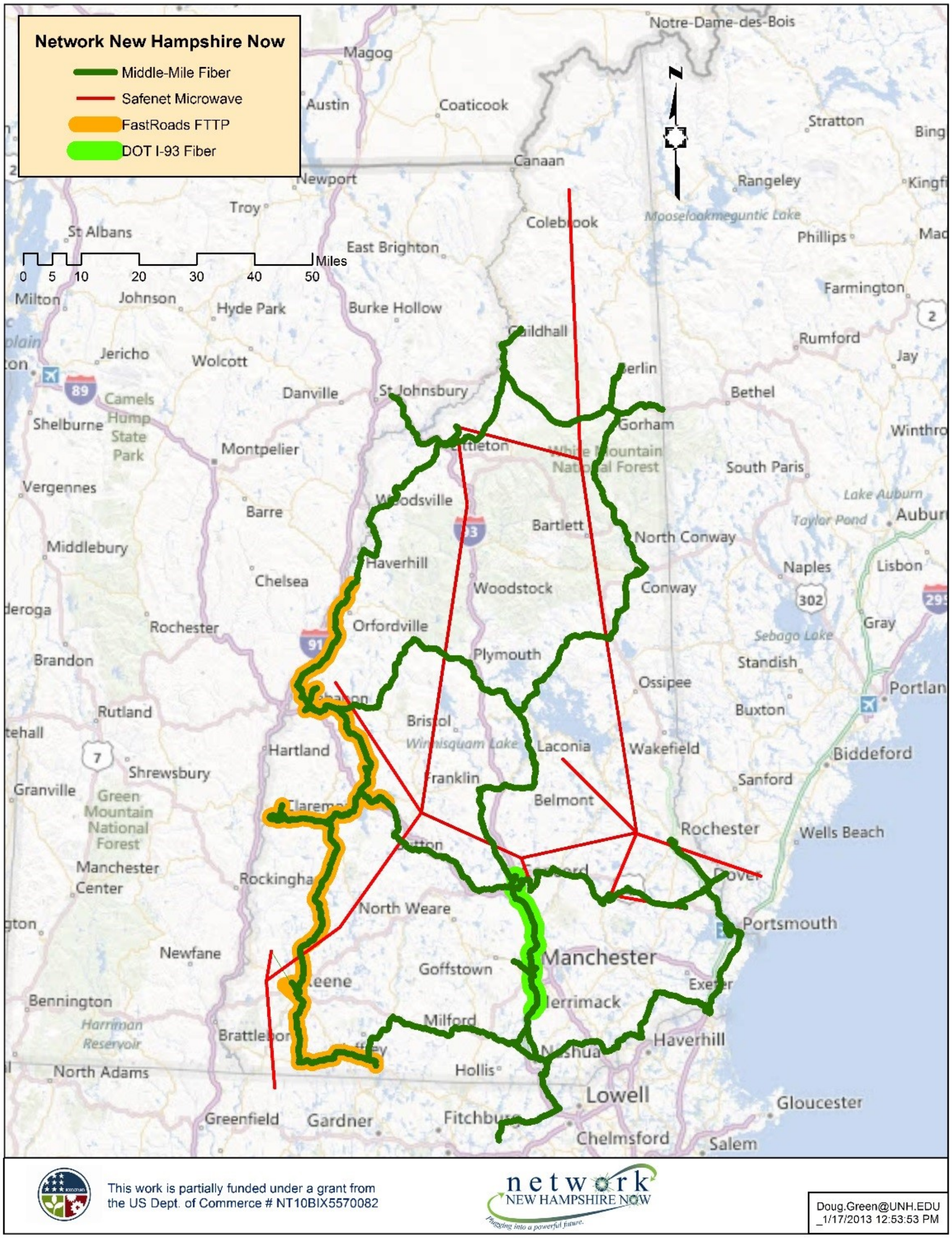


Figure 9.1.1-3: Network New Hampshire Now NHSafeNet Tower Locations

Source: (Network New Hampshire Now, 2015)

Local/Dispatch Public Safety Networks

New Hampshire State Police headquarters are in Concord (Troop D), which is one of seven troop barracks in New Hampshire (New Hampshire Department of Safety, 2015) County and local dispatch for the State Police uses VHF frequencies of 151-159 MHz. New Hampshire has a standardized and zoned radio plan for fire and EMS units with VHF radios having local programming in three radio zones (Radio Reference.com, 2015a). County and city public safety agencies such as police, fire, and EMS use a variety of VHF frequencies for dispatch and tactical communications (Radio Reference.com, 2015a).[7] In addition, individual counties, such as Hillsborough County where Nashua is located, use 800 MHz trunked systems for a variety of citywide communications addressing interoperability needs of police and fire, as well as support of other municipal agencies (Radio Reference.com, 2015b).

Mutual Aid Networks

Mutual aid and incident support communications in New Hampshire are provided across VHF and 800 MHz systems (Radio Reference.com, 2015a). Figure 9.1.1-4 presents the mutual aid structure within New Hampshire representing 259 mutual aid compacts across New Hampshire's participating jurisdictional agreements (Young, 2006).

Public Safety Answering Points (PSAPs)

According to the Federal Communications Commission (FCC)'s Master PSAP registry, there are 6 PSAPs supporting New Hampshire (FCC, 2015b). Of the six PSAPs, three are operated by county Sheriff offices located in Laconia, North Haverhill, and Brentwood; two are operated by the state in Concord and Laconia; and one is located in the Portsmouth Navy Yard in Portsmouth (FCC, 2015b).

Commercial Telecommunications Infrastructure

New Hampshire'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 New Hampshire'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.

[7] For example in Hillsborough County Sheriff/Police Dispatch uses VHF and a mix of analog and digital radios

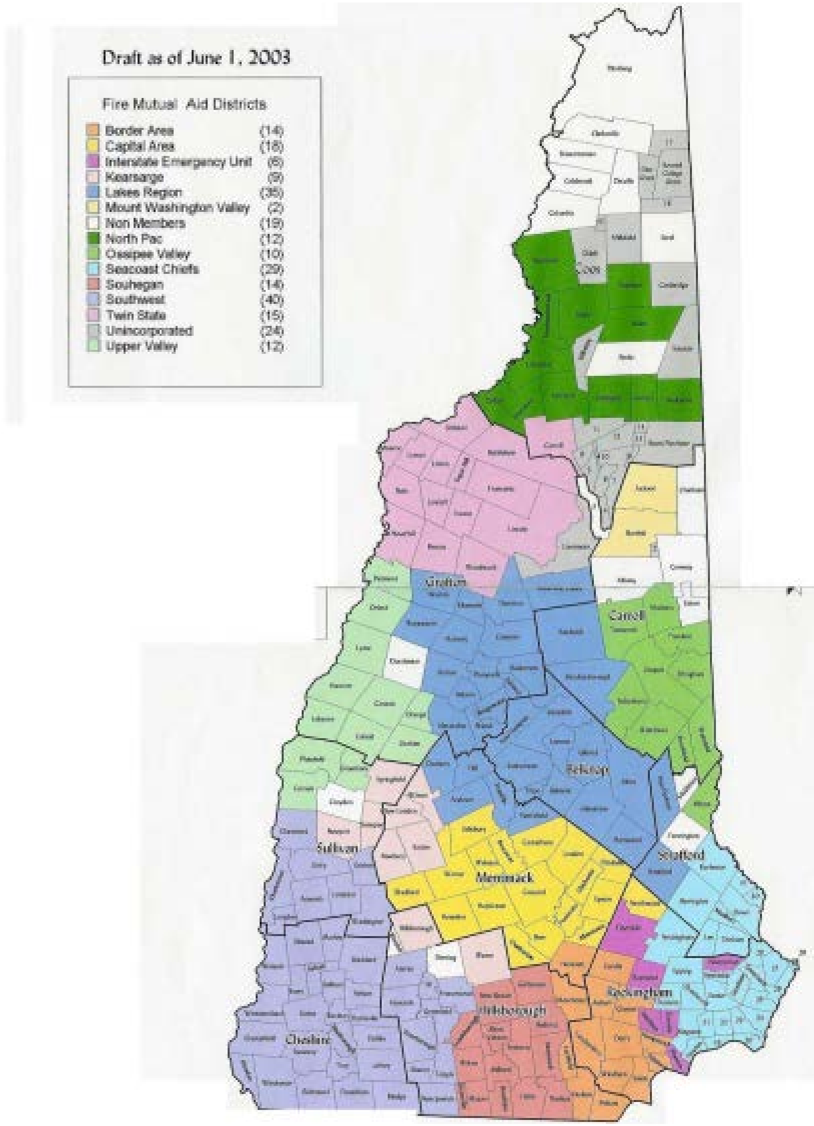


Figure 9.1.1-4: New Hampshire Mutual Aide Compact Jurisdictions

Source: (Young, 2006)

Carriers, Coverage, and Subscribers

New Hampshire'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 9.1.1-8 presents the number of providers of switched access[8] lines, Internet access,[9] and mobile wireless services including coverage.

[8] "A service connection between an end user and the local telephone company's switch; the basis of plain old telephone services. (POTS)" (FCC, 2014a).
[9] Internet access includes Direct Subscriber Line (DSL), cable modem, fiber, satellite, and fixed wireless providers.

Table 9.1.1-9 shows the wireless providers in New Hampshire along with their geographic coverage. The following four maps, Figure 9.1.1-5, Figure 9.1.1-6, Figure 9.1.1-7, and Figure 9.1.1-8, show i) the combined coverage for the top two providers; Verizon and AT&T; ii) USAT's and U.S. Cellular's coverage; iii) Sprint's and T-Mobile's coverage; and iv) the coverage of all other providers with less than 5% coverage area, respectively.

Table 9.1.1-8: Telecommunications Access Providers and Coverage in New Hampshire, as of December 31, 2013

Commercial Telecommunications Access Providers	Number of Service Providers	Coverage
Switched access line	111	98% of households
Internet access	32	77% of households
Mobile Wireless	5	91% of population

Sources: (FCC, 2014a) (FCC, 2014b) (NTIA, 2014)

Table 9.1.1-9: Wireless Telecommunications Coverage by Providers

Wireless Telecommunications Providers	Coverage
AT&T Mobility LLC	83.00%
Verizon Wireless	76.71%
USAT Corp	76.71%
U.S. Cellular	61.56%
Sprint	23.57%
Other[a]	12.81%
T-Mobile	10.98%

Source: (NTIA, 2014)

[a]Other: Provider with less than 5% coverage area. Providers include: Spectra Access, WiValley, Wave Comm, GAW High-Speed Internet, Lakes Region Wireless, Wireless LINC of NH and VT, Cyberpine Cooperative, Tamworth Wireless Cooperative, and Argent Communications.

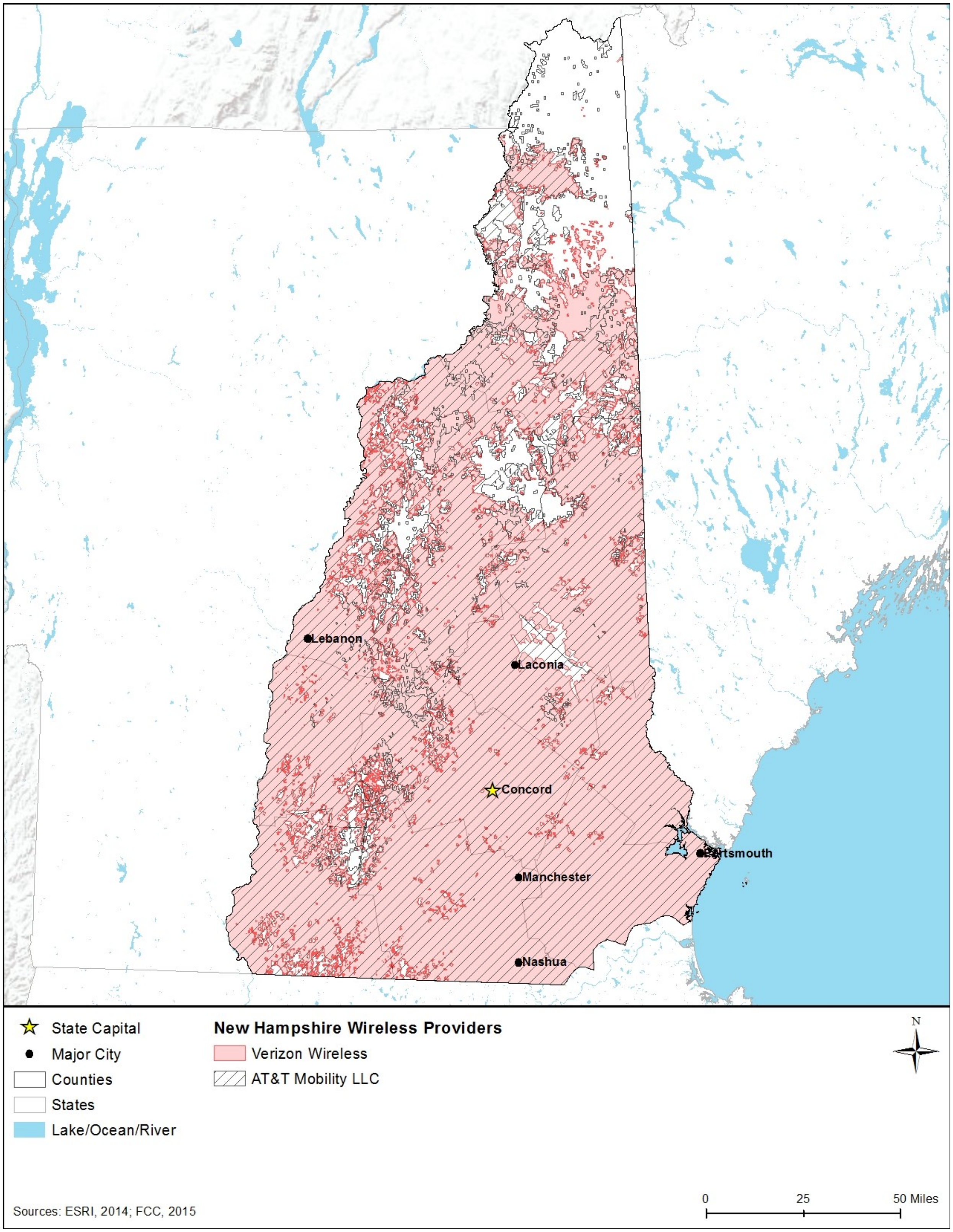


Figure 9.1.1-5: AT&T and Verizon Wireless Availability in New Hampshire

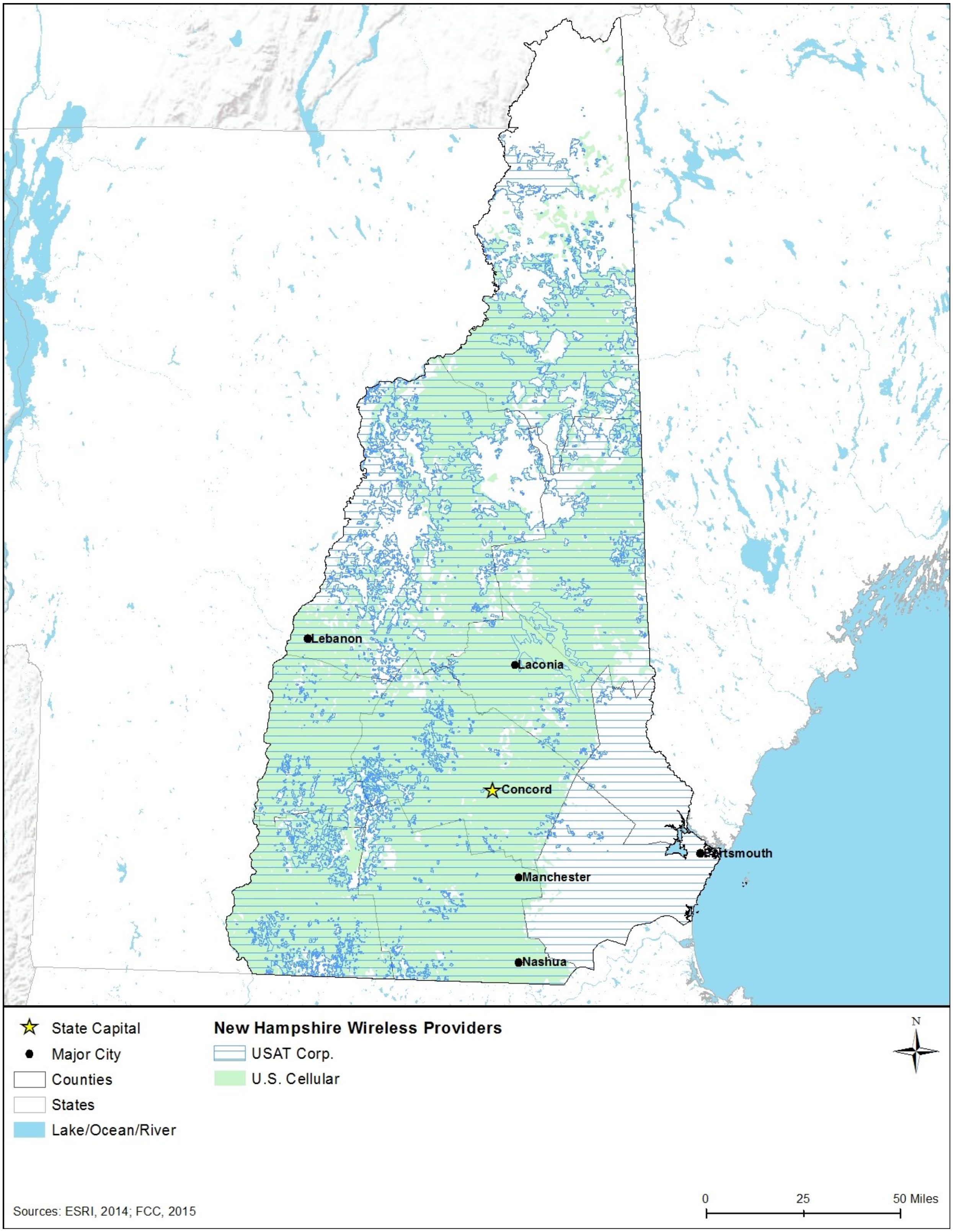


Figure 9.1.1-6: USAT and U.S. Cellular Wireless Availability in New Hampshire

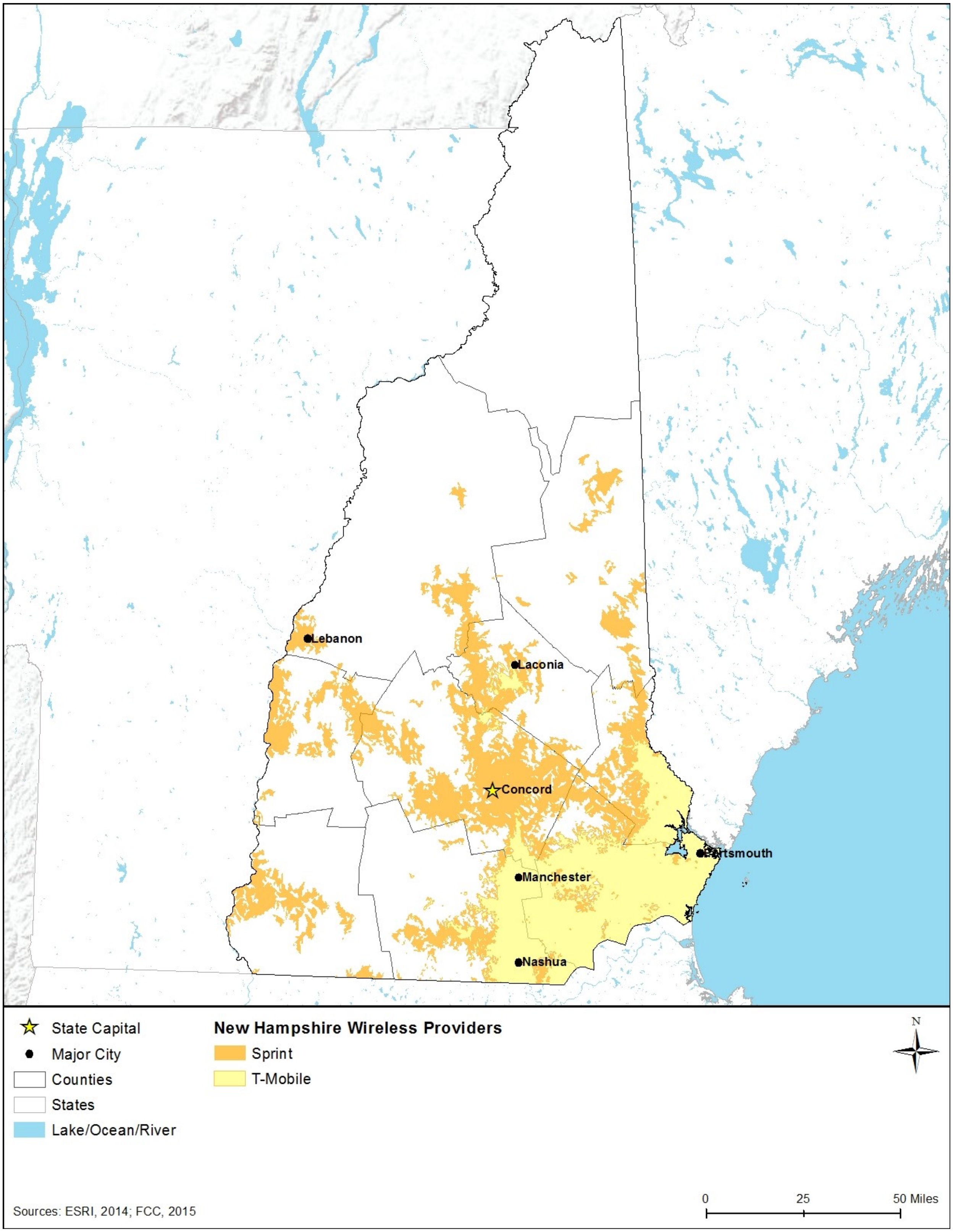


Figure 9.1.1-7: Sprint and T-Mobile Wireless Availability in New Hampshire

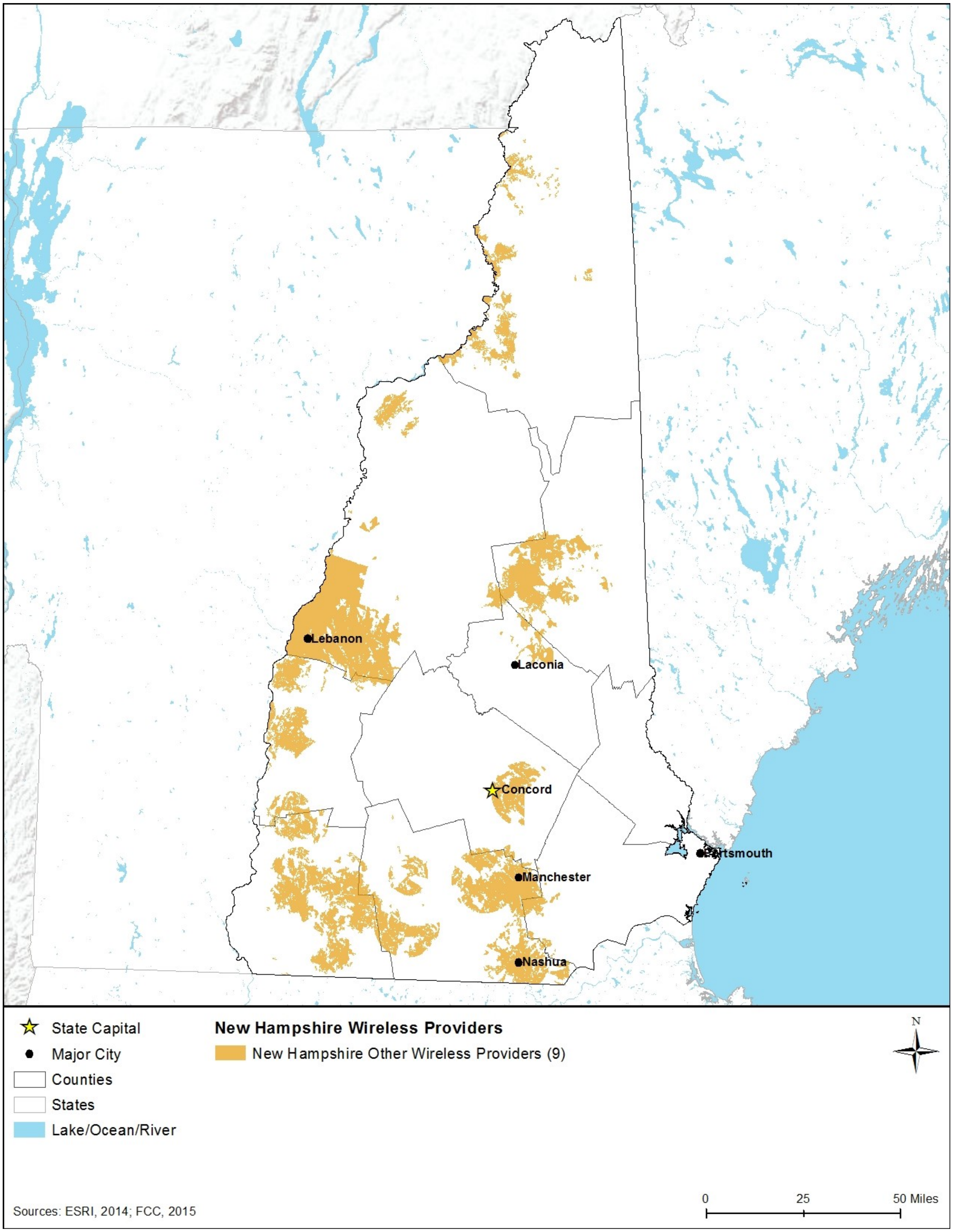


Figure 9.1.1-8: Other Provider Wireless Availability in New Hampshire

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 9.1.1-9 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 9.1.1-9: Types of Towers

Telecommunications tower infrastructure can be found throughout New Hampshire, although tower infrastructure is concentrated in the higher and more densely populated areas of New Hampshire. Owners of towers and some types of antennas are required to register those infrastructure assets with the FCC (FCC, 2016b).[10] Table 9.1.1-10 shows the number of towers (including broadcast towers) registered with the FCC in the state of New Hampshire. Figure 9.1.1-10 shows the location of those 270 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 9.1.1-10: Number of Commercial Towers in New Hampshire by Type

Constructed[a] Towers[b]		Constructed Monopole Towers	
100ft and over	16	100ft and over	0
75ft – 100ft	15	75ft – 100ft	0
50ft – 75ft	87	50ft – 75ft	2
25ft – 50ft	93	25ft – 50ft	5
25ft and below	18	25ft and below	0
Subtotal	**229**	Subtotal	**7**
Constructed Guyed Towers		**Buildings with Constructed Towers**	
100ft and over	0	100ft and over	0
75ft – 100ft	5	75ft – 100ft	1
50ft – 75ft	4	50ft – 75ft	0
25ft – 50ft	2	25ft – 50ft	1
25ft and below	0	25ft and below	1
Subtotal	**11**	Subtotal	**3**
Constructed Lattice Towers		**Multiple Constructed Structures[c]**	
100ft and over	0	100ft and over	2
75ft – 100ft	0	75ft – 100ft	2
50ft – 75ft	10	50ft – 75ft	0
25ft – 50ft	3	25ft – 50ft	0
25ft and below	2	25ft and below	0
Subtotal	**15**	Subtotal	**4**
Constructed Tanks[d]			
Tanks	1		
Subtotal	**1**		
Total All Tower Structures		**270**	

Source: (FCC, 2015c)

[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, 2013)
[b] Free standing or guyed structure used for communication purposes (FCC, 2013)
[c] Multiple constructed structures per antenna registration (FCC, 2013)
[d] Any type of tank – water, gas, etc. with a constructed antenna (FCC, 2013)

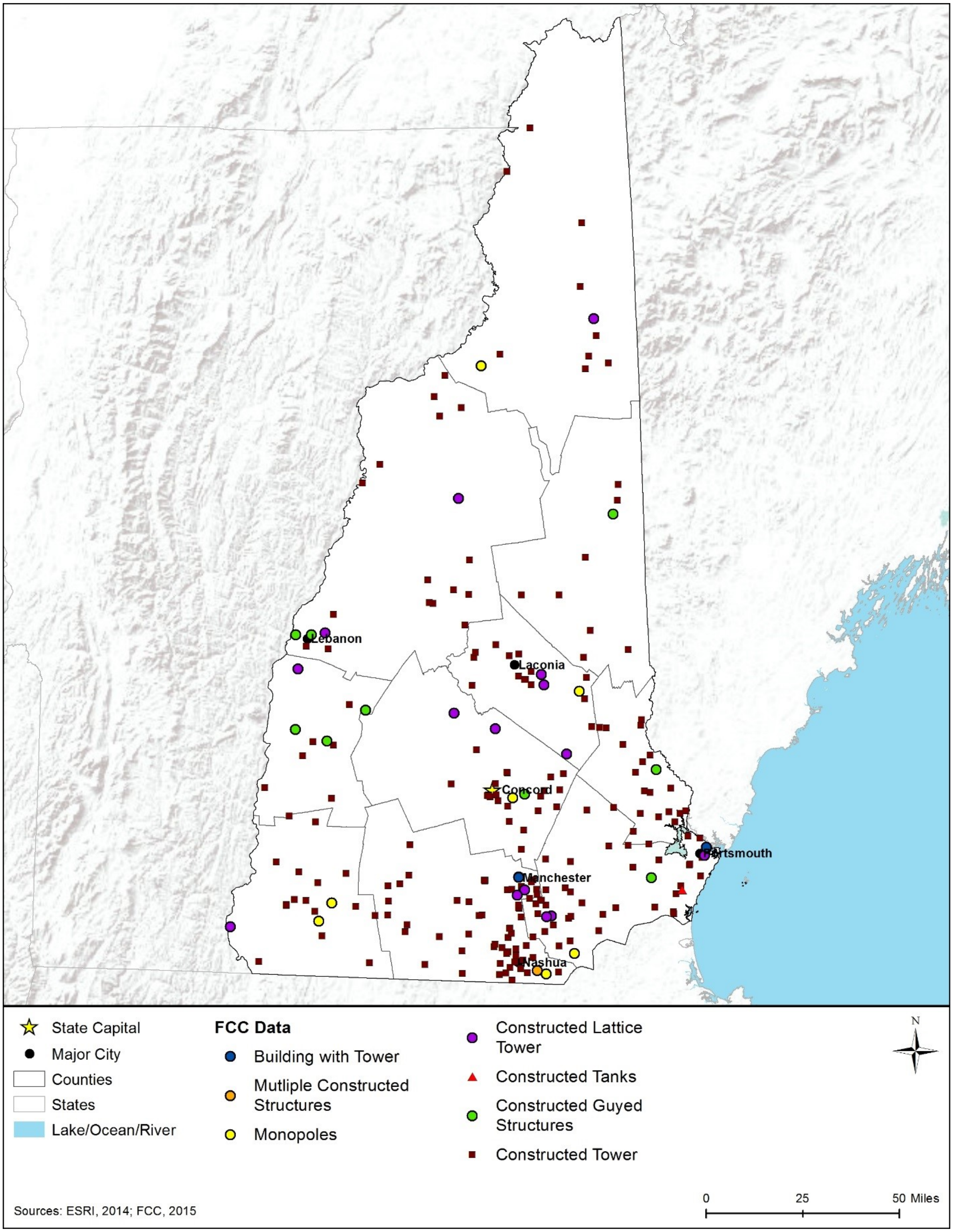
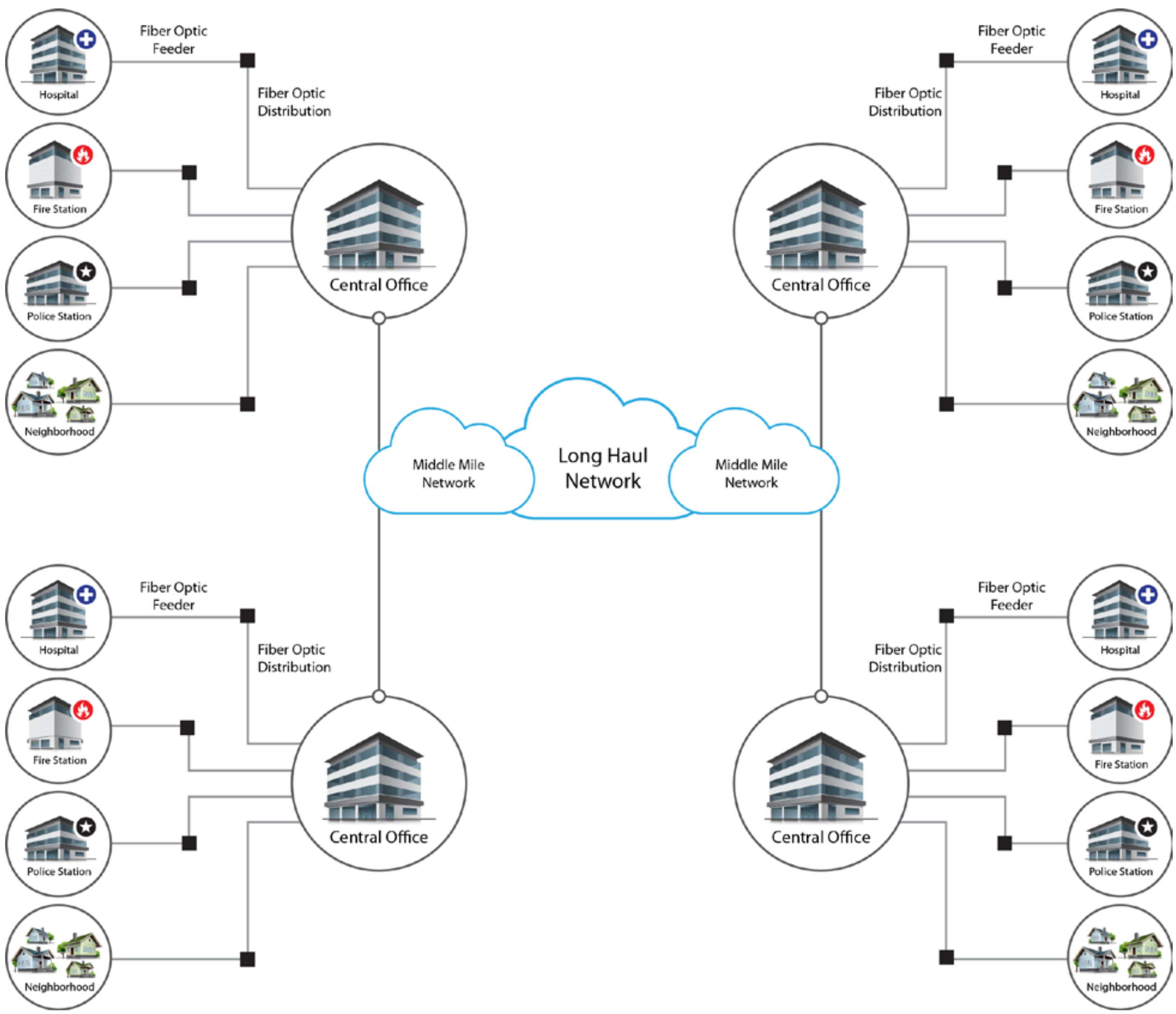


Figure 9.1.1-10: FCC Tower Structure Locations in New Hampshire

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 9.1.1-11. 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).



Prepared by: Booz Allen Hamilton

Figure 9.1.1-11: Typical Fiber Optic Network in New Hampshire

Last Mile Fiber Assets

In New Hampshire, fiber access networks are concentrated in the highest population centers as shown in the figures below. There are 20 fiber providers that offer service in the state, as listed in Table 9.1.1-11. The following three maps: Figure 9.1.1-12, Figure 9.1.1-13, and Figure 9.1.1-14 show; i) the coverage for the top provider, ii) all other providers with coverage above 5%, and iii) the coverage of all other providers with less than 5% coverage area, respectively.

Table 9.1.1-11: Fiber Provider Coverage

Fiber Provider	Coverage
FairPoint Communications	40.94%
Comcast	21.38%
G4 Communications	12.14%
Time Warner Cable	11.36%
Other[a]	7.08%

Source: (NTIA, 2014)

[a]Other: Provider with less than 5% coverage area. Providers include: MetroCast, TDS Telecomm, 186 Communications, LLC, Megapath Corporation, Granite State Telephone, Freedom Ring Communications, Sovernet Communications, FastRoads, LLC, WiValley, Charter Communications, Inc., Argent Communications, Dunbarton Telephone Company, Level 3 Communications, Bretton Woods Communications, Topsham Communications, Biddeford Internet Corporation.

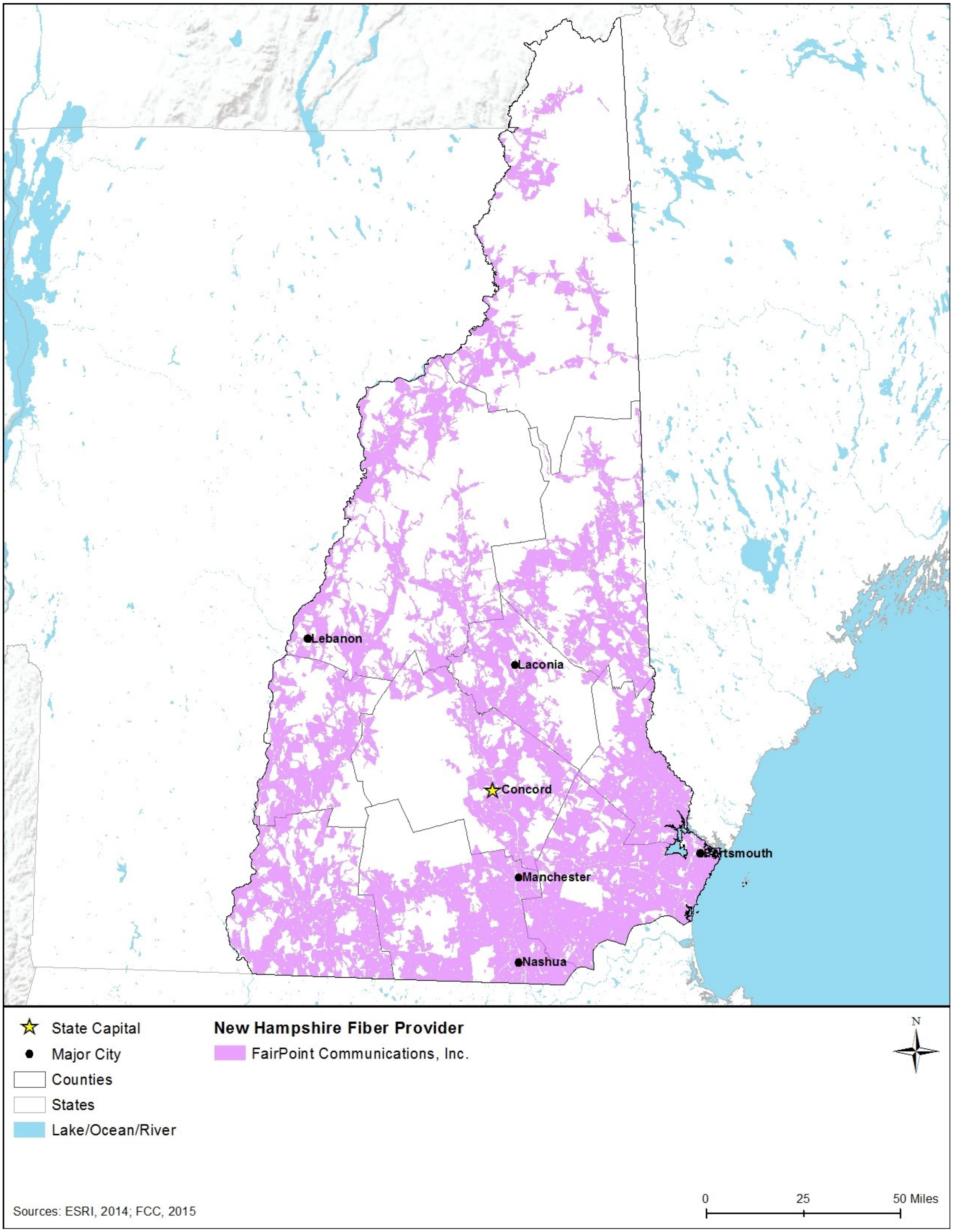


Figure 9.1.1-12: FairPoint Communications Fiber Availability in New Hampshire

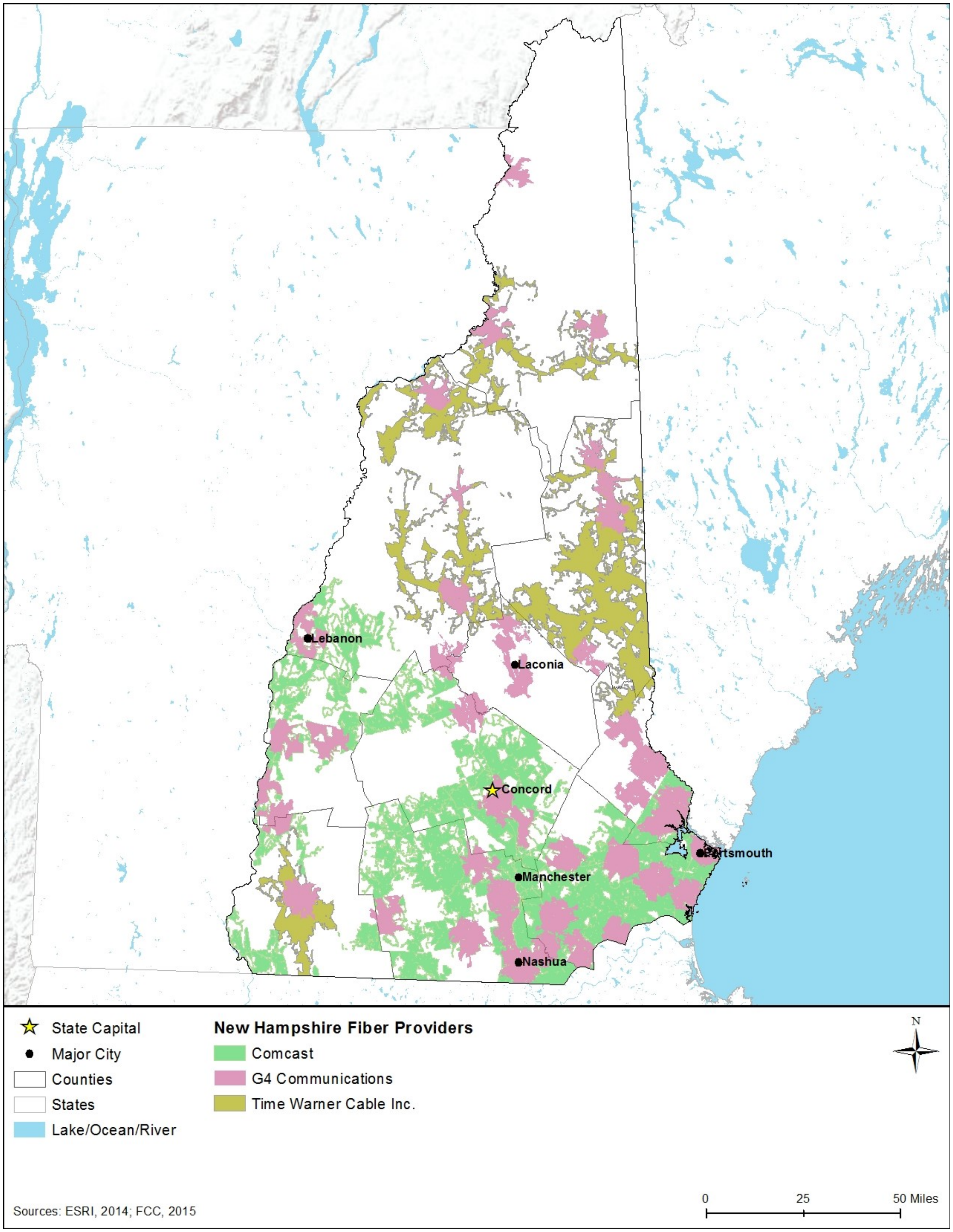


Figure 9.1.1-13: Fiber Availability in New Hampshire for All Other Providers with Coverage Above 5%

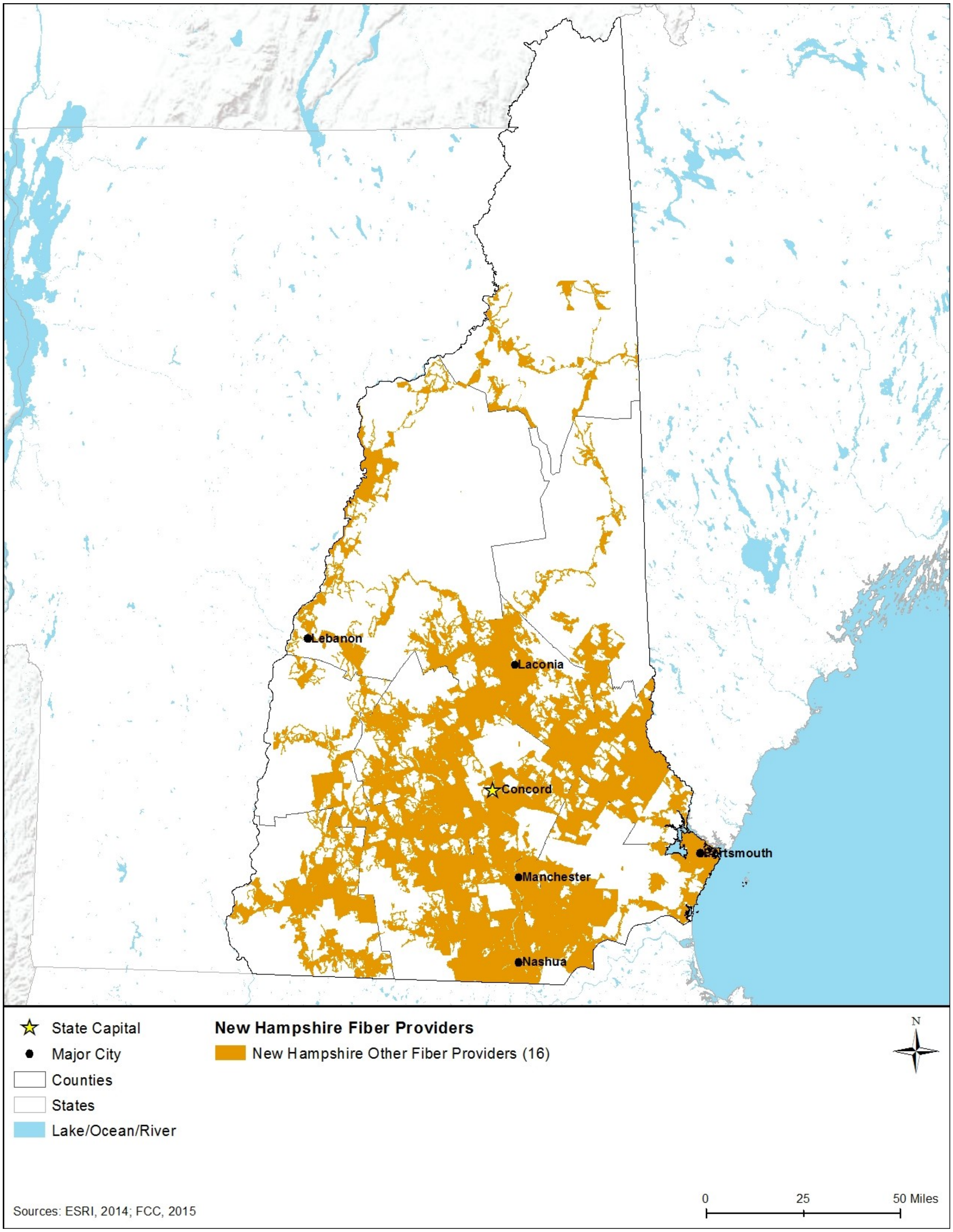


Figure 9.1.1-14: Wireless Availability in New Hampshire for All Other Coverage Providers Below 5%

Data Centers

Data centers (also known as network access points, collocation facilities, hosting centers, carrier hotels, and Internet exchanges) are large telecommunications facilities which house routers, switches, servers, storage, and other telecommunications equipment. These data centers facilitate efficient network interconnection among and between telecommunications carriers and between carriers and their largest customers. In addition to providing interconnection opportunities, these facilities also offer racks and cages for equipment; power and cooling; cabling; physical security; and 24x7 monitoring (CIO Council, 2015; GAO, 2013).

9.1.1.6. Utilities

Utilities are the systems that are essential to support daily operations in a community and cover a broad array of public services, such as electricity, wastewater, and sewage. Section 9.1.4, Water Resources, describes the potable water sources in the state.

Electricity

New Hampshire’s electricity is distributed through four electric companies: Eversource Energy, Liberty Utilities, Unitil Energy Systems, Inc. and the New Hampshire Electric Cooperative Inc. They are regulated by the New Hampshire Public Utilities Commission (NHPUC), which restructured the state’s energy market in the late 1990’s and early 2000’s (NHPUC, 2015a). These four companies operate in mutually exclusive territories, with Eversource serving 72 percent of New Hampshire’s retail customers. Eversource provides service across many areas of the state, ranging from the state’s more rural northern areas to its metropolitan southern areas. Unitil Energy Systems, Inc. (UES) provides service in the Seacoast and Capital areas, covering 11 percent of New Hampshire’s retail customers. The New Hampshire Electric Cooperative Inc. (NHEC) provides service in central New Hampshire and also covers 11 percent of the retail customers in New Hampshire. The remaining 6 percent of customers get their service from Liberty Utilities, which services areas in the western and southern parts of New Hampshire (NHPUC, 2015a). In 2014, 52 percent of the state’s net electricity generation came from the Seabrook nuclear power reactor, which is the largest reactor in New England. During the first four months of 2015, nuclear power was the largest source of electricity generation for the state, accounting for the production of 898 gigawatt hours (GWh) of electricity, or approximately 52 percent. Other sources of electricity generation include natural gas and renewable sources, such as hydroelectric power. By 2025, New Hampshire intends to produce 24.8 percent of its electricity through renewable means (EIA, 2015a).

Water

Water utilities in the state are regulated by the Gas and Water Division of the New Hampshire Public Service Commission. There are 17 water utilities that fall under the Division’s jurisdiction, owning a total of approximately 100 individual water systems. The largest of these is Pennichuck Water Works, a utility that serves approximately 27,500 customers in the Nashua area. Pennichuck Water Works also owns several smaller systems in the southern area of New Hampshire (NHPUC, 2015b). It should be noted that the number of water utilities in the state has decreased during the last twenty years, largely due to large utilities buying out smaller companies. In 1999, there were thirty-nine water utility companies, compared with the current twenty. The utilities regulated by the Gas and Water Division only provide service to 15 percent of the state's population. A further 38 percent of New Hampshire's residents obtain water from private wells.

The remaining 53 percent get their water from municipal utilities that are not regulated by the Public Service Commission (NHPUC, 2015c). It is the duty of the Drinking and Groundwater Bureau, part of the New Hampshire Department of Environmental Services (NHDES), to ensure the quality of drinking water. The Bureau applies the federal Safe Drinking Water Act to the roughly 2,400 water systems in New Hampshire (NHDES, 2015a). Any water system that "serves the same people year-round" must complete an annual Consumer Confidence Report (CCR), which details the quality of the system's drinking water. CCRs are distributed to customers either electronically or through the mail (NHDES, 2015b).

Wastewater

The New Hampshire Public Utilities Commission regulates five investor-owned sewer companies in the state (NHPUC, 2015c). Bodwell Waste Services Corp. is the largest of these five, serving nearly 500 people (NHPUC, 2015d). Wastewater treatment facilities that discharge into surface waters must obtain a National Pollutant Discharge Elimination System (NPDES) permit from the Environmental Protection Agency (USEPA), as New Hampshire is not authorized to issue these permits. NPDES permits are generally issued to industrial or municipal treatment plants. While the state does not issue permits, the NHDES certifies these permits to be certain that the "limitations and conditions contained in the NPDES permit will ensure that the proposed discharge will not violate any state law or regulation" (NHDES, 2015c). The NHDES also handles the inspections of wastewater treatment facilities, as well as any investigations that may be required. Compliance investigations are carried out by the NHDES Wastewater Engineering Bureau, a group dedicated to ensuring proper design and construction, as well as proper operations and maintenance of the state's wastewater treatment facilities (NHDES, 2015d).

Solid Waste Management

The Solid Waste Management Bureau is a part of the NHDES. New Hampshire defines solid waste as "any abandoned or discarded material that has been placed in the waste stream. This includes, for example, household trash, construction and demolition debris, furniture, appliances, tires, and recyclables, such as paper, cans, glass and plastic containers." (NHDES, 2015e). This does not include hazardous wastes, septage, or biosolids, as these are regulated under other programs (NHDES, 2015e). The Bureau regulates approximately 260 solid waste facilities, including several types of transfer, recycling, processing and treatment facilities. They also regulate 360 asbestos disposal sites, six composting facilities, and 150 auto salvage yards. New Hampshire has six lined Municipal Solid Waste landfills and three lined ash landfills. The state also has approximately 290 unlined landfills which have been closed and capped. New Hampshire's permitted landfills have sufficient capacity to handle the state's waste through

2022, so long as all of the facilities remain open. While approximately 80 percent of the state's solid waste is recyclable, the current recycling rate is approximately 35 percent. There have been increase in recycling rates for recycling strategies, such as single-stream or pay-as-you-throw recycling (Wimsatt, 2014). The state has established a goal of a 40 percent recycling rate, which was intended to be completed by 2000 (New Hampshire General Court, 1999).

9.1.2. Soils

9.1.2.1. 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.
- *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.

9.1.2.2. Specific Regulatory Considerations

The Proposed Action must meet the requirements of the National Environmental Policy Act (NEPA) 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 Section 1.8. A list of applicable state laws and regulations is included in Table 9.1.2-1 below.

Table 9.1.2-1: Relevant New Hampshire Soils Laws and Regulations

State Law/Regulation	Regulatory Agency	Applicability
Water Pollution and Waste Disposal (Revised Statues Annotated [RSA] 485-A:17)	NHDES	A permit from NHDES is required when more than 100,000 square feet of contiguous land area is to be disturbed. Note, many local requirements have a smaller areal threshold. (New Hampshire General Court, 2012)
New Hampshire Comprehensive Shoreland Protection Act (CSPA, RSA 483-B)	NHDES	All excavation, earth moving and filling activities within the protected shoreland (250 feet from the water's edge) must have appropriate erosion and sedimentation controls in accordance with the Alteration of Terrain Program (RSA 485-A:17 and Env-Wq 1500). (NHDES, 2015f)

9.1.2.3. Environmental Setting

New Hampshire is composed of one Land Resource Region (LRR),[11] as defined by the National Resources Conservation Service (NRCS), the Northeastern Forage and Forest Region (NRCS, 2006). Within New Hampshire's one LRR are four Major Land Resource Areas (MLRA),[12] which are characterized by patterns of soils, climate, water resources, land uses, and type of farming (NRCS, 2006) . The locations and characteristics of New Hampshire's MLRAs are presented in Figure 9.1.2-1 and Table 9.1.2-1, respectively.

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[13] such as bacteria, fungi, biological crusts, vegetation, animals, and climatic variables such as precipitation and temperature. For example, expansive soils[14] 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[15] (discussed further in the subsections below).

[11] Land Resource Region: "A geographical area made up of an aggregation of Major Land Resource Areas (MLRA) with similar characteristics." (NRCS, 2006)
[12] 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)
[13] The flora and fauna of a region.
[14] 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)
[15] Rutting is indentations in soil from operating equipment in moist conditions or soils with lower bearing strength. (USFS, 2009b)

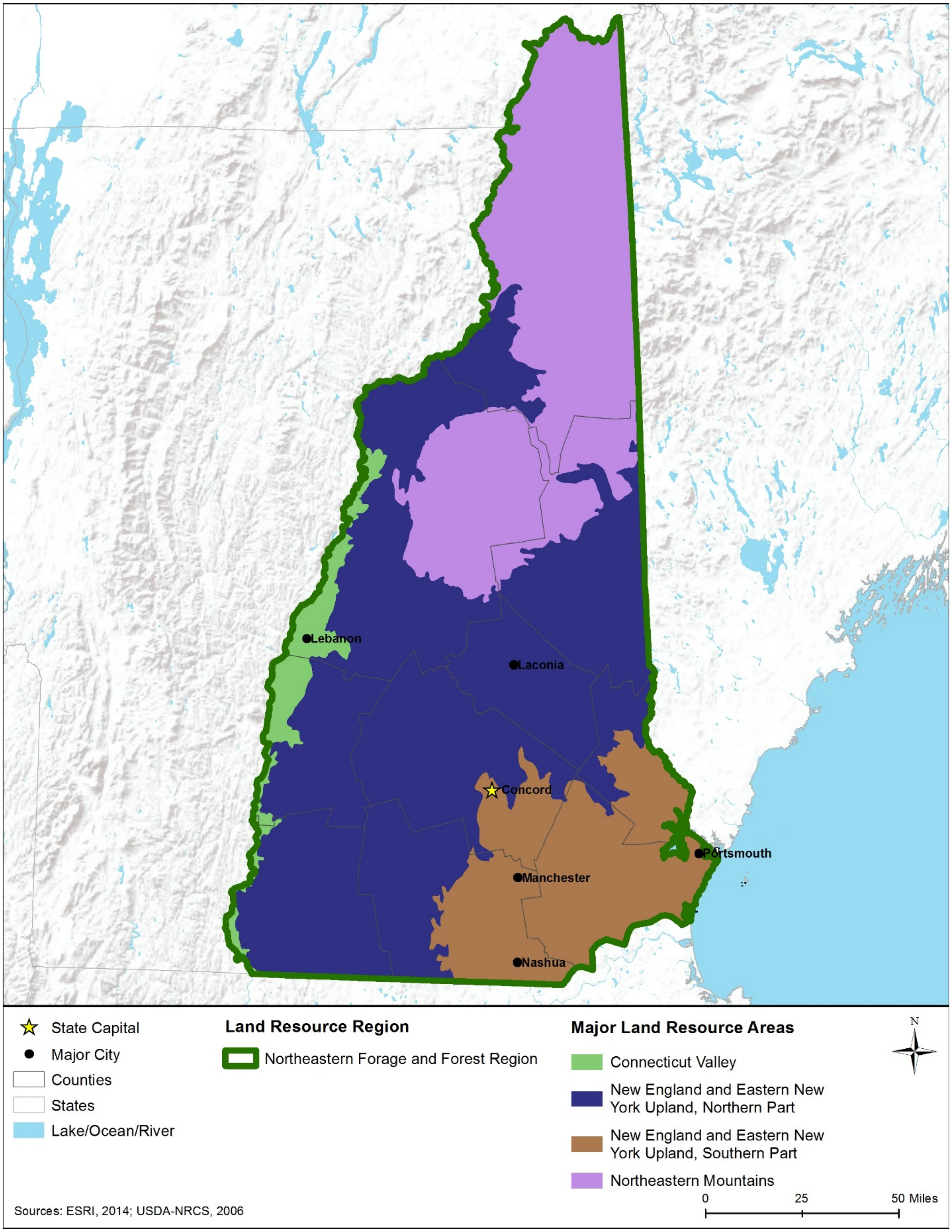


Figure 9.1.2-1: Locations of Major Land Resource Areas in New Hampshire

Table 9.1.2-2: Characteristics of Major Land Resource Areas in New Hampshire

MLRA Name	Region of State	Soil Characteristics
Connecticut Valley	Western New Hampshire	Entisols[16] and Inceptisols[17] are the dominant soil orders in this area, and the soils in this area are generally very deep, excessively drained to poorly drained, and clayey, loamy, or sandy.
New England and Eastern New York Upland, Northern Part	Southern and Central New Hampshire	Dominant soil orders in this MLRA are Inceptisols and Spodosols,[18] and the soils in this area are shallow to very deep, are generally excessively drained to poorly drained, and sandy or loamy.
New England and Eastern New York Upland, Southern Part	Southeastern New Hampshire	Dominant soil orders in this MLRA include Entisols, Histosols,[19] and Inceptisols, and the soils are generally very deep, somewhat excessively drained to poorly drained, and loamy or sandy.
Northeastern Mountains	Northern New Hampshire	Inceptisols and Spodosols are dominant soil orders in this MLRA. The soils in this area range from shallow to very deep, somewhat excessively drained to poorly drained, and are loamy.

Source: (NRCS, 2006)

9.1.2.4. 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[20] 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[21] soil database identifies ten different soil suborders in New Hampshire (NRCS, 2015c). Figure 9.1.2-2 depicts the distribution of the soil suborders, and Table 9.1.2-3 provides a summary of the major physical-chemical characteristics of the various soil suborders found.

[16] 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% of the world's ice-free land surface." (NRCS, 2015d)

[17] 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 17% of the world's ice-free land surface." (NRCS, 2015d)

[18] Spodosols: "Soils formed from weathering processes that strip organic matter combined with aluminum from the surface layer and deposit them in subsoil. They commonly occur in areas of coarse-textured deposits under forests of humid regions, tend to be acid and infertile, and make up nearly 4% of the world's ice-free land surface." (NRCS, 2015d)

[19] Histosols: "Soils that have a high content of organic matter and no permafrost. Also known as bogs, moors, peats, or mucks, these soils are saturated year round and form in decomposed plant remains. If exposed to air and drained, the microbes will decompose and the soils can subside dramatically. They make up nearly 1% of the world's ice-free land surface." (NRCS, 2015d)

[20] "Soil properties inferred from the combined data of soil science and other disciplines (e.g., soil temperature and moisture regimes inferred from soil science and meteorology)" (NRCS, 2015e)

[21] STATS2GO is the Digital General Soil Map of the United States developed by the National Cooperative Soil Survey and supersedes the State Soil Geographic (STATSGO) dataset; the U.S. General Soil Map is comprised of general soil association units and is maintained and distributed as a spatial and tabular dataset. (NRCS, 2015c)

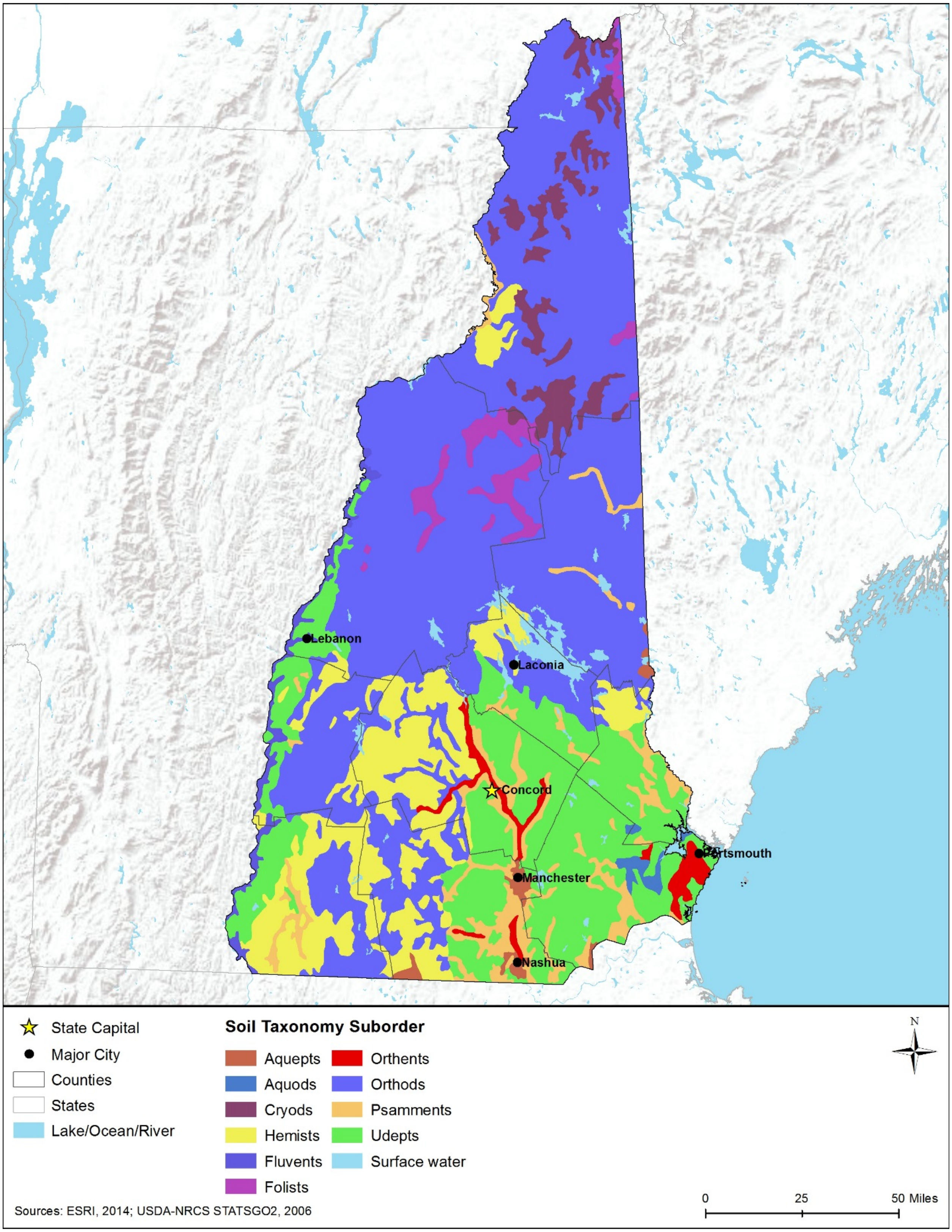


Figure 9.1.2-2: New Hampshire Soil Taxonomy Suborders

Table 9.1.2-3: Major Characteristics of Soil Suborders Found in New Hampshire, as depicted in Figure 9.1.2-2

Soil Order	Soil Suborder	Ecological Site Description	Soil Texture	Slope (%)	Drainage Class	Hydric Soil[22]	Hydrologic Group	Runoff Potential	Permeability[23]	Erosion Potential	Compaction and Rutting Potential
Inceptisols	Aquepts	Aquepts have poor or very poor natural drainage. If these soils have not been artificially drained, ground water 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.	Fine sandy loam, loamy sand	0-8	Very poorly drained to poorly drained	Yes	C, D	Medium to High	Low to Very Low	Medium to High, depending on slope	High, due to hydric soil and poor drainage conditions
Spodosols	Aquods	Aquods are characterized by a shallow fluctuating water table, with water-loving vegetation, ranging from moss, shrubs, and trees in cold areas to mixed forests and palms in the warmest areas. Although some Aquods have been cleared and are used as cropland or pasture, most are used as forest or wildlife habitat, as they are naturally infertile (but they can be highly responsive to good management).	Sand	0-5	Somewhat poorly drained	No	B	Medium	Moderate	Medium	Low
Spodosols	Cryods	Cryods are soils of high latitudes and/or high elevations, with coniferous forest vegetation, and are used as forest or wildlife habitat.	Loam	8-15	Moderately well drained	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.	Silt loam	0-3	Moderately well drained	No	B	Medium	Moderate	Medium	Low
Histosols	Folists	Folists mostly consist of horizons derived from leaf litter, twigs, and branches resting on bedrock or on fragmental materials. Most support forest vegetation, with some also supporting grass, or used for specialty crops or for urban or recreational development.	Peat	3-80	Well drained	No	A	Low	High	Low	Low
Histosols	Hemists	Hemists are usually found in broad, flat areas, such as coastal plains and outwash plains as well as closed depressions. They are typically under natural vegetation and uses for rangeland, woodlands, and/or wildlife habitat, although some large areas have been cleared and drained, and utilized for cropland.	Mucky peat	0-2	Very poorly drained	Yes	A, D	Low to High	High to Very Low	Low to High, depending on slope	High, due to hydric soil and poor drainage conditions
Entisols	Orthents	Orthents are commonly found on recent erosional surfaces and are used primarily as rangeland, pasture, or wildlife habitat.	Stratified cobbly coarse sand to very gravelly loamy fine sand, Very gravelly loamy coarse sand	0-35	Excessively drained	No	A	Low	High	Low	Low
Spodosols	Orthods	Orthods have a moderate accumulation of organic carbon, and are relatively freely drained. Most of these soils are either used as forest or have been cleared and are used as cropland or pasture. Although they are naturally infertile, they can be highly responsive to good management.	Extremely gravelly coarse sand, fine sandy loam, gravelly fine sandy loam, gravelly loamy sand, loam, loamy sand, sand, sandy loam, silt loam, very fine sandy loam	0-50	Moderately well drained to excessively drained	No	A, B, C, D	Low to High	High to Very Low	Low to High, depending on slope	Low

[22] 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" (NPS, 2016b).
[23] Based on Runoff Potential, described in Section 9.1.2.5.

Soil Order	Soil Suborder	Ecological Site Description	Soil Texture	Slope (%)	Drainage Class	Hydric Soil[22]	Hydrologic Group	Runoff Potential	Permeability[23]	Erosion Potential	Compaction and Rutting Potential
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	0-15	Moderately well drained to excessively drained	No	A, B	Low to Medium	Moderate to High	Low to Medium, depending on slope	Low
Inceptisols	Udepts	Udepts have a 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.	Channery loam, fine sandy loam, gravelly fine sandy loam, loam, sandy loam, silt loam, stratified loamy sand	0-25	Moderately well drained to somewhat excessively drained	No	A, B, C, D	Low, Medium, High	Very Low, Low, Moderate, High	Low to High, depending on slope	Low

Source: (NRCS, 2015c) (NRCS, 1999)

9.1.2.5. Runoff Potential

The NRCS uses four Hydrologic Soil Groups (A, B, C, and D) that are based on a soil's runoff potential.[24] Group A generally has the smaller runoff potential, whereas Group D generally has the greatest (Purdue University, 2015). Table 9.1.2-3 (above) provides a summary of the runoff potential for each soil suborder in New Hampshire.

- **Group A. Sand, loamy sand or sandy loam soils.** This group of soils has "low runoff potential and high infiltration rates[25] 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). Folists, Hemists, Orthents, Orthods, Psamments, and Udepts fall into this category in New Hampshire.
- **Group B. Silt loam or loam soils.** This group of soils has a "moderate infiltration rate when thoroughly wetted and consists chiefly of 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. Aquods, Fluvents, Orthods, Psamments, and Udepts fall into this category in New Hampshire.
- **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. Aquepts, Cryods, Orthods, and Udepts fall into this category in New Hampshire.
- **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). Aquepts, Hemists, Orthods, and Udepts fall into this category in New Hampshire.

9.1.2.6. Soil Erosion

"Soil erosion involves the breakdown, detachment, transport, and redistribution of soil particles by forces of water, wind, or gravity" (NRCS, 2015f). 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 public safety hazard (NRCS, 1996a). Table 9.1.2-3 (above) provides a summary of the erosion potential for each soil suborder in New Hampshire. Soils with the highest erosion potential in New Hampshire include those in the Aquepts, Aquods, Cryods, Fluvents, Hemists, Orthods,

[24] 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.
[25] 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)

Psamments, and Udepts suborders, which are found throughout most of the state (Figure 9.1.2-2).

9.1.2.7. 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 9.1.2-3 provides a summary of the compaction and rutting potential for each soil suborder in New Hampshire. Soils with the highest potential for compaction and rutting in New Hampshire include those in the Aquepts and Hemists suborders, which are mostly found in southwest areas of the state (Figure 9.1.2-2).

9.1.3. Geology

9.1.3.1. 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 groundwater availability. Several of these elements are discussed in other sections of this PEIS, including Water Resources (Section 9.1.4), Human Health and Safety (Section 9.1.15), and Climate Change (Section 9.1.14).

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

- Section 9.1.3.3, Major Physiographic Regions and Provinces[26],[27]
- Section 9.1.3.4, Surface Geology
- Section 9.1.3.5, Bedrock Geology[28]
- Section 9.1.3.6, Paleontological Resources[29]
- Section 9.1.3.7, Fossil Fuel and Mineral Resources

[26] Physiographic regions: Areas of the United States that share commonalities based on topography, geography, and geology. (Fenneman, 1916)
[27] Physiographic provinces: Subsets within physiographic regions. (Fenneman, 1916)
[28] Bedrock: Solid rock beneath the soil and superficial rock. (USGS, 2015d)
[29] Paleontology: "Study of life in past geologic time based on fossil plants and animals." (USGS, 2015e)

- Section 9.1.3.8, Potential Geologic Hazards[30]

9.1.3.2. Specific Regulatory Considerations

The Proposed Action must meet the requirements of NEPA and other applicable laws and regulations. Applicable federal laws and regulations that apply to Geology, such as the National Historic Preservation Act and the Clean Water Act, are detailed in Appendix C. A list of applicable state laws and regulations is included in Table 9.1.3-1 below.

Table 9.1.3-1: Relevant New Hampshire Geology Laws and Regulations

State Law/Regulation	Regulatory Agency	Applicability
New Hampshire State Building Code	New Hampshire Bureau of Public Works	Provisions for earthquake-resistant design (New Hampshire Department of Safety, 2014)
Bridge Design Manual (2015)	NHDOT	Bridges must be designed with consideration of seismic motion (New Hampshire Department of Safety, 2014)

9.1.3.3. 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, in a large proportion of cases, 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)

New Hampshire is entirely within the Appalachian Highlands Physiographic Region and the New England Province (USGS, 2003b) (Figure 9.1.3-1). To characterize differences in physiography across the state and to better support PEIS tiering, the physiographic sections of the New England Province in New Hampshire are summarized below.

[30] 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, 2013a)

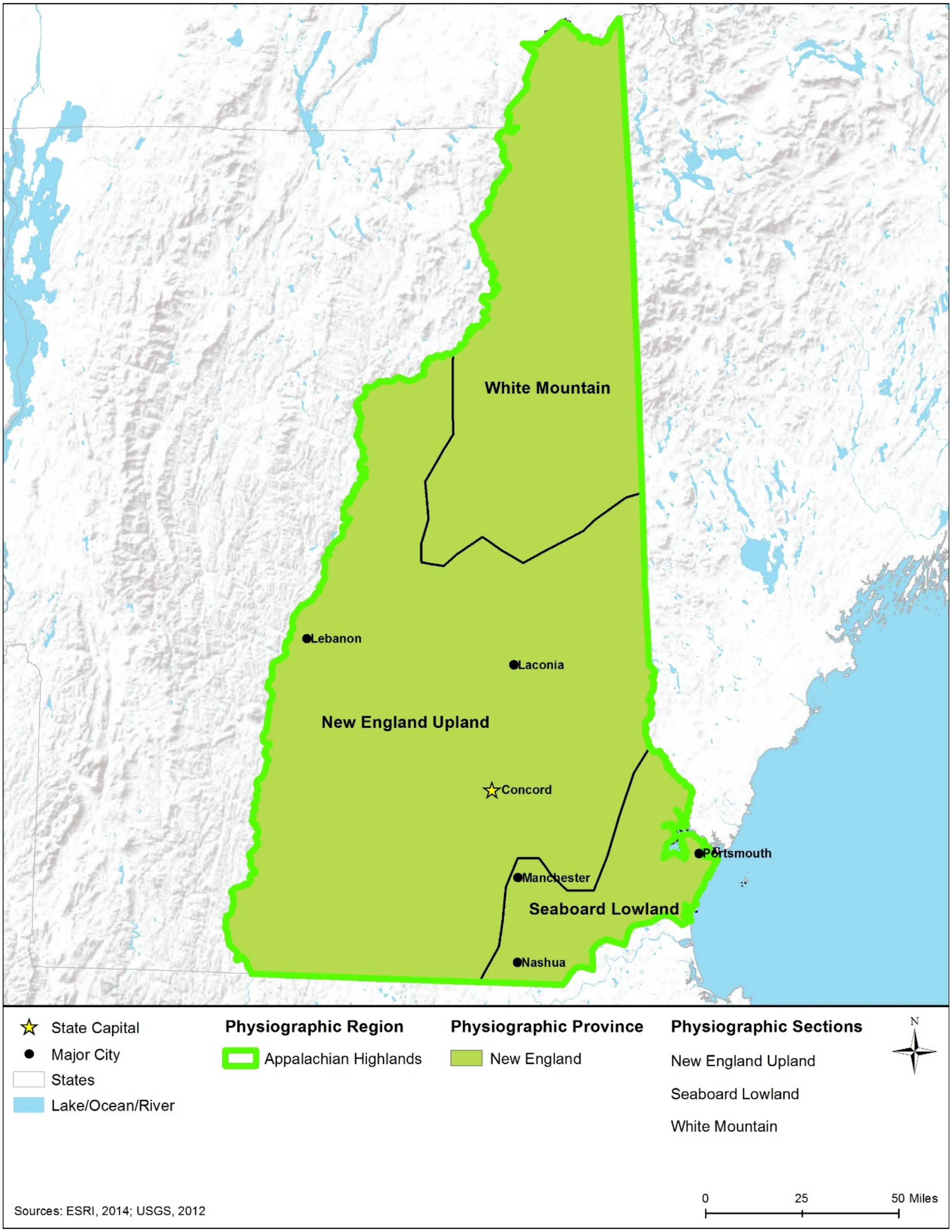


Figure 9.1.3-1: Physiographic Regions, Provinces, and Sections of New Hampshire

Appalachian Highlands Region

The Appalachian Highlands Region extends from Canada to Alabama. This region is composed of layers of folded sedimentary rock,[31] created when the North American plates collided with the Eurasian and African plates more than 500 million years ago (MYA). Once similar in height to the present-day Rocky Mountains,[32] the Appalachian Highlands have eroded considerably, and most peaks are now under 5,000 feet above sea level (ASL). The current Appalachian Highlands Region is characterized by prime and unique farmlands and is rich in mineral resources. (USGS, 2003b)

As reported above, the Appalachian Highlands Region within New Hampshire is composed of one physiographic province: the New England Province. Within New Hampshire, there are three physiographic sections in the New England physiographic province: Seaboard Lowland, New England Upland, and White Mountain. Each of these sections is discussed in detail below (USGS, 2003b).

<u>Seaboard Lowland</u> – The Seaboard Lowland section spans the length of New Hampshire's 13 mile coastline and extends 15 to 20 miles inland. The Seaboard Lowland borders the New England Upland to the west at about 400 to 500 feet above sea level (ASL); the section borders the Atlantic Ocean to the east. Throughout the Seaboard Lowland, relief is below 200 feet. The Seaboard Lowland has been characterized as the "sloping margin of the New England Upland Section." (USGS, 1999a)

<u>New England Upland</u> – The New England Upland section extends from New Hampshire's southern border with Massachusetts to the foot of the White Mountains in the north-central portion of the state (Lobeck, 1917). The section is marked as "an area of undulating hilly topography, ranging in elevation from below 1,000 feet to above 2,000 feet;" Fenneman described the New England Upland as an upraised plain with sporadic hills dissected by narrow valleys (USGS, 1999a).

<u>White Mountain</u> – The White Mountain section encompasses the entire northern portion of New Hampshire. The southern border of the White Mountains intersects with the New England Uplands in the north-central portion of the state. The White Mountains rise from 1,500 feet ASL and in most cases topographic relief is between 500 to 1,500 feet; in a few locations topographic relief can exceed 3,500 feet. At 6,288 feet ASL, Mount Washington is the highest locale within the White Mountain section. (USGS, 1999a)

9.1.3.4. Surface Geology

Surficial geology is characterized by materials such as till,[33] 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

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[31] Sedimentary Rock: "Rocks that formed from pre-existing rocks or pieces of once-living organisms. They form from deposits that accumulate on the Earth's surface. Sedimentary rocks often have distinctive layering or bedding." (USGS, 2014e)
[32] The Rocky Mountains exceed 14,000 feet above sea level. (NPS, 2016a)
[33] 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, 2013a)

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,[34] subsidence,[35] and erosion. (Thompson, 2015)

Glaciation likely began to impact New Hampshire's landscape about 180,000 years ago. During the period from 180,000 years ago through 60,000 years ago, most glaciation was limited to the slopes of the Presidential, Twin, and Moosilauke Ranges, where they carved out valleys "with steep walls and broad floors." Between 60,000 and 40,000 years ago, during the Wisconsinan Glaciation, a continental ice sheet descended from Canada and covered the entire state. "Coarser rock fragments drawn across the rock floor cut straight scratches or striations in the direction of ice motion" (Goldthwait, Goldthwait, & Goldthwait, 1951); striations are observed on many of New Hampshire's highest peaks, indicating that they were submerged during the Wisconsinan Glaciation. In other places, where the glacier's bottom pushed silt and clay, surface rocks were smoothed. The continental glacier began to recede 20,000 years ago and had disappeared completely from New Hampshire's landscape by 14,000 years ago. As the glaciers retreated northward, meltwater created channels along hillslopes and potholes in the bedrock. (Goldthwait, Goldthwait, & Goldthwait, 1951)

Throughout New Hampshire, glacial till covers the modern landscape; average deposit depth is 32 feet, though one deposit near Greenfield measured 395 feet. These deposits contain sediments ranging from fine clays to large boulders. Portions of southern New Hampshire are marked by drumlins;[36] while there are several hundred drumlins in southern portions of the state, few have been documented in the central or northern areas of New Hampshire. (Goldthwait, Goldthwait, & Goldthwait, 1951)

Figure 9.1.3-2 displays the surface geology for New Hampshire.

[34] Slope failure, also referred to as mass wasting, is the downslope movement of rock debris and soil in response to gravitational stresses.
[35] Subsidence: "Gradual settling or sudden sinking of the Earth's surface owing to subsurface movement of earth materials." (USGS, 2000)
[36] Drumlin: "A smooth elliptical hill of bedrock a few hundred or thousand feet long. It is shaped and aligned by the grinding of a glacier." (Goldthwait, Goldthwait, & Goldthwait, 1951)

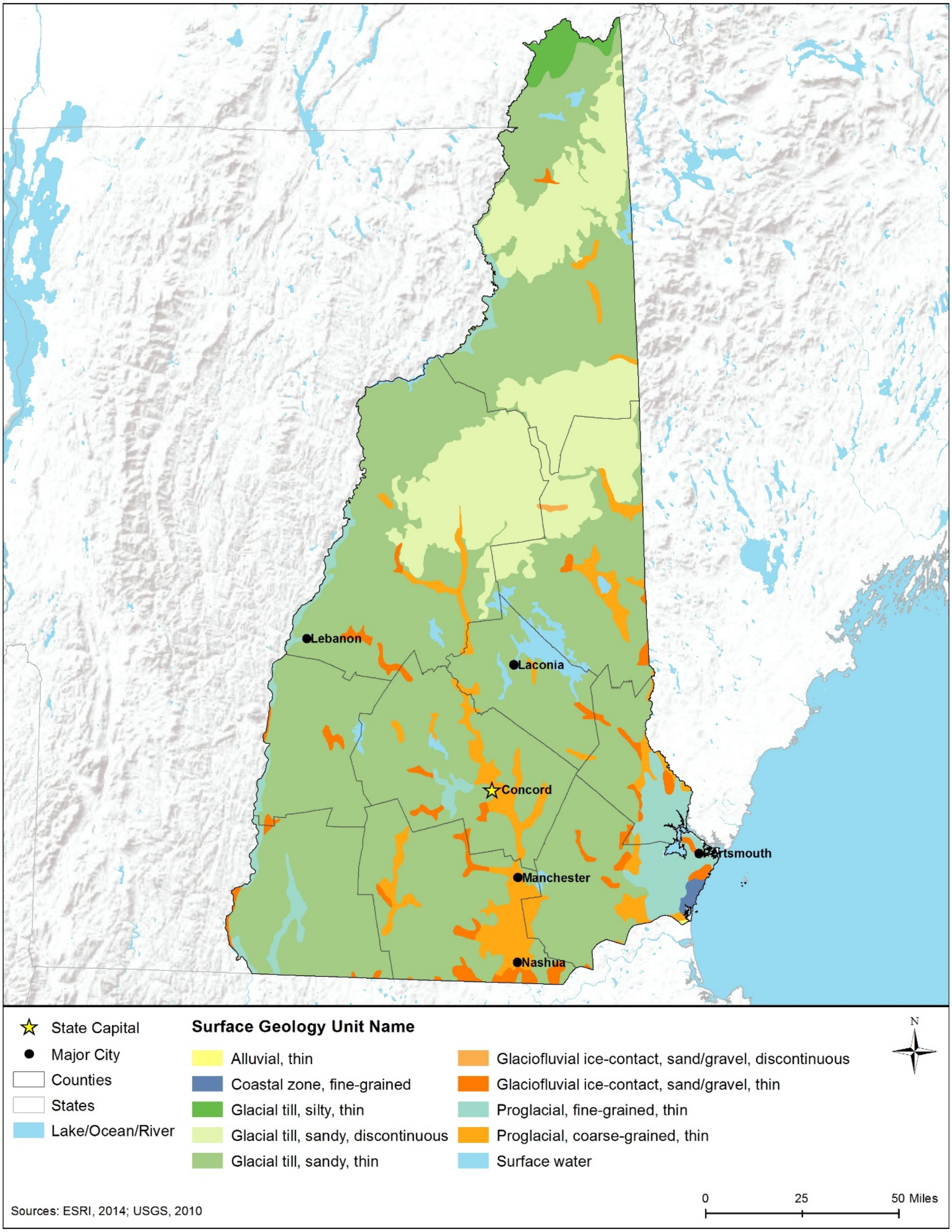


Figure 9.1.3-2: Generalized Surface Geology for New Hampshire

9.1.3.5. 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., 3-dimensional geometry), including dip (slope of the formation),[37] rock composition, and regional tectonism[38]. 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 (NHDES, 2014a).

New Hampshire's bedrock geology reveals more than 400 million years of geologic history. Between 400 and 300 MYA, New Hampshire was under a shallow sea, resulting in the deposition of fine-grained sediments and the subsequent formation of marine sedimentary rocks. Igneous[39] rocks (i.e., granite[40]) "intruded up into the layers of marine sediments" around 300 MYA (Goldthwait, Goldthwait, & Goldthwait, 1951). Between 300 MYA and 250 MYA, these rock bodies were folded and faulted and, in some cases, subjected to sufficient heat and pressure to create metamorphic rocks[41] including schist,[42] gneiss,[43] and quartzite.[44] Additional granite intrusions pushed into New Hampshire's folded rock between 250 MYA and 200 MYA (Goldthwait, Goldthwait, & Goldthwait, 1951). A map of New Hampshire's bedrock geology is included in Figure 9.1.3-3.

The absence of marine deposits during the last 200 MYA suggests that New Hampshire has been undergoing erosion since that period. With the exception of the White Mountains and a few hilltops throughout the other physiographic sections, New Hampshire's landscape has been leveled into a plain. "It is estimated that at least one and in places perhaps several miles thickness of rock have been removed during the repeated cycles of erosion." (Goldthwait, Goldthwait, & Goldthwait, 1951)

[37] 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)
[38] Tectonism: “Structure forces affecting the deformation, uplift, and movement of the earth’s crust.” (USGS, 2015f)
[39] Igneous Rock: "Rock formed when molten rock (magma) that has cooled and solidified (crystallized)." (USGS, 2015g)
[40] Granite: "A coarse-grained intrusive igneous rock with at least 65% silica." (USGS, 2015g)
[41] Metamorphic Rock: "A rock that has undergone chemical or structural changes produced by increase in heat or pressure, or by replacement of elements by hot, chemically active fluids." (USGS, 2015g)
[42] Schist: "Metamorphic rock usually derived from fine-grained sedimentary rock such as shale. Individual minerals in schist have grown during metamorphism so that they are easily visible to the naked eye." (USGS, 2015g)
[43] Gneiss: "A coarse-grained, foliated metamorphic rock that commonly has alternating bands of light and dark-colored minerals." (USGS, 2015g)
[44] Quartzite: "Hard, somewhat glassy-looking rock made up almost entirely of quartz." (USGS, 2015g)

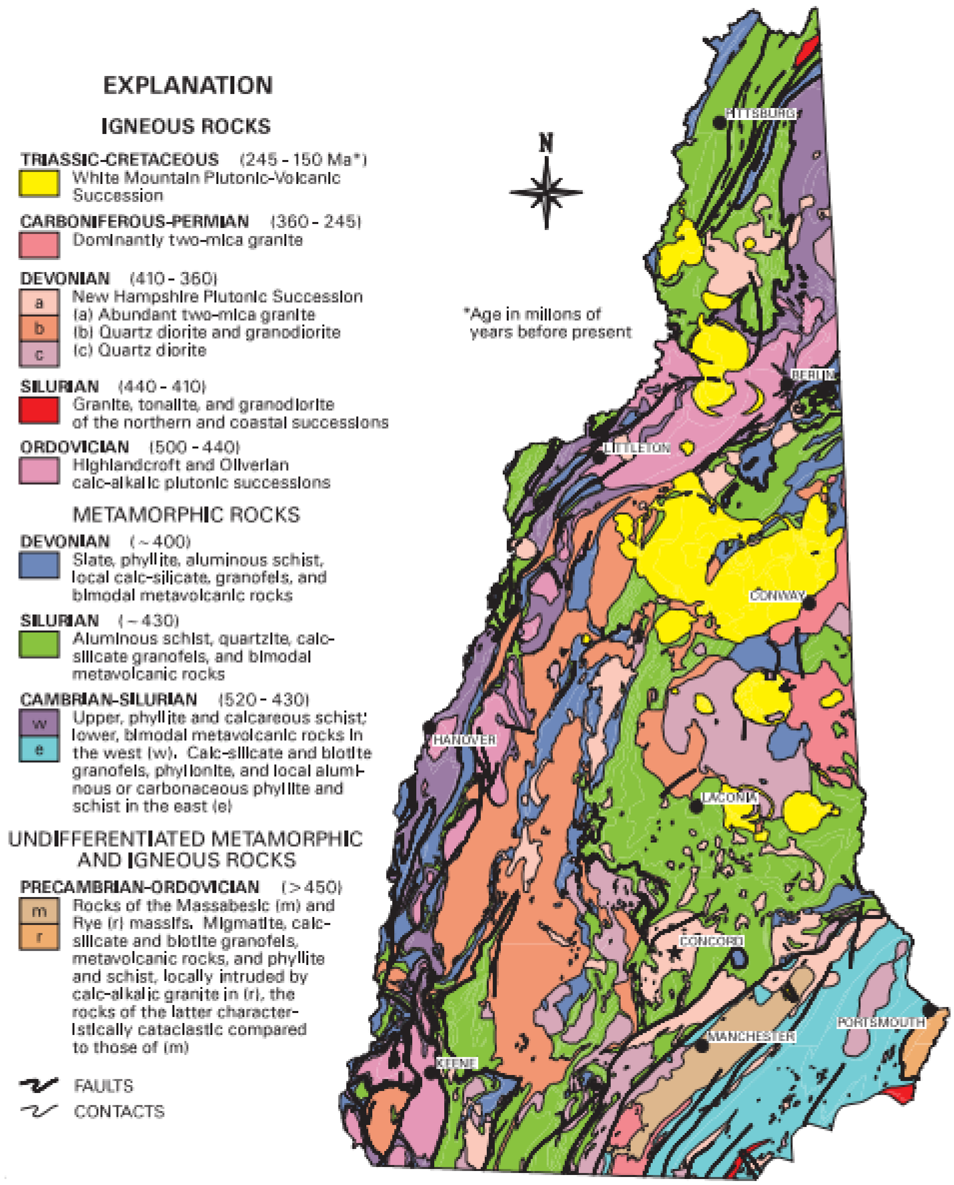


Figure 9.1.3-3: Generalized Bedrock Geology for New Hampshire

Source: (NHDES, 1997)

9.1.3.6. Paleontological Resources

There is little fossil record in New Hampshire, as a result of its metamorphic geology that would have destroyed any fossils in the rocks due to the extensive heat and pressure (PaleoPortal, 2015). A few brachiopods from the Devonian Period (416 to 359 MYA) have been documented in the northwest part of the state (Boucot & Arndt, 1960); plant and pollen fossils from the Cenozoic Era (66 MYA to present) have also been found in this area (PaleoPortal, 2015). New Hampshire does not have state fossil (NPS, 2010).

9.1.3.7. Fossil Fuel and Mineral Resources

Oil and Gas

New Hampshire does not produce petroleum or natural gas. The state relies on imports of these products from other areas. (EIA, 2015b)

Minerals

As of 2015, New Hampshire's total nonfuel mineral production was valued at $111M, ranking 48th nationwide (in terms of dollar value). Together, construction sand and gravel (51 percent) and crushed stone (44 percent) account for more than 95 percent of New Hampshire's total mineral production. Construction sand and gravel production is concentrated in Merrimack County, while Hillsborough and Rockingham Counties are large producers of crushed stone. The balance of New Hampshire's mineral production is largely dimension stone[45]; New Hampshire ranked 13th nationwide in dimension stone production as of 2008. (USGS, 2016).

9.1.3.8. Geologic Hazards

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

Earthquakes

Between 1973 and March 2012, there were six earthquakes of a magnitude-3.5 (on the Richter scale) or greater in New Hampshire (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 (USGS, 2012a).

> **Notable New Hampshire Earthquakes**
>
> The two largest earthquakes ever recorded in New Hampshire were magnitude-5.5 quakes that occurred in December 1940 near Ossipee Lake (roughly 40 miles northeast of Concord). Damage occurred both within New Hampshire and in out-of-state locations including Maine, Massachusetts, New York, and Vermont; shockwaves were felt in places as far north as Quebec and as far south as Pennsylvania (USGS, 2014b).

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 of New Hampshire's earthquakes, typically occur at depths of 6 to 12 miles; these earthquakes typically do not reach magnitudes higher than 6.0 on the Richter scale. Subduction zone earthquakes happen where tectonic plates converge. "When these plates collide, one plate slides (subducts) beneath the other, where it is reabsorbed into the mantle of the earth." Convergence boundaries between two tectonic plates can result in earthquakes with

[45] Dimension stone: "Natural rock material quarried for the purpose of obtaining blocks or slabs that meet specifications as to size (width, length, and thickness) and shape." (USGS, 2015h)

magnitudes that exceed 8.0 on the Richter scale (Oregon Department of Geology, 2015). New Hampshire is located far from any convergence boundaries, but is located in the middle of a tectonic plate (Kafka, 2014).

Figure 9.1.3-4 depicts the seismic risk throughout New Hampshire. Areas of greatest seismicity in New Hampshire are concentrated in the southeast portions of the state (USGS, 2014b). The map indicates levels of horizontal shaking (measured in Peak Ground Acceleration (PGA)) 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[46] (USGS, 2010).

Landslides

New Hampshire's geology is relatively stable and the risk of exposure to landslides "is generally limited to recreational and sparsely populated areas in the North and North Central portion of the state" (New Hampshire Department of Safety, 2013).

"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, rapid snowmelt, 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)

Areas in the White Mountains have the highest risk to landslide in the state, in the form of rockslides and debris avalanches. Coastal areas of New Hampshire's Seaboard Lowland are underlain by marine clay that is also susceptible to landslides (USGS, 1982). Finally, locales along the Connecticut and Merrimack Rivers are at risk to landslides due to the weakness of underlying sedimentary deposits (New Hampshire Department of Safety, 2013). Figure 9.1.3-5 displays landslide susceptibility throughout New Hampshire.

[46] Post-1985 buildings (in California) have experienced only minor damage with shaking of 60% g. (USGS, 2010)

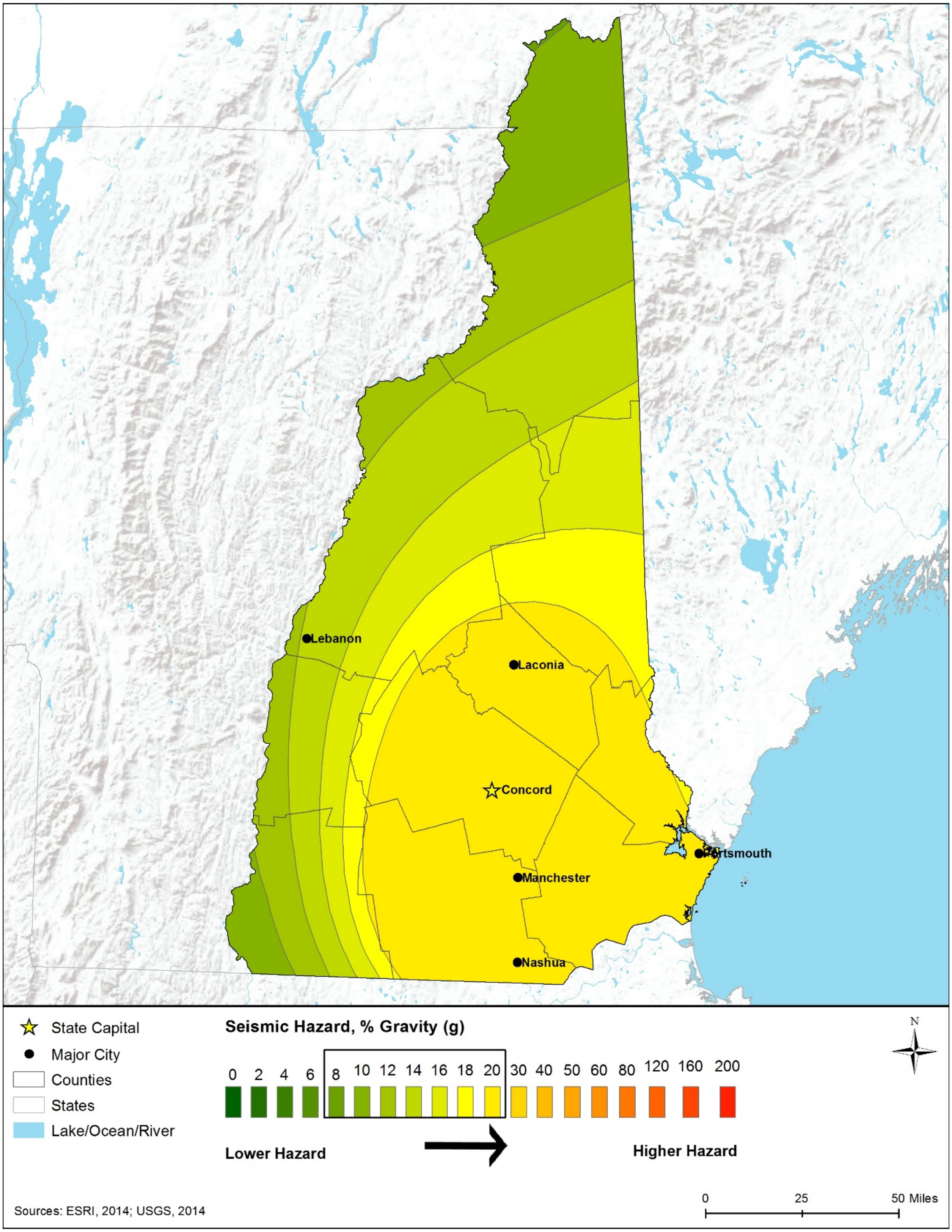
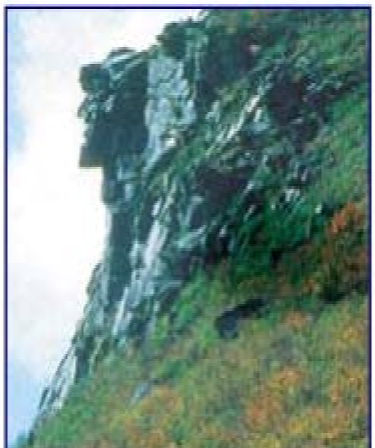


Figure 9.1.3-4: New Hampshire 2014 Seismic Hazard Map

Old Man of the Mountain Landslide (2003)

New Hampshire's most famous recent landslide occurred in May 2003 when the state's symbol, a rock formation in Franconia Notch State Park, commonly known as the "Old Man of the Mountain," collapsed in a natural landslide event. A series of five, 200 million year old granite platforms combined to make up the "Old Man's" profile; the rock formation measured 40 feet in length and 25 feet in width (New Hampshire Parks and Recreation, 2016b). The landmark's 2003 collapse is largely attributed to repeated freeze-thaw activity that expanded existing cracks within its rocks, eventually weakening the rock sufficiently to cause it to fall apart (New Hampshire Department of Safety, 2013).

Photos: Before and After the Collapse of the "Old Man of the Mountain"



(Photo of the Old Man 2000)

(View After the Rock Slide May 3, 2003)

Source: (New Hampshire Department of Safety, 2013)

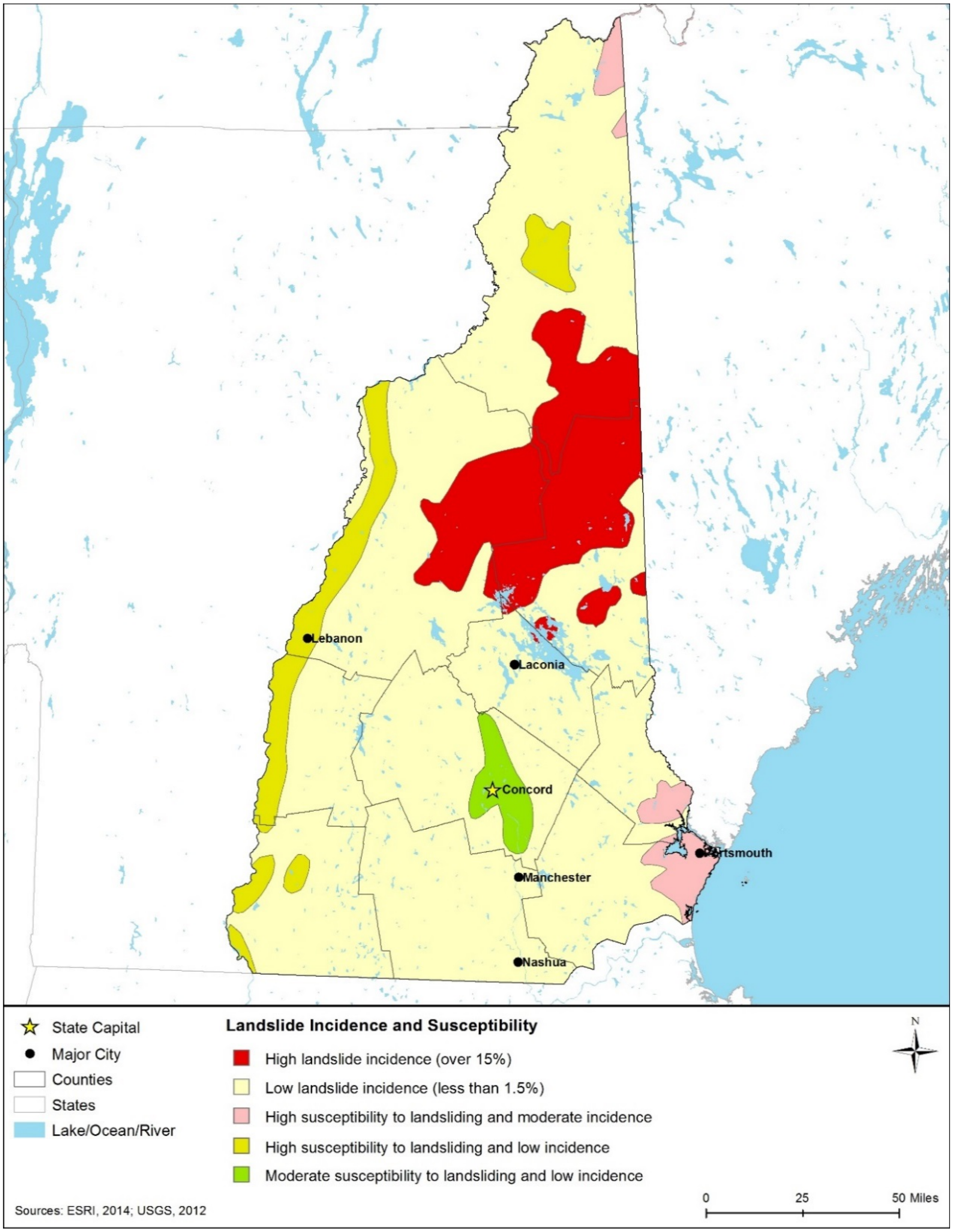


Figure 9.1.3-5: New Hampshire Landslide Incidence and Susceptibility Hazard Map[47]

[47] Susceptibility hazards not indicated in Figure 9.1.3-5 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

Subsidence

Land subsidence is a "gradual settling or sudden sinking of the Earth's surface owing to subsurface movement of earth materials." The main triggers of land subsidence can be aquifer compaction, drainage of organic soils, mining, sinkholes, and thawing permafrost. More than 80 percent of subsidence in the United States is due to 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 lowering of the land surface elevation, which is permanent (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 more susceptible to inundation, both during storm events and non-events. Lowered terrain is more susceptible to inundation during high tides. Changes in ground-surface elevation not only affect the integrity and operation of existing infrastructure, but also complicate vegetation and best management of land use. (USGS, 2013b)

The threat of land subsidence in New Hampshire is minimal due to a lack of karst topography (USGS, 2006a), limited potential for subsidence due to aquifer compaction (USGS, 2000), and lack of organic soils (USGS, 2000). The 2013 State of New Hampshire Multi-Hazard Mitigation Plan indicates that "subsidence has been removed from the Plan as a hazard due to the few historical instances, low risk and low probability of it occurring in the state" (New Hampshire Department of Safety, 2013).

9.1.4. Water Resources

9.1.4.1. Definition of the Resource

Water resources are defined as all surface water bodies and groundwater systems including streams, rivers, lakes, canals, ditches, estuarine waters, floodplains, aquifers, and other aquatic habitats (wetlands are discussed separately in Section 9.1.5). These resources can be grouped into watersheds, which 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, 2014c)

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the incidence of landslides. Some generalization was necessary at this scale, and several small areas of high incidence and susceptibility were slightly exaggerated. (USGS, 2014f)

9.1.4.2. Specific Regulatory Considerations

Federal laws relevant to protecting the quality and use of water resources are summarized in Appendix C. Table 9.1.4-1 identifies relevant state water laws and regulations in New Hampshire.

Table 9.1.4-1 Relevant New Hampshire Water Laws and Regulations

State Law/Regulation	Regulatory Agency	Applicability
Drinking Water Source Protection Program	NHDES	Temporary (120 days or less) discharges to the ground or groundwater with the potential to contaminate surface water or wetlands requires a permit (NHDES, 2012).
		Any discharge of wastewater to the ground or groundwater requires a permit (NHDES, 2015g).
Shoreland Water Quality Protection Act	NHDES	New excavation, construction, or filling activities within protected shoreland (250 feet from the water's edge) must have appropriate erosion and sedimentation controls in accordance with the Alteration of Terrain Program. (NHDES, 2010a)
Water Quality Certification Program	NHDES	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 NHDES indicating that the proposed discharge will meet the state's water quality standards. (NHDES, 2014b)
National Pollutant Discharge Elimination System (NPDES) program	NHDES	Any point source discharge or disposal of any waste or sewage to surface water requires a permit (NHDES, 2014c).

9.1.4.3. Environmental Setting: Surface Water

Surface water resources are lakes, ponds, rivers, and streams, as well as estuarine[48] and coastal waters. There are more than 16,000 miles of streams and rivers in New Hampshire (New Hampshire Department of Safety, 2013).

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). New Hampshire's waters (lakes, rivers, and streams) are divided into five major watersheds, or drainage basins (Figure 9.1.4-1). NH Appendix A, Table A-1: Characteristics of New Hampshire's Watersheds, provides detailed information on the state's major watersheds, as defined by NHDES. The Merrimack River Watershed, the largest in the state in terms of square miles, drains approximately 40 percent of the state and has the most ponds and lakes within its boundaries. The second largest is the Connecticut River Watershed, which drains about one-third of the state. (NHDES, 2008a)

[48] 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, 2015b)

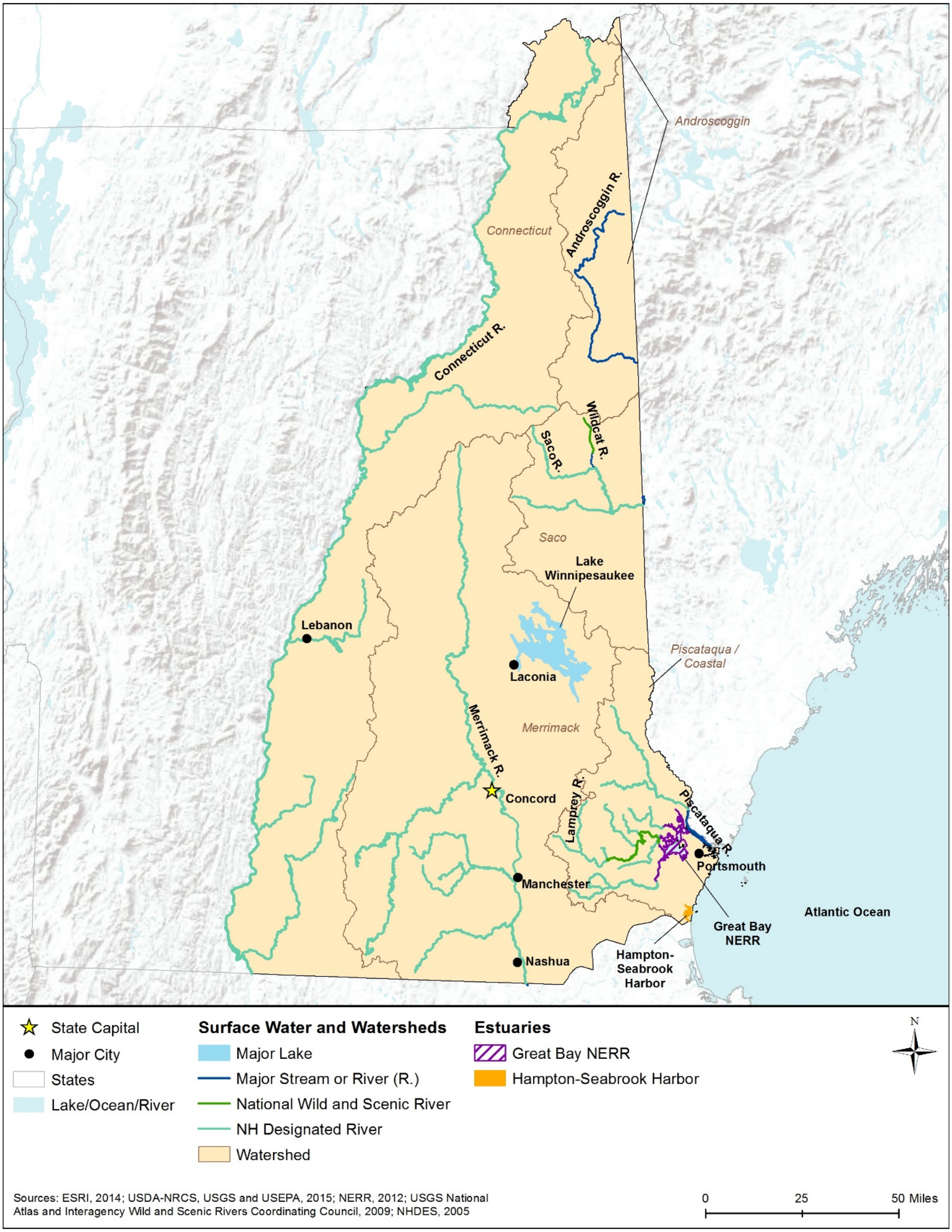

Figure 9.1.4-1 Major New Hampshire Watersheds, Surface Waterbodies, and Estuaries

Freshwater

As shown in Figure 9.1.4-1, major rivers in New Hampshire include Connecticut, Androscoggin, Merrimack, Saco, and Piscataqua. The Connecticut River is the longest river in the state, and serves as the border between New Hampshire and Vermont. New Hampshire also contains more than 4,000 lakes and ponds, with close to 1,000 lakes measuring more than 10 acres in size. (NHDES, 2008b)

The largest lake in the state is Lake Winnipesaukee, covering a surface area of over 44,000 acres and a total watershed of more than 224,000 acres (Moultonborough Conservation Commission, 2014). Although a few lakes in the state are used for public water supply, most are open for recreational activities such as swimming, boating, and fishing. Common water quality issues for lakes and ponds in New Hampshire include high mercury concentrations and acid pollution from atmospheric deposition, and impacts from road salt runoff that include chloride concentrations toxic to aquatic life. Urban development has also contributed to greater phosphorus and road salt loading into lakes and ponds, as well as rivers and streams, and some surface water sources in the state face issues from invasive species and climate change. (NHDES, 2008b)

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 from ocean waves and storms. Estuarine environments support a variety of habitats, including tidal wetlands, mudflats, rocky shores, oyster reefs, freshwater wetlands, sandy beaches, and eelgrass beds, and are a critical part of the life cycle of many different plant and animal species. (USEPA, 2012a)

New Hampshire's total coastal area encompasses approximately 18 miles of Atlantic coastline and approximately 220 miles of estuarine shoreline. The coastal area includes three coastal environments: the Great Bay and its tributaries, the Hampton-Seabrook Estuary, and the Atlantic coastline. These environments provide habitat for over 130 rare species, are major tourist destinations, and are areas experiencing the fastest population growth in the state. (NHDES, 2008c)

New Hampshire has two major estuaries located in the southeastern corner of the state (Figure 9.1.4-1):

- The **Great Bay Estuary** stretches along 144 miles of estuarine shoreline, and covers approximately 13,000 acres. It is the largest estuary in New Hampshire, and is a National Estuarine Research Reserve (NERR). At a distance of ten miles inland, it is one of the most recessed estuaries on the Atlantic Coast. The Great Bay Estuary has a watershed of just over 1,000 square miles in New Hampshire and Maine, and its tributaries include the Cocheco, Exeter, Lamprey, Oyster, and Salmon Falls rivers (NHDES, 2008c). Many different habitats are found in and around the estuary, including forests, upland fields, tidal creeks, mudflats, salt marshes, and eelgrass beds (NOAA, 2015a). Nutrient loading into the estuary is a concern, as is fecal coliform bacteria from stormwater and other nonpoint source pollution flowing into the bay. Additional issues affecting the water quality of the bay are increased mooring permits that result in oil or fuel contamination, sewage releases, and physical damage from the moorings, along with dams constructed in upstream tributaries that are obstacles for fish migration. (NHDES, 2008c). For more information, go to http://nerrs.noaa.gov/reserves/great-bay.html

- The **Hampton-Seabrook Harbor** encompasses approximately 1,100 acres and includes approximately 70 miles of estuarine shoreline.[49] It is located behind the barrier beaches of the Atlantic coast. It is a popular tourist destination, with some of the last remaining sand dunes along the coast of New Hampshire. Some of the most productive clam flats in the state are found at the harbor, and approximately 5,000 acres of salt marsh surround it. (NHDES, 2008c)

Figure 9.1.4-2. Great Bay NERR

Source: (NOAA, 2015f)

9.1.4.4. Sensitive or Protected Waterbodies

Wild and Scenic Rivers

The Lamprey River, between Epping and the confluence with the Piscassic River (Figure 9.1.4-1) is a federally designated National Wild and Scenic River in New Hampshire (National Wild and Scenic Rivers System, 2015a). This nearly 24-mile stretch of river, including its wetlands, floodplain, and shoreline, provides a number of wildlife habitats, including the greatest quantity of anadromous[50] fish within the Great Bay watershed (National Wild and Scenic Rivers System, 2015b). The Wildcat Brook in Eastern New Hampshire is also a federally designated National Wild and Scenic River, and includes three separate stretches of river that total nearly 15 miles. It begins in White Mountain National Forest and includes areas of scenic and recreational value, as well as high-quality water. (National Wild and Scenic Rivers System, 2015c)

State Designated Critical Resource Waters

In 1988, New Hampshire created the Rivers Management and Protection Program (RMPP) to protect specific Designated Rivers. The Rivers Management and Protection Act, protects these rivers for their outstanding natural and cultural resources, pursuant to New Hampshire Revised Statues Annotated (RSA) 483. NHDES administers the RMPP, and currently includes nearly 1,000 miles of rivers and streams throughout the state. A list of current Designated Rivers can be found at des.nh.gov/organization/divisions/water/wmb/rivers/desigriv.htm (NHDES, 2014d).

[49] Estuarine shoreline includes the entire length of the harbor shoreline and is separate from coastal shoreline.

[50] Anadromous: " Species that live their adult lives in the ocean but move into freshwater streams to reproduce or spawn (e.g., salmon)." (NOAA, 2014)

9.1.4.5. 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,[51] the causes of impairment, and probable sources. Table 9.1.4-2 summarizes the water quality of New Hampshire's assessed major waterbodies by category, percent impaired, designated use,[52] cause, and probable sources. Figure 9.1.4-3 shows the Section 303(d) waters in New Hampshire as of 2010.

Table 9.1.4-2 shows the various sources causing impairments to New Hampshire's waterbodies. All of New Hampshire's rivers and streams, lakes, reservoirs, and ponds, and estuaries and bays are impaired. Elevated mercury levels are found in freshwater sources throughout the state; most of this comes from atmospheric deposition.[53] There is also a statewide ban on freshwater fish consumption due to mercury concentrations found in fish tissue (NHDES, 2008a). Designated uses of the impaired rivers and streams, along with lakes, reservoirs, and ponds, include aquatic life and primary contact recreation. Additionally, designated uses of estuaries and bays include fish and shellfish consumption, along with aquatic life. (USEPA, 2015a)

Table 9.1.4-2 Section 303(d) Impaired Waters of New Hampshire, 2010

Water Type[a]	Amount of Waters Assessed (Percent)	Amount Impaired (Percent)	Designated Uses of Impaired Waters	Top Causes of Impairment	Top Probable Sources for Impairment
Rivers and Streams	100%	100%	aquatic life, drinking water supply, fish consumption, primary contact recreation	Mercury, pH, pathogens[b] such as e. coli	atmospheric deposition, unknown sources, urban runoff/stormwater
Lakes, Reservoirs, and Ponds	100%	100%	aquatic life, fish consumption, primary contact recreation	mercury, pH, non-native aquatic plants, dissolved oxygen saturation	atmospheric deposition, unknown sources, naturally occurring organic acids
Estuaries and Bays	100%	100%	Fish and shellfish consumption, aquatic life	Dioxins, mercury, polychlorinated biphenyls	Atmospheric deposition, unknown sources

[a] Some waters may be considered for more than one water type
[b] Pathogen: a bacterium, virus, or other microorganism that can cause disease (USEPA, 2015b).

Source: (USEPA, 2015a)

[51] 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, 2015b)
[52] 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, 2015b)
[53] 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, 2015b)

9.1.4.6. Floodplains

Floodplains are lowlands along inland or coastal waters, including flood-prone areas of offshore islands. 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] 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 New Hampshire:

- **Riverine floodplains** occur along rivers and streams where overbank flooding may occur, inundating adjacent land areas. In mountainous areas, floodwaters can build and recede quickly, with fast moving and deep water. Flooding in these areas can cause greater damage than typical riverine flooding due to the high velocity of water flow, the amount of debris carried, and the broad area affected by floodwaters. Whereas, flatter floodplains may remain inundated for days or weeks, covered by slow-moving and shallow water. (FEMA, 2014b)
- **Coastal floodplains** in New Hampshire borders the Atlantic Ocean coastline. Coastal flooding can occur when strong wind and storms, usually nor’easters and hurricanes, increase water levels on the adjacent shorelines. (FEMA, 2013)

There are several causes of flooding in New Hampshire, often resulting in loss of life and damage to property, infrastructure, agriculture, and the environment. These include severe rain events, hurricanes and storm surge, debris and ice jams, and rapid snowmelt. (New Hampshire Department of Safety, 2013)

Although some areas, such as floodplains, are more prone to flooding than others, no area in the state is exempt from flood hazards. New Hampshire has a high risk for flooding across the state, but in particular, Hillsborough County (including the cities of Manchester and Nashua) and Merrimack County (including the city of Concord, the state capital) are more susceptible to flooding, and therefore more vulnerable to flood damage. (New Hampshire Department of Safety, 2013)

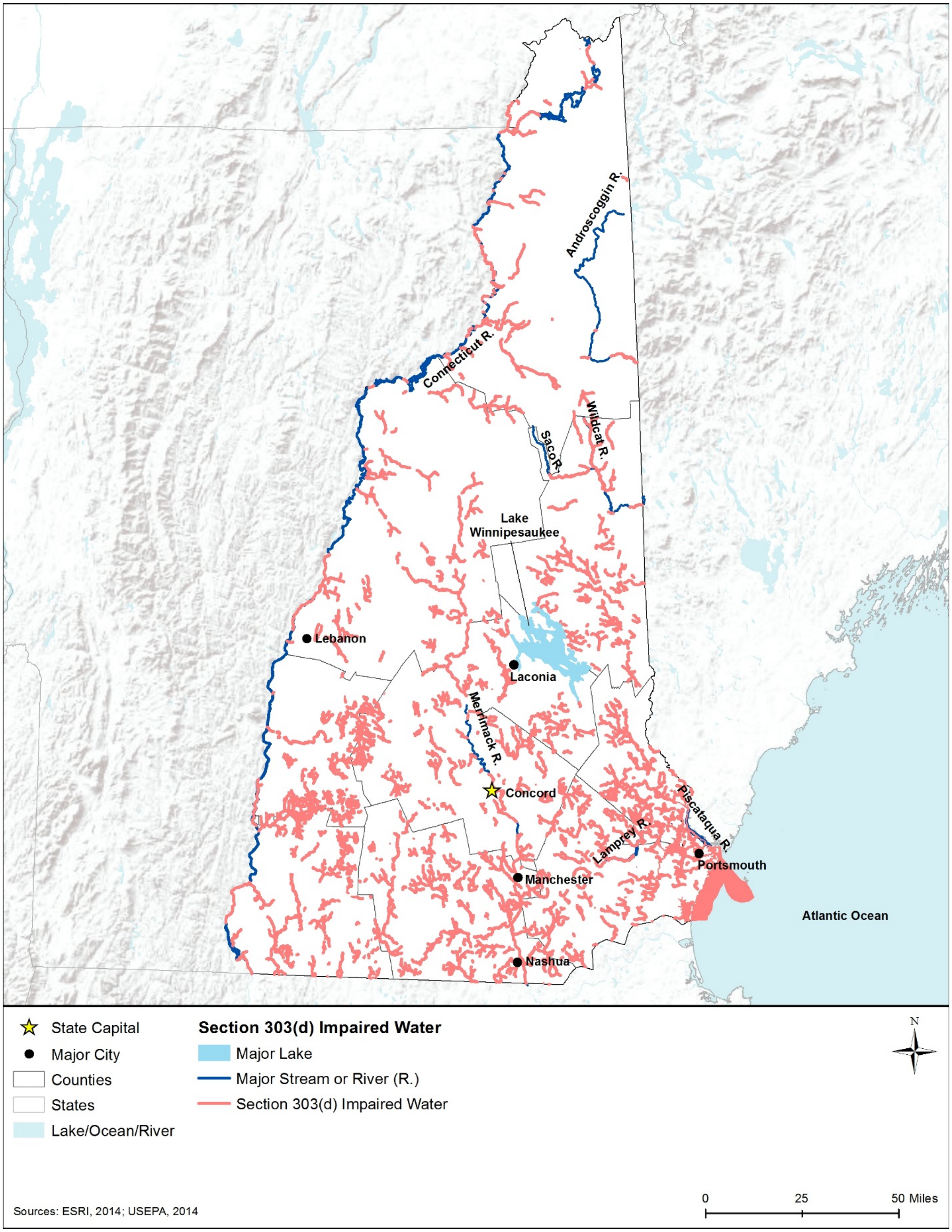

Figure 9.1.4-3 Section 303(d) Impaired Waters of New Hampshire, 2010

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 almost 200 communities in the state through the National Flood Insurance Program (NFIP) (FEMA, 2014c). Established to reduce the economic and social cost of flood damage by subsidizing insurance 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, 2015). As an incentive, communities can voluntarily participate in the NFIP Community Rating System (CRS), 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, the state had five communities participating in the CRS (FEMA, 2014c).[54]

9.1.4.7. 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, 1999b). 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.

New Hampshire's principal aquifers consist of sand and gravel aquifers of alluvial and glacial origin.[55] Over one-half of New Hampshire's population draws its drinking water from the state's groundwater resources. Generally, the water quality of New Hampshire's principal aquifers is suitable for drinking and daily water needs (NHDES, 2015h). However, domestic and small public supply drinking water wells are typically drilled into bedrock, where naturally occurring contaminants such as radon and arsenic can be an issue (NHDES, 2010b).

Table 9.1.4-3 provides details on aquifer characteristics; Figure 9.1.4-4 shows New Hampshire's principal aquifers. There are no sole source aquifers in New Hampshire (USEPA, 2014a).

[54] A list of the five CRS communities can be found in the most recent FEMA CRS report dated May 1, 2014 (http://www.fema.gov/media-library-data/1398878892102-5cbcaa727a635327277d834491210fec/CRS_Communites_May_1_2014.pdf) and additional program information is available from FEMA's NFIP CRS website (www.fema.gov/national-flood-insurance-program-community-rating-system.)

[55] Sand and gravel aquifers of alluvial (sand, silt, or gravel materials left by river waters) and glacial origin are highly productive aquifers in the northern part of the country, consisting of mostly sand and gravel deposits formed by melting glaciers. (USGS, 2015i)

Table 9.1.4-3 Description of New Hampshire's Principal Aquifers

Aquifer Type and Name	Location in State	Groundwater Quality
Aquifers of Alluvial and Glacial Origin These aquifers consist mainly of the sand, gravel, and bedrock eroded by the glaciers.	Found along river valleys and in large outwash plains all over the state	Suitable for most uses, water is typically slightly soft and acidic with small concentrations of dissolved solids

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

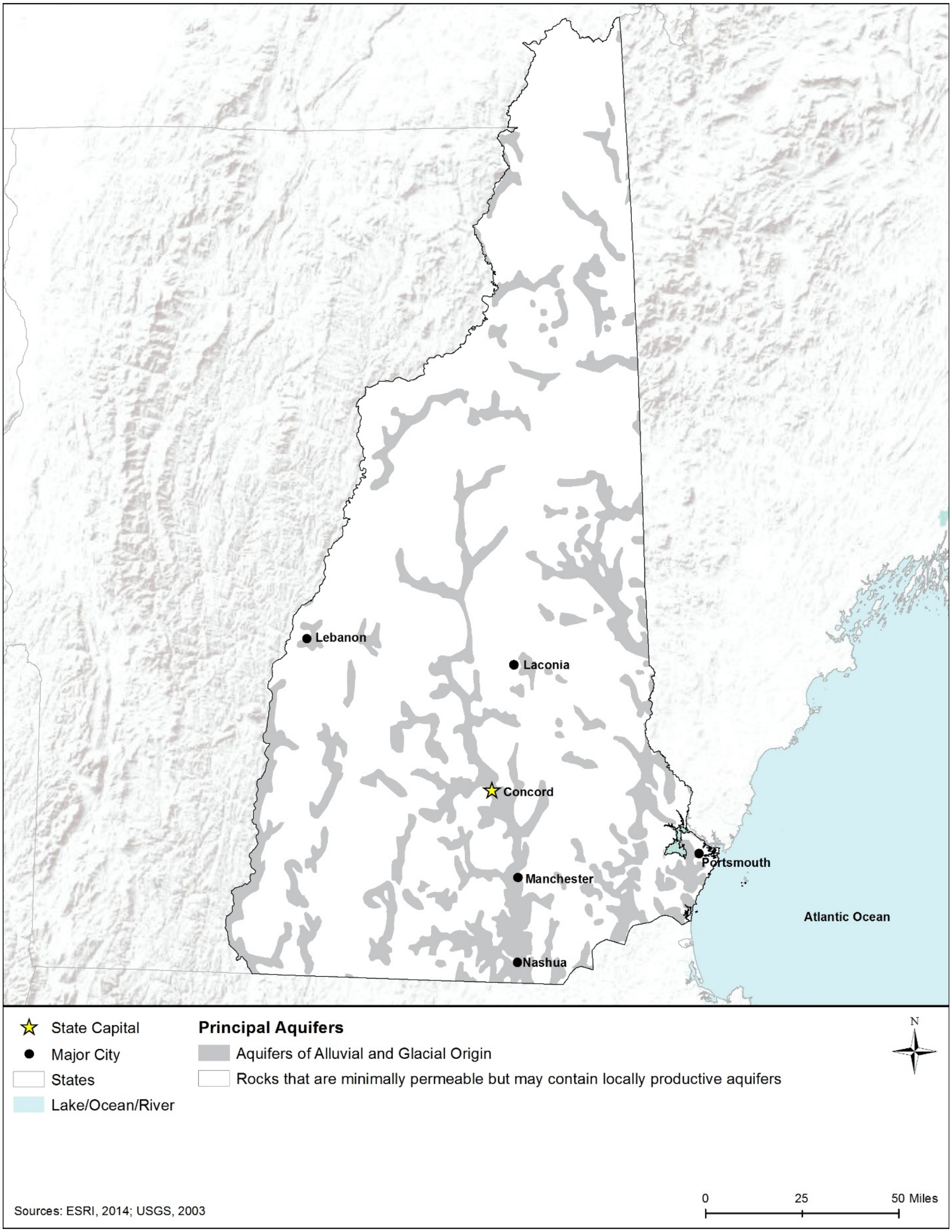

Figure 9.1.4-4 Principal and Sole Source Aquifers of New Hampshire Wetlands

9.1.5. Wetlands

9.1.5.1. Definition of the Resource

The Clean Water Act (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 Environmental Protection Agency (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 (USEPA, 2015c). Additionally, wetlands provide recreation opportunities for people, such as hiking, bird watching, and photography.

9.1.5.2. Specific Regulatory Considerations

Appendix C explains the pertinent federal laws to protecting wetlands in detail. Table 9.1.5-1 summarizes the major New Hampshire state laws and permitting requirements relevant to the state's wetlands.

Table 9.1.5-1. Relevant New Hampshire Wetland Laws and Regulations

State Law/Regulation	Regulatory Agency	Applicability
Fill and Dredge in Wetlands Act (Revised Statues Annotated [RSA] 482-A)	NHDES	Any activity within jurisdictional areas that involves excavating, removing, filling, dredging, or constructing structures requires a permit for the NHDES Wetlands Bureau. Jurisdictional areas include surface waters, wetlands, sand dunes, the prime wetland buffer (measured as 100 feet upland from wetlands that have been designated as prime wetlands by a municipality), and the tidal buffer zone (measured as 100 feet landward from the highest observable tide line) (NHDES, 2014e)
Shoreland Water Quality Protection Act (RSA 483-B)	NHDES	New excavation, construction, or filling activities within protected shoreland (250 feet from the water's edge) must have appropriate erosion and sedimentation controls in accordance with the Alteration of Terrain Program (RSA 485-A:17 and Env-Wq 1500). (NHDES, 2010a)
Water Quality Certification Program	NHDES	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 NHDES indicating that the proposed discharge will meet the state's water quality standards. (NHDES, 2014b)

9.1.5.3. 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 et al. (1979). The WCS includes five major wetland systems: Marine, Estuarine, Riverine, Lacustrine, and Palustrine (detailed in Table 9.1.5-2). The first four include both wetlands and deepwater habitats but the Palustrine includes only wetland habitats. (USFWS, 2015a)

- The Marine System consists of open ocean, continental shelf, including beaches, rocky shores, lagoons, and shallow coral reefs. Normal marine salinity (saltiness) to hypersaline (more than 35 percent salty) water chemistry; minimal influence from rivers or 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 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 of 0.5 ppt or greater.
- Lacustrine System includes inland water bodies that are situated in topographic depressions, lack emergent trees and shrubs, have less than 30 percent vegetation cover, and occupy at least 20 acres. Includes lakes, larger ponds, sloughs, lochs, bayous, etc.
- Palustrine includes all nontidal wetlands dominated by trees, shrubs, persistent emergent plants, or emergent mosses or lichens, and all wetlands that occur in tidal areas where the salinity is below 5 percent. The System is characterized based on the type and duration of flooding, water chemistry, vegetation, or substrate characteristics (soil types). (Cowardin et al., 1979)

In New Hampshire, the two main types of wetlands are palustrine (freshwater) wetlands found on river and lake floodplains across the state, and estuarine/marine (tidal) wetlands found along estuaries and the Atlantic Ocean coastline. Table 9.1.5-1 uses 2014 NWI data to characterize and map New Hampshire wetlands on a broad-scale. The data are not intended for site-specific analyses and are not a substitute for field-level wetland surveys, delineations, or jurisdictional determinations which may be conducted, as appropriate, at the site-specific level once those locations are known. The map codes and colorings in Table 9.1.5-2 correspond to the wetland types in Figure 9.1.5-1.

Table 9.1.5-2. New Hampshire Wetland Types, Descriptions, Location, and Amount, 2014

Wetland Type	Map Code and Color	Description	Occurrence	Amount (acres)[a]
Palustrine forested wetland	PFO	PFO wetlands contain woody vegetation that are at least 20 feet tall. Floodplain forests, hardwood swamps, and silver maple-ash swamps are examples of PFO wetlands.	Throughout the state	210,577
Palustrine scrub-shrub wetland	PSS	Woody vegetation less than 20 feet tall dominates PSS wetlands. Thickets and shrub swamps are examples of PSS wetlands.		

Wetland Type	Map Code and Color	Description	Occurrence	Amount (acres)[a]
Palustrine emergent wetlands	PEM	Palustrine emergent 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,[56] prairie potholes, and sloughs.	Throughout the state	43,908
Palustrine unconsolidated bottom	PUB	PUB and PAB 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%.	Throughout the state	26,636
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[57], and other miscellaneous wetlands are included in this group.	Throughout the state	36
Riverine wetland	R	Riverine systems include rivers, creeks, and streams. They are contained in natural or artificial channels periodically or continuously containing flowing water.	Found along rivers throughout the state	1,486
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, including any areas with abundant submerged or floating-leaved aquatic vegetation. These wetlands are generally less than 8.2 feet deep.	Found around lakes throughout the state	918
Estuarine and Marine intertidal wetland	E2/M2	These intertidal wetlands include the areas between the highest and lowest tide levels. Semidiurnal tides (two high 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.	Great Bay Estuary, Hampton-Seabrook Estuary, and along the Atlantic Coast	6,612

[a] 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)

Source: (Cowardin et al., 1979) (USFWS, 2015a)

[56] Fens are nutrient-rich, grass- and sedge-dominated emergent wetlands that are recharged from groundwater and have continuous running water. (Edinger, et al., 2014)

57 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)

Palustrine Wetlands

Palustrine wetlands are the dominant wetland type in New Hampshire, and account for approximately 96 percent of all wetlands in the state. Nearly 50 percent of palustrine wetlands are forested, while one-quarter are palustrine scrub-shrub (PSS – see Table 9.1.5-2), and the other quarter includes palustrine emergent wetlands (PEM – see Table 9.1.5-2) and ponds. (USFWS, 2007)

Forested wetlands are found throughout the state, and are usually found in stagnant or isolated basins, with reduced drainage and deep, saturated organic soils. Forested wetlands in the northern part of the state are typically dominated by black spruce, American larch, red spruce, and balsam fir, along with shrub thickets of species such as mountain holly. Forested wetlands in central and southern New Hampshire are usually characterized by red maple with a tall shrub understory typically dominated by highbush blueberry and winterberry. Threats to these wetlands include dredging and filling from population growth in the southeastern part of the state, impacts from invasive insect species (particularly hemlock woolly adelgid [*Adelges tsugae*]), and timber harvesting that damages vegetation structure and decaying debris, and results in compaction and rutting of the soil and subsequent sediment runoff. (NHFG, 2015a)

Estuarine and Marine Wetlands

Estuarine wetlands comprise about three percent of the state's wetland areas. Of these, the most common are emergent wetlands, such as brackish and salt marsh (USFWS, 2007). The majority of salt marsh in New Hampshire is found along the coastline, with about 10 percent found in and around the Great Bay Estuary. These marshes provide habitat for insects, crustaceans, fish, and migratory birds, including a number of species of special concern in New Hampshire, such as the saltmarsh sharp-tailed sparrow, Nelson's sharp-tailed sparrow, and willet. It is estimated that between 30 and 50 percent of the original salt marsh habitat in New Hampshire has been destroyed by development. The greatest threats to salt marsh habitat include sea level rise, restricted tidal flow due to roads and culverts, oil spills from marine vessels, and shoreline hardening structures (sea walls, rip rap, etc.) that can directly or indirectly alter sediment dynamics and localized hydrology in the wetland. (NHFG, 2015a)

Figure 9.1.5-2. Salt Marsh

Source: (NHFG, 2015a)

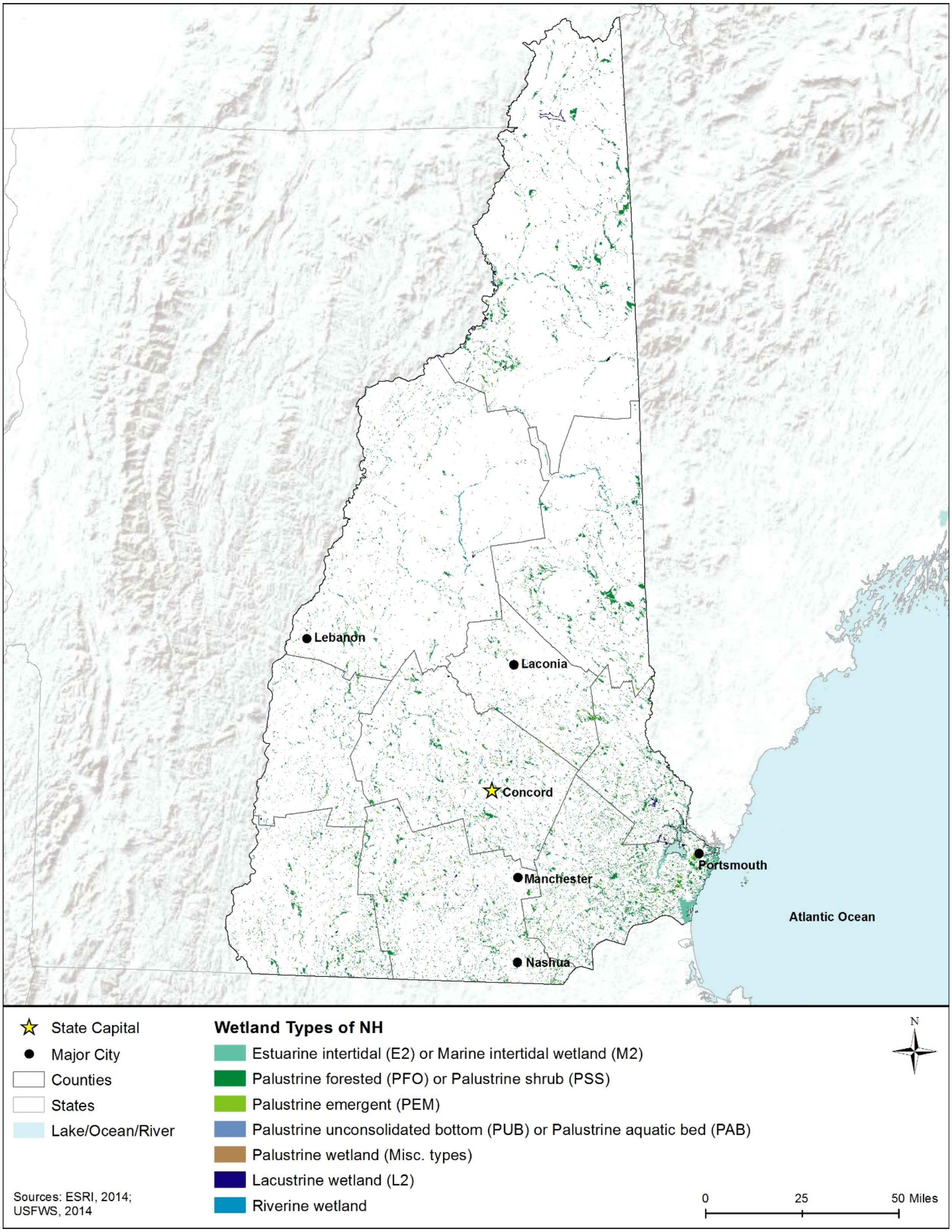

Figure 9.1.5-1. Wetlands by Type, New Hampshire, 2014

Riverine and Lacustrine Wetlands

Riverine and lacustrine wetlands are those associated with river and lake systems, respectively, and make up less than one percent of the state's wetlands (USFWS, 2007), and thus are not discussed in this document.

9.1.5.4. Wetlands of Special Concern or Value

In addition to protections under the state's Fill and Dredge in Wetlands Act, Shoreland Water Quality Protection Act, and national CWA, New Hampshire also allows municipalities to designate certain high quality ("prime") wetlands for further protections, under RSA 482-A:15 and Env-Wt 700. These "prime wetlands" can be either tidal or nontidal, and are usually highly valued based on their large size, unspoiled character, and ability to support rare or threatened plant and animal species populations. After evaluation for designation via both field and desk top analysis, residents of a municipality will vote on adoption of the prime wetland. After the NHDES then formally accepts the designation, the prime wetland, along with a 100 foot buffer, are afforded further protections under New Hampshire wetlands law. These protections include a more stringent burden of proof on project proposals in the wetland or buffer zone that the proposed project is the alternative with the least impact, and that the proposed project will not result in a net loss of any of the wetland's values. Maps of different municipal wetlands can be located at http://des.nh.gov/organization/divisions/water/wetlands/prime_wetlands.htm (NHDES, 2008d) (NHDES, 2014f).

Other important wetland sites in New Hampshire include:

- Wildlife Management Areas are designated for outdoor recreation; these public lands include more than 52,000 acres (NHFG, 2015b).
- National Natural Landmarks range in size from smaller than five acres to over 4,000 acres, and are owned by the USFWS, U.S. Forest Service (USFS), the New Hampshire Division of Parks, New Hampshire municipalities, The Nature Conservancy, and the New Hampshire Audubon Society (NPS, 2014a).
- Other wetlands protected under easements or agreements through voluntary government programs and resource conservation groups are found across the state, including the NRCS Agricultural Conservation Easement Program, USFS, and easements managed by natural resource conservation groups such as state land trusts, The Nature Conservancy, and Monadnock Conservancy. According to the National Conservation Easement Database, a national electronic repository of government and privately held conservation easements (http://conservationeasement.us/), NRCS holds more than 12,000 acres in conservation easements in New Hampshire (NCED, 2015).

For more information on New Hampshire's wildlife management areas, National Natural Landmarks, conservation programs, and easements, see Section 9.1.8, Visual Resources and Section 9.1.7, Land Use, Recreation, and Airspace.

9.1.6. Biological Resources

9.1.6.1. Definition of the Resource

This Chapter describes the biological resources of New Hampshire. Biological resources include terrestrial[58] vegetation, wildlife, fisheries and aquatic[59] habitats[60], and threatened[61] and endangered[62] species as well as species of conservation concern. Wildlife habitat and associated biological ecosystems are also important components of biological resources. Due to the significant topographic variation and coastal communities within the state, New Hampshire supports a wide diversity[63] of biological resources (NHNHB, 2015). Each of these topics is discussed in more detail below.

9.1.6.2. Specific Regulatory Considerations

The pertinent federal laws relevant to the protection and management of biological resources in New Hampshire are summarized in detail in Appendix C. Table 9.1.6-1 summarizes major state laws relevant to New Hampshire's biological resources.

Table 9.1.6-1. Relevant New Hampshire Biological Resources Laws and Regulations

State Law/Regulation	Regulatory Agency	Applicability
New Hampshire Prohibited Invasive[64] Species (New Hampshire Administrative Rules [NHAR] Part Agr. 3802)	New Hampshire Department of Agriculture Markets and Food (NHDAMF)	Deems it illegal for any person to collect, transport, import, export, move, buy, sell, distribute, propagate or transplant any living and viable portion of any plant species listed as prohibited. No person shall collect, transport, import, export, move, buy, sell, distribute, propagate or release any living insect species listed as prohibited.
Prohibited aquatic invasive species	New Hampshire Fish and Game (NHFG)	Deems it unlawful to possess, sell, import, or release any aquatic species listed as prohibited.
Regulated release of exotic[65] fish	NHFG	Deems it illegal to release any exotic fish, amphibian, reptile, or invertebrate into the waters of the state.

58 Terrestrial: "Pertaining to land." (USEPA, 2015l)

59 Aquatic: "Pertaining to water." (USEPA, 2015l)

60 Habitat: "The environment in which an organism or population of plants or animals lives; the normal kind of location inhabited by a plant or animal." (USFWS, 2015u)

61 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)). (USEPA, 2015l)

62 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)). (USEPA, 2015l)

63 Diversity: "An ecological measure of the variety of organisms present in a habitat." (USEPA, 2015l)

64 Invasive: "These are species that are imported from their original ecosystem. They can out-compete native species as the invaders often do not have predators or other factors to keep them in check." (USEPA, 2015l)

65 Exotic: "A non-native plant or animal introduced from another geographic area." (USEPA, 2015l)

9.1.6.3. Terrestrial Vegetation

The distribution of flora within the state is a function of the characteristic geology[66], soils, climate[67], and water of a given geographic area and correlates with distinct areas identified as ecoregions[68]. Ecoregions are broadly defined areas that share similar characteristics, such as climate, geology, soils, and other environmental conditions and represent ecosystems of regional extent. 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 geographic regions of a state.

New Hampshire is comprised of two primary geographic regions: the Appalachian Mountains and Coastal New Hampshire. Coastal New Hampshire covers the southeastern corner of the state and the Appalachian Mountains cover the remainder, primarily the northern half of the state. The ecoregions mapped by the USEPA are the most commonly referenced, although individual states and organizations have also developed ecoregions that may differ slightly from those designated by the USEPA. The USEPA Level I ecoregion is the coarsest level, dividing North America into 15 ecological regions. Level II further divides the continent into 50 regions. The continental U.S. contains 104 Level III ecoregions and the conterminous United States has 84 ecoregions. This Section provides an overview of the terrestrial vegetation resources for New Hampshire at USEPA Level III (Griffith, et al., 2009).

As shown in Figure 9.1.6-1, the USEPA divides New Hampshire into two Level III ecoregions. The two ecoregions support a variety of different plant communities, all predicated on their general location within the state. Communities are predominately forested and range from deciduous[69] northern hardwood forests at lower elevations to coniferous[70] spruce-fir forest at high elevations. The topographic relief within the state heavily influences microclimates that shape these forest communities. Coastal communities are also prevalent in the southeastern portion of the state. Table 9.1.6-2 provides a summary of the general abiotic[71] characteristics, vegetative communities, and the typical vegetation found within each of the two New Hampshire Level III ecoregions.

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[66] 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 groundwater availability.

[67] Climate: "The average weather conditions in a particular location or region at a particular time of the year. Climate is usually measured over a period of 30 years or more." (USEPA, 2015l)

[68] Ecoregion: "A relatively homogeneous ecological area defined by similarity of climate, landform, soil, potential natural vegetation, hydrology, or other ecologically relevant variables." (USEPA, 2015l)

[69] Deciduous: "Plants having structures that are shed at regular intervals or at a given stage in development, such as trees that shed their leaves seasonally." (USEPA, 2015l)

[70] Coniferous: "Cone-bearing trees, mostly evergreens that have needle-shaped or scale-like leaves." (USEPA, 2015l)

[71] Abiotic: "Nonliving characteristic of the environment; the physical and chemical components that relate to the state of ecological resources." (USEPA, 2015l)

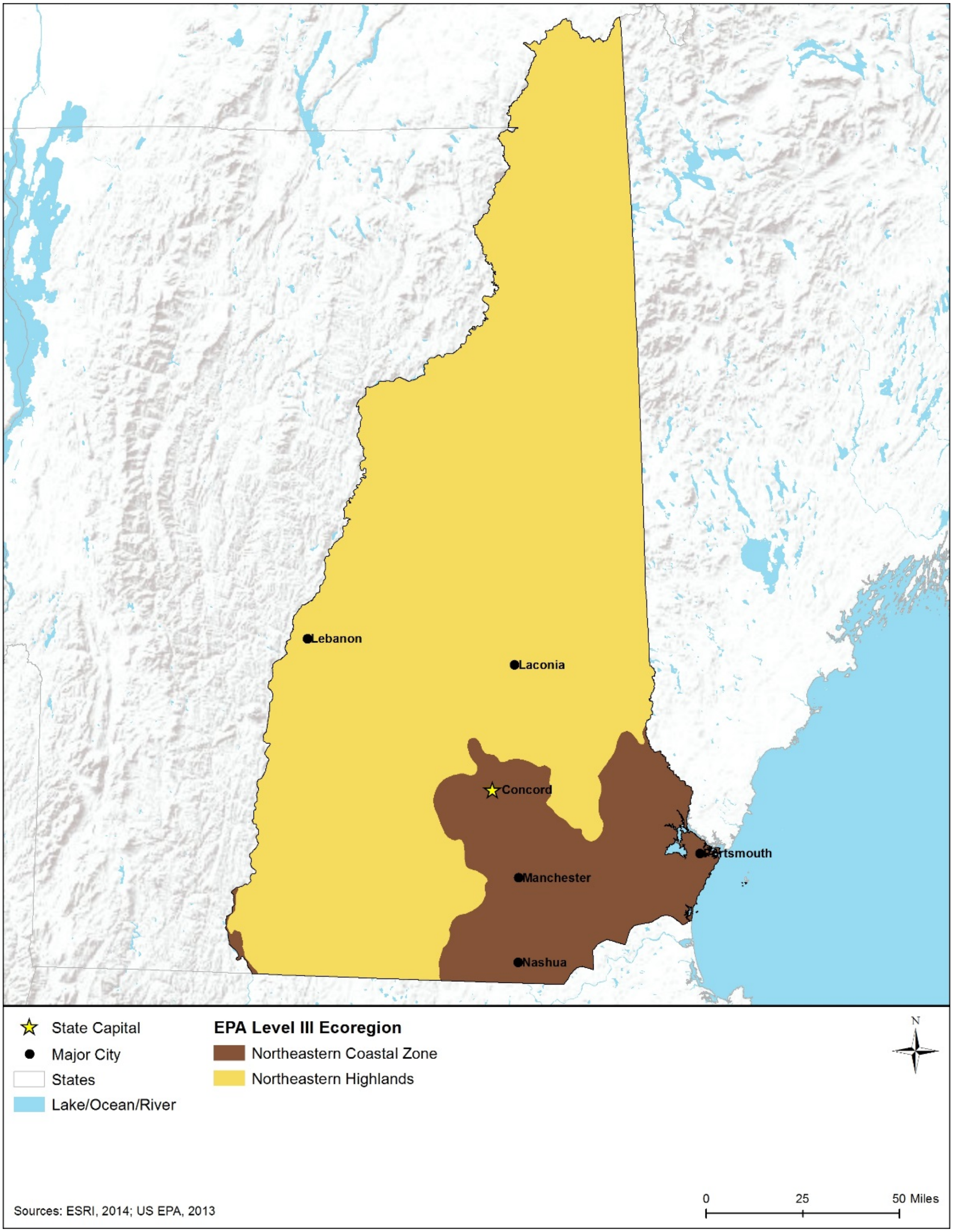

Figure 9.1.6-1. USEPA Level III Ecoregions in New Hampshire

Table 9.1.6-2. USEPA Level III Ecoregions of New Hampshire

Ecoregion Number	Ecoregion Description	Abiotic Characterization	General Vegetative Communities	Typical Dominant Vegetation
Geographic Region: Appalachian Mountains				
58	Northeastern Highlands	A mostly forested hill and mountain region characterized by nutrient poor soils, high-gradient streams and glacial[72] lakes. The regions is also a transitional zone between the boreal forested regions to the north and deciduous hardwood forests to the south. Farming occurs in alluvial valleys and areas with limestone derived soils.	Northern Hardwoods, Northern Hardwoods/Spruce, and Northeastern Spruce-Fir	• **Hardwood Trees –** sugar maple (*Acer saccharum*), red maple (*Acer rubrum*), American beech (*Fagus grandifolia*), yellow birch (*Betula alleghaniensis*), and mountain maple (*Acer spicatum*) • **Coniferous Trees –** eastern hemlock (*Tsuga canadensis*), red spruce (*Picea rubens*), and balsam fir (*Abies balsamea*)
Geographic Region: Coastal New Hampshire				
59	Northeastern Coastal Zone	A more densely populated region with irregular plains and plains with high hills. Much of the native vegetation was converted to farmland with the progression of European settlement, but land use has now reverted to predominantly forests, woodland, and urban/suburban development. To date, farming only occurs in a small portion of the region.	Appalachian Oak Forest and Northeastern Oak-Pine Forest	• **Hardwood Trees –** white oak (*Quercus alba*), red oak (*Quercus rubra*), and red maple • **Coniferous Trees –** white pine (*Pinus strobus*) and pitch pine (*Pinus rigida*)

Sources: (Griffith, et al., 2009) (USEPA, 2013a)

[72] Glacial: "Of or pertaining to distinctive processes and features produced by or derived from glaciers and ice sheets." (USEPA, 2015l)

Communities of Concern

New Hampshire contains vegetative communities of concern that include rare natural plant communities, plant communities with greater vulnerability or sensitivity to disturbance, and communities that provide habitat for 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. This ranking system also gives an indication of the level of potential impact to a particular community[73] that could result from implementation of an action.

The New Hampshire Natural Heritage Bureau (NHNHB) statewide inventory includes lists of all types of natural communities known to occur, or that have historically occurred, in the state. Historical occurrences are important for assessing previously undocumented occurrences or re-occurrences of previously documented species. Each natural community is assigned a rank based on its rarity and vulnerability. As with most state heritage programs, the NHNHB ranking system assesses rarity using a state rank (S1, S2, S3, S4, S5) that indicates its rarity within New Hampshire. Communities ranked as an S1 by the NHNHB are considered critically imperiled and of the greatest concern. This rank is typically based on the range of the community, the number of occurrences, the viability of the occurrences, recent trends, and the vulnerability of the community. As new data become available, ranks are revised as necessary to reflect the most current information (NHNHB, 2015).

A total of 50 vegetative communities are ranked as S1 communities[74] in New Hampshire; these communities represent the rarest terrestrial habitat in the state. These communities occur throughout the mountain and coastal regions of New Hampshire. NH Appendix B, Table B-1, provides a description of the communities of conservation concern in New Hampshire along with their distribution, abundance, and the associated USEPA Level III ecoregions.

Nuisance and Invasive Plants

Nuisance and invasive plants are a broad category that includes a large number of undesirable plant species. Noxious weeds are typically non-native species that have been introduced into an ecosystem inadvertently; however, on occasion native species can be considered a noxious weed. Noxious weeds greatly affect agricultural areas, forest management, natural, and other open areas (U.S. Legal, 2015). 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 2014, 112 federally recognized noxious weed species have been catalogued in the United States (88 terrestrial, 19 aquatic, and 5 parasitic) (USDA, 2015b).

Noxious weeds and other invasive plants pose a large threat to New Hampshire's agricultural and natural resources. Invasive species can have adverse ecological and economic impacts to these

[73] Community: "In ecology, an assemblage of populations of different species within a specified location in space and time. Sometimes, a particular subgrouping may be specified, such as the fish community in a lake or the soil arthropod community in a forest." (USEPA, 2015l)
[74] S1 – Critically imperiled and extremely rare in the state or because of factors making it especially vulnerable to extirpation from the state, generally with fewer than five high quality occurrences. (NHFG, 2015h)

resources by displacing native species, degrading wildlife habitat, and increasing soil erosion[75]. A total of 27 state-listed invasive plant species are regulated in New Hampshire as set forth in NHAR Part Agr 3802. Of these species, 26 are terrestrial in nature and one species is aquatic in nature. The following species by vegetation type are regulated in New Hampshire:

- **Trees –** tree of heaven (*Ailanthus altissima*), Norway maple (*Acer platanoides*)
- **Shrubs –** Japanese barberry (*Berberis thunbergii*), European barberry (*Berberis vulgaris*), Autumn olive (*Elaeagnus umbellata*), burning bush (*Euonymus alatus*,), blunt leaved privet (*Ligustrum obtusifolium*), showy bush honeysuckle (*Lonicera bella*), multiflora rose (*Rosa multiflora*), Marrow's honeysuckle (*Lonicera morrow*), Tartarian honeysuckle (*Lonicera tartarica*), common buckthorn (*Rhamnus cathartica*), and glossy buckthorh (*Rhamnus frangula*)
- **Terrestrial Forbs, Grasses, and Vines –** garlic mustard (*Alliaria petiolata*), oriental bittersweet (*Celastrus orbiculatus*), spotted knapweed (*Centaurea biebersteinii*), buck swallow-wort (*Cynanchum nigrum*), pale swallow-wort (*Cynanchum rossicum*), giant hogweed (*Heracleum mantegazzianum*), dame's rocket (*Hesperis matronalis*), perennial[76] pepperweed (*Lepidium latifolium*), Japanese honeysuckle (*Lonicera japonica*), Japanese stilt grass (*Microstegium vimineum*), Japanese knotweed (*Polygonum cuspidatum*), mile-a-minute vine (*Polygonum perfoliatum*), and bohemia knotweed (*Reynoutria × bohemica*)
    - **Aquatic Vegetation –** water-flag (*Iris pseudacorus*)

9.1.6.4. Terrestrial Wildlife

This section discusses the terrestrial wildlife species in New Hampshire, divided among mammals[77], birds[78], reptiles and amphibians[79], and invertebrates[80]. Terrestrial wildlife consist of those species, and their habitats, that live predominantly on land. Terrestrial wildlife include common big game species, small game animals, furbearers[81], nongame animals, game birds, waterfowl, and migratory birds as well as their habitats within New Hampshire. A discussion of non-native and/or invasive terrestrial wildlife species is also included within this section. Information regarding the types and location of native and non-native/invasive wildlife is useful for assessing the importance of any impacts to these resources or the habitats they occupy.

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[75] Erosion: "The general process or the group of processes whereby the materials of Earth's crust are loosened, dissolved, or worn away and simultaneously moved from one place to another, by natural agencies, which include weathering, solution, corrosion, and transportation." (USEPA, 2015l)

[76] Perennial: "Plants that live for more than two growing seasons. Perennial plants either die back after each season (herbaceous plants) or grow continuously (shrubs)." (USEPA, 2015l)

[77] Mammals: "Warm-blooded vertebrates that give birth to and nurse live young; have highly evolved skeletal structures; are covered with hair, either at maturity or at some stage of their embryonic development; and generally have two pairs of limbs, although some aquatic mammals have evolved without hind limbs." (USEPA, 2015l)

[78] Birds: "Warm-blooded vertebrates possessing feathers and belonging to the class Aves." (USEPA, 2015l)

[79] Amphibian: "A cold-blooded vertebrate that lives in water and on land. Amphibians' aquatic, gill-breathing larval stage is typically followed by a terrestrial, lung-breathing adult stage." (USEPA, 2015l)

[80] Invertebrates: "Animals without backbones: e.g. insects, spiders, crayfish, worms, snails, mussels, clams, etc." (USEPA, 2015l)

[81] Furbearers are mammals that traditionally have been hunted and trapped for their fur.

According to the NHFG, the state is home to 68 mammal species, 40 reptile and amphibian species, and 317 species of birds (NHFG, 2015c).

Mammals

Common and widespread mammalian species in New Hampshire include the white-tailed deer (*Odocoileus virginianus*), raccoon (*Procyon lotor*), Virginia opossum (*Didelphis virginiana*), woodchuck (*Marmota monax*), and eastern chipmunk (*Tamias striatus*). Mammals such as the Canada lynx (*Lynx canadensis*), river otter (*Lutra canadensis*), and fisher (*Martes pennanti*) are uncommon or rare in New Hampshire due to restricted habitat; they are rarely spotted and exhibit secretive behavior (NHFG, 2009).

In New Hampshire, white-tailed deer, moose (*Alces alces*), and black bear (*Ursus americanus*) are classified as big game species, whereas small game species include small mammals (e.g., squirrels and rabbits), furbearers, and upland and migratory game bird (NHFG, 2015d). The following 10 species of furbearers may be legally hunted or trapped in the New Hampshire: raccoon, red fox (*Vulpes vulpes*), gray fox (*Urocyon cinereoargenteus*), mink (*Mustela vison*), muskrat (*Ondatra zibethicus*), fisher, weasel (*Mustella* spp.), opossum, beaver (*Castor canadensis*), and river otter.

New Hampshire has identified six mammals as Species of Special Concern (SSC); one of these species, the northern long-eared bat (*Myotis septentrionalis*), is federally listed as threatened under the ESA. Section 9.1.6.6, Threatened and Endangered Species and Species of Conservation Concern, identifies these protected species. The SSC list consists of at-risk species that are rare or declining, and State Wildlife Grants can provide funding for efforts to prevent fish and wildlife populations from becoming endangered. Although these species have been targeted for conservation they are not currently under legal protection, with the exception of those also listed under the ESA. The SSC list is updated periodically and is used by the state to focus their conservation efforts and as a basis for implementing their State Wildlife Action Plan (SWAP) (NHFG, 2009).

Birds

The number of native bird species documented in New Hampshire varies according to the timing of the data collection effort, changes in bird taxonomy[82], and the reporting organization's method for categorizing occurrence and determining native versus non-native status. Further, the diverse ecological communities (i.e., mountains, large river valleys, coastline, etc.) found in New Hampshire support a large variety of bird species.

Of the 317 species of birds that are known to inhabit New Hampshire, 186 are known to have breeding populations[83] (such as American Kestrel, Blue Jay, Prairie Warbler, and Vesper

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[82] Taxonomy: "A formal representation of relationships between items in a hierarchical structure." (USEPA, 2015l)

[83] Population: "Aggregate of individuals of a biological species that are geographically isolated from other members of the species and are actually or potentially interbreeding." (USEPA, 2015l)

Sparrow) in the state, with the remainder being migratory or winter residents (NHFG, 2015e). Among the 317 extant[84] species in New Hampshire, 24 SSC have been identified (NHFG, 2009).

New Hampshire is located within Atlantic Flyway. Spanning nearly 3,000 miles and covering the entire east coast of the U.S., the Atlantic Flyway stretches as far north as the Arctic Tundra and as far south as the Caribbean. It is the most densely human-populated of the four waterfowl migration flyways in North America (Atlantic, Mississippi, Central, and Pacific) (Ducks Unlimited 2015). Large numbers of migratory birds utilize these flyways and other migration corridors and pathways throughout the state each year during their annual migrations northward in the spring and southward in the fall. "The Migratory Bird Treaty Act (MBTA) makes it illegal for anyone to take, possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, or barter, any migratory bird, or the parts, nests, or eggs of such a bird except under the terms of a valid permit issued pursuant to Federal regulations" (USFWS, 2013a). The USFWS is responsible for enforcing the MBTA and maintaining the list of protected species. The migratory bird species protected under the MBTA are listed in 50 CFR 10.13 (USFWS, 2013a).

Bald eagles (*Haliaeetus leucocephalus*) and golden eagles (*Aquila chrysaetos*) are protected under the Bald and Golden Eagle Protection Act. Bald eagles are generally found near large rivers and lakes sporadically in the entire state throughout the year (eBird, 2015). Golden eagles generally nest in mountains and cliffs. Golden eagles are found sporadically in the entire state throughout the year (eBird, 2015).

A total of 17 Important Bird Areas (IBAs) have also been identified in New Hampshire (New Hampshire Audubon, 2016). Figure 9.1.6-2 presents the IBAs in New Hampshire. IBAs assist in achieving local conservation priorities to provide important habitat for native bird populations during breeding[85], migratory stops, feeding, and over-wintering areas. A variety of habitats are designated as IBAs, including conifer forests, coastal islands, salt marshes, grasslands, freshwater wetlands, and bodies of water. These IBAs are widely distributed throughout the state, although the largest concentration of IBAs are located in the high elevation areas of the White Mountains in the northern portion of the state. These IBAs are mostly forested communities with an abundance of rocky cliffs that are key nesting habitat for the peregrine falcon (New Hampshire Audubon, 2016).

Of the 17 IBAs that have been identified in New Hampshire, the majority occur in the Appalachian Mountain region of the state. These include:

Appalachian Mountains

- Squam Lake
- High Elevation Spruce-Fir, Ossipee Pine Barrens, Squam Lake
- Middle Connecticut River Valley
- Connecticut Lakes Headwaters, High Elevation Spruce-Fir, Lake Umbagog, Pondicherry Basin, Pontook Reservoir

[84] Extant: "A species that is currently in existence (the opposite of extinct)." (USEPA, 2015l)

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

- High Elevation Spruce-Fir, Squam Lake
- Merrimack River Floodplain
- Middle Connecticut River Valley
- Grafton Forest Block

Coastal New Hampshire

- Hampton/Seabrook Estuary, Brentwood Mitigation Area, Isles of Shoals, Pawtuckaway Highlands, Powwow Pond
- Great Bay

Reptiles and Amphibians

A total of 40 reptile and amphibian species occur in the state New Hampshire, including 12 salamanders, 10 frogs and toads, 7 turtles, and 11 snakes. Examples include the Bullfrog (*Rana cataesbeiana*), Wood frog *(Rana sylvatica*), Brown snake (*Storeria dekayi*), Timber rattlesnake (*Crotalus horridus*), Eastern newt (*Notophthalmus viridescens*), Spotted salamander (*Ambystoma macuatum*), Snapping turtle (*Chelydra serpentine*), and Spotted turtle (*Clemmys guttata*) (NHFG, 2016). Of the 40 native reptile and amphibian species, 7 SSC have been identified. Many of these species have a very limited range within New Hampshire, some of which are only found in coastal habitats in southern New Hampshire (NHFG, 2009). Possession of New Hampshire's reptile and amphibian species is regulated by the NHFG. Some species are not allowed to be possessed and are protected by closed seasons, and others are allowed to be collected with regulated possession limits (NHFG, 2015f).

Invertebrates

New Hampshire is home to a large number invertebrate species, including a wide variety of bees, hornets, wasps, butterflies, moths, beetles, flies, spiders, mites, millipedes, and nematodes. These invertebrates provide an abundant food source for mammals, birds, reptiles, amphibians, and other invertebrates. Fourteen invertebrate species are listed as SSC in New Hampshire. In natural systems, the size and health of the pollinator[86] population is linked to ecosystem health, with a direct relationship between pollinator diversity and plant diversity. Bees play an important role in natural and agricultural systems. In the U.S., one-third of all agricultural output depends on pollinators\ In New Hampshire, important agriculture crops such as apples and cranberries are dependent on pollinator services (NRCS, 2009). Life history, distribution, and abundance information is limited to a small number of New Hampshire's invertebrates. Given this lack of information on invertebrate species within the state, New Hampshire has chosen to focus identification on SSC species.

[86] Pollinators: "Animals or insects that transfer pollen from plant to plant." (USEPA, 2015l)

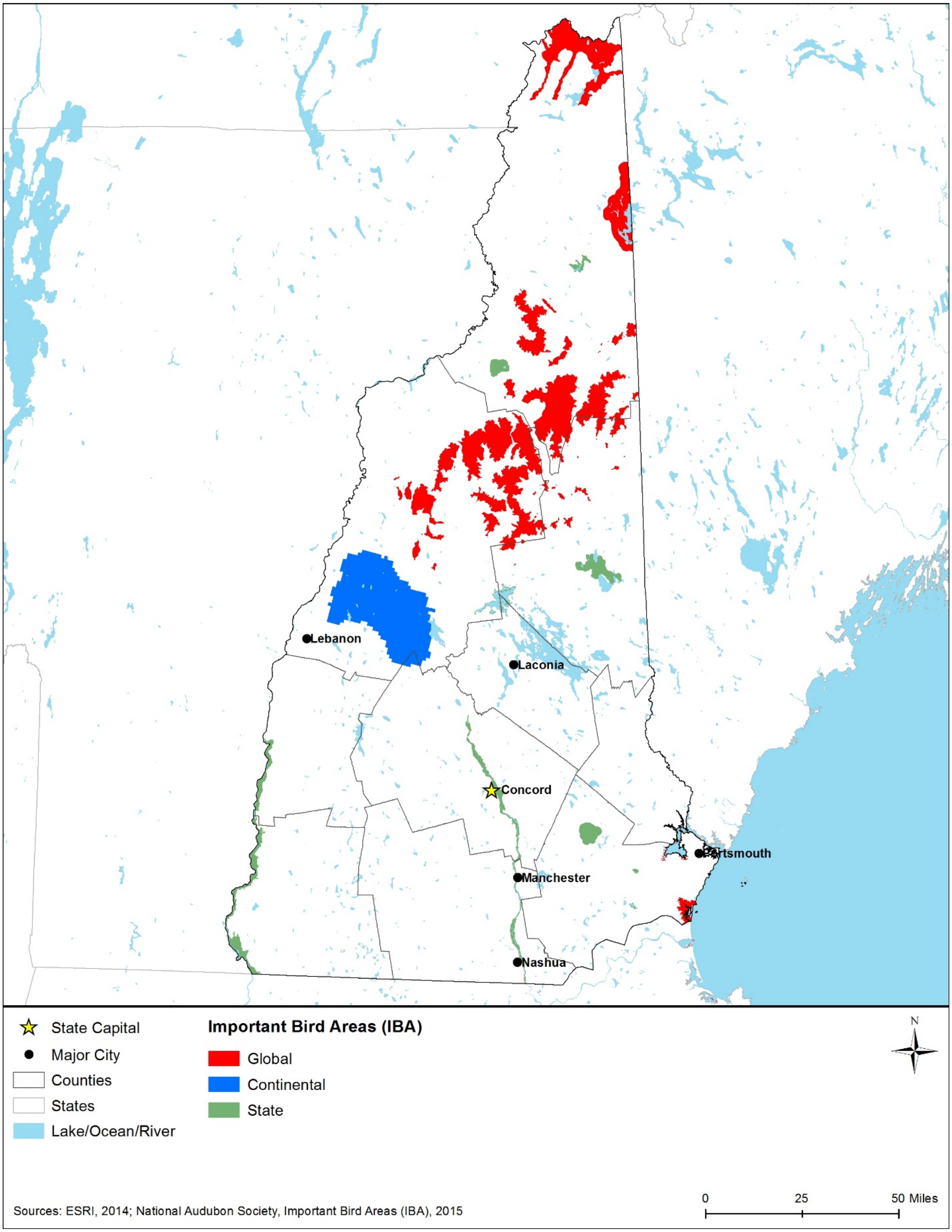

Figure 9.1.6-2: Important Bird Areas in New Hampshire

Invasive Wildlife Species

New Hampshire has not adopted regulations that prohibit or regulate the possession, transport, importation, sale, purchase, and introduction of invasive terrestrial wildlife species. However, invasive insects that pose a particularly large threat to New Hampshire's forest and agricultural resources are regulated; a total of 16 species of terrestrial invertebrates are regulated in New Hampshire. According to NHAR Part Agr 3802, it is illegal to collect, transport, import, export, move, buy, sell, distribute, propagate or release any of the insect species listed below. Species such as the gypsy moth (*Lymantria dispar*), hemlock woolly adelgid (*Adelges tsugae*), emerald ash borer (*Agrilus planipennis*), and Asian longhorn beetle (*Anoplophora glabripennis*) are known to cause irreversible damage to native forests. In addition, quarantines have been enacted in an effort to reduce the spread of many plant pests[87]. Currently, federal quarantines are in place that restrict the transport of plant materials with the potential to contain the emerald ash borer (USDA, 2015b). The following insect species are prohibited in New Hampshire:

- **Insects –** honeybee tracheal mite (*Acarapis woodi*), hemlock woolly adelgid, city longhorn beetle (*Aeolesthes sarta*), emerald ash borer, Asian longhorn beetle, cedar longhorned beetle (*Callidiellum rufipenne*), Siberian silk moth (*Dendrolimus sibiricus*), redhaired bark beetle (*Hylurgus lingniperda*), European spruce bark beetle (*Ips typographus*), Asian gypsy moth (*Lymantria dispar*), Japanese beetle (*Popillia japonica*), viburnum leaf beetle (*Pyrrhalta viburni*), European chafer (*Rhizotrogus majalis*), nun moth (*Symantria monacha*), brown spruce longhorned beetle (*Tetropium fuscum*), and varroa mite (*Varroa destructor*)

9.1.6.5. Fisheries and Aquatic Habitat

This section discusses the aquatic wildlife species in New Hampshire, including fish, marine[88] mammals, and invertebrates. A summary of non-native and/or invasive aquatic species is also presented. Fish are divided into freshwater and saltwater species, although eight species of New Hampshire's fish are diadromous (i.e., anadromous[89] and catadromous[90]), reflecting the state's location along the Atlantic coast and the variety of aquatic habitats that it provides. Five of the eight diadromous species are considered SSC in New Hampshire (NHFG, 2015c). A distinctive feature of the New Hampshire landscape with regard to aquatic wildlife is the coastal habitats in the Great Bay area of southeast New Hampshire as this area includes open ocean, estuaries, bays, inlets, and other coastal features that provide habitat for a multitude of wildlife. Essential Fish Habitat (EFH), as identified by the Magnuson-Stevens Fishery Conservation and Management Act, exists in the state.

[87] "Plant pest" is defined by 7 CFR §340.1 as "any living stage (including active and dormant forms) of insects, mites, nematodes, slugs, snails, protozoa, or other invertebrate animals, bacteria, fungi, other parasitic plants or reproductive parts thereof; viruses; or any organisms similar to or allied with any of the foregoing; or any infectious agents or substances, which can directly or indirectly injure or cause disease or damage in or to any plants or parts thereof, or any processed, manufactured, or other products of plants."

[88] Marine: "Any marine environment, from pond to ocean, in which plants and animals interact with the chemical and physical features of the environment." (USEPA, 2015l)

[89] Anadromous: "Referring to the life cycle of fishes, such as salmon, in which adults travel upriver from the sea to breed, usually returning to the area where they were born." (USEPA, 2015l)

[90] Catadromous: "An organism which lives in fresh water and goes to the sea to spawn, such as some eels." (USEPA, 2015l)

Freshwater Fish

New Hampshire is home to 48 species of freshwater fish, with 13 of these species being listed as Species of Greatest Conservation Need (SGCN) or species with low and declining populations. These species range in size from small darters and minnows to larger species such as salmon and sturgeon. Approximately 20 percent of these species are considered sport fish, with the remaining 80 percent being classified as nongame species. These species are grouped into approximately 17 families, as follows: lampreys, freshwater eels, herrings, freshwater catfishes, bowfins, killfishes, livebearers, minnows/carps, perches, pikes, sculpins, sturgeons, suckers, temperate basses, sunfishes, and trout (NHFG, 2015c). Common species found throughout New Hampshire include brown bullhead (*Ameiurus nebulosus*) and the yellow bullhead (*Ameiurus natalis*) as well as common carp (*Cyprinus carpio*), creek chub (*Semotilus atromaculatus*), and common shiner (*Notropis cornutus*) (NHFG, 2015c).

Walleye (*Etheostoma fusiforme*) and yellow perch (*Perca flavescens*) are larger members of the perch family and are important sport fish in New Hampshire. Yellow perch are common throughout much of the state. Walleye are common in the Connecticut River between Monroe and Hinsdale (NHFG, 2015c). The sunfish family includes eight species, many of which are common throughout the state and highly popular with sport fishermen. The most commonly encountered species are the bluegill (*Lepomis macrochirus*), black crappie (*Pomoxis nigromaculatus*), largemouth bass (*Micropterus salmoides*), and smallmouth bass (*Micropterus dolomieu*). These sunfish species live in a wide variety of habitats, including rocky, cool lakes, streams, and reservoirs (NHFG, 2015c). New Hampshire waters are home to 6 species of the trout family including the brook trout (*Salvelinus fontinalis*), brown trout (*Salmo trutta*), rainbow trout (*Oncorhynchus mykiss*), and lake trout (*Salvelinus namaycush*). Brook trout are the only native stream dwelling trout in New Hampshire and are typically found in high elevation cold mountain streams. Trout are among the most popular game fish in New Hampshire. They occupy the cold water streams and lakes throughout the state (NHFG, 2015c).

Saltwater Fish

New Hampshire's nearshore marine waters are home to a large number of fish species inhabiting the wide variety of marine habitats such as the Great Bay Estuary, the mouth of the Piscataqua River, numerous smaller bays and estuaries, and miles of Atlantic coastline. New Hampshire is home to 66 species of marine fish of which two are listed as SGCN (NHFG, 2009) (NHFG, 2015c).

Many saltwater fish species are known for their recreational and commercial fishing value. The anadromous striped bass (*Morone saxatilis*) is an important fish species for both recreational anglers and the commercial fishing industry. The Great Bay area is an important foraging ground for the species, which can be found there between May and October. Striped bass numbers in New Hampshire have greatly increased in recent years and individuals have been caught in excess of 50 pounds. In addition to striped bass, other important recreational and commercial fish include the tautog, summer flounder, winter flounder, black sea bass, and blue fish. Many of these species migrate inshore to New Hampshire's coastal waters during the spring months when water temperatures are warmer and migrate offshore in the fall as coastal waters cool (NHFG, 2015c).

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. NOAA provides an online mapping application[91] and website[92] to provide the public a means to obtain illustrative representations of EFH. This tool can be used to identify the existing conditions for a project location to identify sensitive resources. Table 9.1.6-3 presents a summary of EFH offshore of New Hampshire.

Shellfish and Other Invertebrates

Ten species of freshwater mussels are known to exist in the waters of New Hampshire. Freshwater mussels are an important food source for many wildlife species such as waterfowl, fish, muskrat, and other furbearers. Mussels are also important water quality indicators as they often require streams with a high oxygen content that are degraded by sedimentation. One of the ten species of mussel is listed as a SSC, six are listed as SGCN, and two of them are listed as federally endangered under the ESA. River diversions, impoundments, and dredging activities are the primary threats to freshwater mussel species. Section 9.1.6.6, Threatened and Endangered Species and Species of Conservation Concern, identifies these protected species.

New Hampshire is also home to an unknown number of smaller invertebrates such as cray fish, amphipods[93], and pillbug species but little is currently known about the extent or range of these species within the state (NHFG, 2015c).

Numerous marine shellfish and other invertebrates occur in the waters along and off the coast of New Hampshire. New Hampshire's marine shellfish are harvest both commercially and recreationally. Sought after species include the American oyster (*Crassostrea virginica*), blue mussel (*Mytilus edulis*), mahogany quahog (*Mercenaria mercenaria*), razor clam (*Ensis arcuatus*), surf clam (*Spisula solidissima*), and softshell clam (*Mya arenaria*). Many of these species can be found along sandy beaches and bays throughout New Hampshire.

Marine Mammals

As mentioned in Section 9.1.6.2, all marine mammals (e.g., whales, dolphins, porpoises, seals, and sea lions) are protected under the MMPA. Although not typically seen, there are five whale species that may occasionally be observed offshore of New Hampshire. These species include the finback whale, sometimes called the fin whale, (*Balaenoptera physalus),* north Atlantic right whale (*Eubalaena glacialis),* humpback whale (*Megaptera novaeangliae*), minke whale (*Balaenoptera acutorostrata*), and pilot whale (*Globicephala* spp.). Only one species of seal, the harbor seal (*Phoca vitulina*), occurs in waters off the coast of New Hampshire. Further, only one species of dolphin is found of the coast of New Hampshire, the common dolphin (*Delphinus*

[91] http://www.habitat.noaa.gov/protection/efh/efhmapper/index.html
[92] http://www.greateratlantic.fisheries.noaa.gov/hcd/list.htm
[93] Amphipod: "A small, shrimp-like crustacean." (USEPA, 2015l)

spp.). This section briefly introduces the marine mammal species found in the coastal waters of New Hampshire.

Table 9.1.6-3. Essential Fish Habitat Offshore of New Hampshire

Common Name	Eggs	Larvae/YOY[94]	Juveniles[95]	Adults
American Plaice	NA	NA	Gulf of Maine and Georges Bank	Gulf of Maine and Georges Bank
Atlantic cod	Great Bay Estuary	Great Bay Estuary	Gulf of Maine and Georges Bank	Gulf of Maine and Georges Bank
Atlantic Halibut	Gulf of Maine and Georges Bank	Gulf of Maine and Georges Bank	Gulf of Maine and Georges Bank	Gulf of Maine and Georges Bank
Atlantic Herring	Gulf of Maine	Great Bay Estuary and Gulf of Maine	Great Bay Estuary and Gulf of Maine	Great Bay Estuary and Gulf of Maine
Atlantic Wolffish	Gulf of Maine	Gulf of Maine	Gulf of Maine	Gulf of Maine
Haddock	Great Bay Estuary	Great Bay Estuary	Gulf of Maine	Gulf of Maine
Little Skate	NA	NA	NA	Gulf of Maine
Monkfish	Gulf of Maine and Georges Bank	Gulf of Maine and Georges Bank	Gulf of Maine and Georges Bank	Gulf of Maine and Georges Bank
Ocean Pout	Gulf of Maine and Georges Bank	Gulf of Maine and Georges Bank	Gulf of Maine and Georges Bank	Gulf of Maine and Georges Bank
Pollock	Great Bay Estuary and Merrimack River	Great Bay Estuary and Merrimack River	Great Bay Estuary and Merrimack River	Great Bay Estuary and Merrimack River
Red Hake	Great Bay Estuary and Gulf of Maine	Great Bay Estuary and Gulf of Maine	Great Bay Estuary and Gulf of Maine	Great Bay Estuary and Gulf of Maine
Sea Scallop	Gulf of Maine	Gulf of Maine	Great Bay Estuary and Gulf of Maine	Great Bay Estuary and Gulf of Maine
Redfish	NA	Gulf of Maine and Georges Bank	Gulf of Maine and Georges Bank	Gulf of Maine and Georges Bank
Silver Hake	Merrimack River	Gulf of Maine and Georges Bank	Gulf of Maine and Georges Bank	Gulf of Maine and Georges Bank
White Hake	Great Bay Estuary and Merrimack River	Gulf of Maine	Great Bay Estuary	Great Bay Estuary
Window Pane Flounder	Great Bay Estuary and Gulf of Maine	Great Bay Estuary and Gulf of Maine	Great Bay Estuary and Gulf of Maine	Great Bay Estuary and Gulf of Maine
Winter Flounder	Great Bay Estuary and Merrimack River	Great Bay Estuary and Merrimack River	Great Bay Estuary and Merrimack River	Great Bay Estuary and Merrimack River
Yellowtail Flounder	Great Bay Estuary and Merrimack River	Great Bay Estuary and Merrimack River	Gulf of Maine and Georges Bank	Gulf of Maine and Georges Bank

Many whale species occur offshore of New Hampshire as transient individuals as they migrate northward towards feeding grounds and southward towards warmer breeding grounds. Occasionally individuals are beached or stranded along the coast, but these are relatively rare occurrences. Their presence offshore is often unnoticed because of their transient nature and deep ocean preference.

[94] 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." (USEPA, 2015l)
[95] Juvenile: "Any member of a species that is not yet sexually mature." (USEPA, 2015l)

A few species of whales exhibit distinctive behaviors. In contrast to migratory patterns displayed by other whale species, minke whales breed during the summer months in the northern hemisphere; however, they spend very little time at the surface and are therefore rarely seen. Other species like the humpback whale are more commonly observed as they spend more time near the water's surface.

Invasive Aquatic Species

New Hampshire has adopted regulations that prohibit or regulate the possession, transport, importation, sale, purchase and introduction of select aquatic invasive species. According to NHAR Fis 3803.04, it is illegal to possess, sell, import, or release the following species into the waters of the state.

- **Aquatic Invertebrates –** zebra mussels (*Dreissena polymorpha, D. bugensis*), spiny waterflea (*Bythotrephes cederstroemi*), fishhook waterflea (*Cercopagis pengoi*), all non-indigenous crayfish, and Asiatic clam (*Corbicula fluminea*)
- **Fish –** walking catfish (*Clarias batrachus*), white amur/grass carp (*Ctenopharyngodon idella*), black carp (*Mylopharyngodaon piceus*), European rudd (*Scardinius erythophthalmus*), round goby (*Neogobius melanostomus*), tubenose goby (*Proterhinus marmoratus*), ruffe (*Gymnocephalus cernuus*), and snakeheads

Also, according to NHAR Fis 3805.01, it is illegal to release any exotic fish, amphibian, reptile, or invertebrate into the waters of the state (NHFG, 2015g).

9.1.6.6. Threatened and Endangered Species and Species of Conservation Concern

The USFWS is responsible for administering the ESA (16 U.S.C §1531 *et seq*.) in New Hampshire. The USFWS has identified six federally endangered and five federally threatened species known to occur in New Hampshire (USFWS, 2015c). Six of these species are limited to the marine or coastal areas of the state. However, none of these species have designated critical habitat[96] (USFWS, 2015d). In addition, NMFS has identified two endangered aquatic species known to occur in New Hampshire. The 11 federally listed species include 1 mammal, 3 birds, 3 reptiles, 1 invertebrate, and 3 plants[97]. These federally listed species are discussed in detail under the following sections.

Mammals

One threatened mammal species is federally listed for New Hampshire as summarized in Table 9.1.6-1. The northern long-eared bat (*Myotis septentrionalis*) occurs throughout the state.

[96] 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)). (USEPA, 2015l)

[97] Note that the New Hampshire Fish and Game Department lists the finback whale (*Balaenoptera physalus)* and the shortnose sturgeon (*Acipenser brevirostrum)* as occurring in New Hampshire; however, the USFWS does not list either species in New Hampshire. For purposes of this discussion, neither species will be discussed specifically as a threatened or endangered species in New Hampshire.

Information on the on the habitat, distribution, and threats to the survival and recovery of the northern long-eared bat in New Hampshire is provided below.

Table 9.1.6-1. Federally Listed Mammal Species of New Hampshire

Common Name	Scientific Name	Federal Status [a]	Critical Habitat	Habitat Description
Terrestrial Mammals				
Northern Long-eared Bat	*Myotis septentrionalis*	T	No	Trees and snags in the state

[a] E = Endangered, C= Candidate

Sources: (USFWS, 2015c) (USFWS, 2015d)

Terrestrial Mammals

Northern Long-eared Bat. The northern long-eared bat (*Myotis sepentionalis)* is brown furred, insectivorous bat with long ears. Reaching a total length of 3 to 3.7 inches in length it is a medium size relative to other members of the genus *Myotis*. The northern long-eared bat was first proposed as endangered in 2013 (78 FR 61046, October 2, 2013), and then listed as threatened in 2015 (80 FR 17973 18033, April 2, 2015). In the U.S., its range includes most of the eastern and north central states (USFWS, 2015e). This species only makes up a small percentage of New Hampshire's overwintering bats (less than 1 percent) and have been found in each of the seven large cave hibernacula in the state (NHFG, 2015h).

This species 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. 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, 2015e).

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 U.S. 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, 2015e).

Birds

Two threatened and one endangered bird species are federally listed for New Hampshire as summarized in Table 9.1.6-2. Breeding and migrating populations of the piping plover (*Charadrius melodus*), roseate tern (*Sterna dougallii dougallii*), and red knot (*Calidris canutus rufa*) are located along the North Atlantic coastal areas of southeastern New Hampshire. Information on the habitat, distribution, and threats to the survival and recovery of each of these species in New Hampshire is provided below.

Table 9.1.6-2. Federally Listed Bird Species of New Hampshire

Common Name	Scientific Name	Federal Status [a]	Critical Habitat	Habitat Description
Piping Plover	*Charadrius melodus*	T	No	Coastal areas of the Gulf of Maine
Roseate Tern	*Sterna dougallii dougallii*	E	No	Coastal areas of the Gulf of Maine
Red knot	*Calidris canutus rufa*	T	No	Coastal areas of the Gulf of Maine

[a] E = Endangered, T = Threatened

Sources: (USFWS, 2015c) (USFWS, 2015d)

Piping Plover. The piping plover is a small, stocky, sand-colored shorebird, listed as endangered in 1985 for the Great Lakes watershed of both the U.S. and Canada, and as threatened in the remainder of its range in the U.S., which includes the Northern Great Plains, Atlantic and Gulf Coasts, Puerto Rico, Virgin Islands (50 FR 50726, December 11, 1985). This species feeds in the intertidal[98] zone of ocean beaches, ocean washover areas, mudflats, sandflats, wrack lines, and the shorelines of coastal ponds, lagoons, and salt marshes. They feed on worms, fly larvae, beetles, crustaceans, and other marine macroinvertebrates (USFWS, 2015f).

Piping plovers breed in three geographic regions of North America, composed of two separate subspecies. Those breeding on the Atlantic Coast of the U.S. and Canada are of the subspecies *C. m. melodus*, whereas the other subspecies, *C. m. circumcinctus*, includes two distinct populations, one which breeds on the Northern Great Plains of the U.S. and Canada, and the other which breeds on the Great Lakes (USFWS, 2015g).

The subspecies *C. m. melodus*, breeds on New Hampshire's coastal beaches, arriving in early April and remain until September when they migrate to coastal areas between North Carolina, Mexico and the Caribbean. This species spends the majority of the year, up to 10 months, on these migration and winter grounds. In New Hampshire, their nests are located between the primary dune and high tide line on coastal sand dune of less than 2 miles of the coast (NHFG, 2005). Current threats to this species include habitat loss and habitat degradation, human disturbance, pets, predation[99], flooding from coastal storms, and environmental contaminants (USFWS, 2015f) (USFWS, 2015g).

Roseate Tern. The roseate tern is approximately 16 inches in length with light-gray wings and a black cap. During breeding season, the roseate tern's white chest gains a rosy tinge on the chest, and its bill and legs turn from black to orange-red. Listed as endangered in 1987 in the Northeast region and threatened in the southeast region (52 FR 42064, November 2, 1987), the roseate tern is a marine bird that breeds along the coasts of the Atlantic, Pacific, and Indian Oceans on salt marsh islands and beaches with sparse vegetation. In eastern North America, the roseate tern breeds from the Canadian maritime provinces south to New York (USFWS, 2011). In New Hampshire, the roseate tern is known to nest in the south western coastal county of Rockingham (USFWS, 2015h). Present threats include vegetation changes in breeding areas, competition with gulls for suitable nest sites, and predation (USFWS, 2011).

[98] Intertidal: "The area of shoreline between the high tide and low tide marks." (USEPA, 2015l)
[99] Predation: "The act or practice of capturing another creature (prey) as a means for securing food." (USEPA, 2015l)

Red Knot Photo credit: USFWS

Red Knot. Federally listed as a threatened species in 2014 (79 FR 73705, December 11, 2014), the red knot is a large sandpiper that flies in large flocks along Delaware Bay and the Atlantic coast each spring. Red knots spend their winters in the southern tip of South America, northern Brazil, the Caribbean, and the southeastern and Gulf Coasts of the U.S. and breed in the tundra of the central Canadian Arctic. Some have been documented to migrate more than 9,300 miles from south to north every spring and return south in autumn. Red knots are infrequently observed in New Hampshire. The species is primarily observed here during migration periods when they are moving either to or from breeding areas in the Canadian Arctic (NHFG, 2015h) (USFWS, 2015i).

The preferred habitat for the red knot is intertidal marines, estuaries, and bays. The red knot stops along the New England coast during the spawning season for the horseshoe crab (*Limulus polyphemus*) and mussel beds, which are important food sources to the species (USFWS, 2005). 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 (NHFG, 2015h) (USFWS, 2015i).

Reptiles

Two endangered and one threatened sea turtles are federally listed for New Hampshire as summarized in Table 9.1.6-4. The sea turtles are found off the coast of New Hampshire in the Gulf of Maine during their seasonal migrations. Information on the habitat, distribution, and threats to the survival and recovery of each of these species in New Hampshire is provided below.

Table 9.1.6-4. Federally Listed Reptile Species of New Hampshire

Common Name	Scientific Name	Federal Status [a]	Critical Habitat	Habitat Description
Green Sea Turtle	*Chelonia mydas*	T	No	Shallows of the Gulf of Maine
Hawksbill Sea Turtle	*Eretmochelys imbricata*	E	No	Gulf of Maine
Leatherback Sea Turtle	*Dermochelys coriacea*	E	No	Gulf of Maine

[a] E = Endangered, T = Threatened

Sources: (USFWS, 2015c) (USFWS, 2015d)

Marine Reptiles

Green Sea Turtle. The green sea turtle (*Chelonia mydas*) occurs throughout tropical and subtropical oceans and is among the largest of the hard-shelled sea turtles growing to as much as 440 pounds and 4 feet in length. The breeding populations in Florida were listed as endangered in 1978 (43 FR 32800, July 28, 1978) whereas all other populations were listed as threatened

(NOAA, 2015b). They are found in the shallow waters (except during migration) of shoals, lagoons reefs, bays, and inlets, often where submerged aquatic vegetation exists, from Maine south to Florida, and throughout the Gulf of Mexico and the Caribbean Sea (USFWS, 2015j) (USFWS, 2015k). Green sea turtles use three primary types of habitat – beaches for nesting, open ocean convergence zones[100], and coastal areas for bottom feeding. Whereas hatchlings consume both plants and animals, adult green sea turtles are herbivorous[101] (NOAA, 2015b).

Green Sea Turtle Photo credit: USFWS

Breeding takes places in subtropical to tropical oceans every two, three, or four years between June and September, with peak nesting in June and July (NOAA, 2015b) (USFWS, 2015j). Hatching usually occurs at night, and many green sea turtle hatchlings seek refuge and food in masses of floating sea plants (USFWS, 2015j).

The collection of green sea turtles for food was the primary cause for the decline of this species; however, current threats include disease, loss or degradation of nesting habitat; disorientation of hatchlings by lighting; nest predation; marine pollution; watercraft strikes; and incidental take from channel dredging and commercial fishing operations (USFWS, 2015j).

Hawksbill Sea Turtle. The hawksbill sea turtle (*Eretmochelys imbricata*) is one of the smaller to medium-sized sea turtles, growing up to three feet in length. It was listed as endangered in 1970 (35 FR 8491, June 6, 1970) and was grandfathered into the ESA of 1973 (Harrington, 1982). 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 100 to 200 pounds. Its upper shell is dark brown with faint yellow streaks and a yellow under shell. The hawksbill is found throughout all of the oceans of the world (USFWS, 2015l). Although in the Atlantic they range from the East Coast of the U.S. to northern Brazil, they are rarely found offshore of New England. This species prefers warm, shallow, coastal waters of reefs, lagoons, inlets, and bays with submerged aquatic vegetation. It is an omnivore, feeding mostly sponges and is most often associated with the coral reef community. Nesting occurs on remote beaches in the Gulf of Mexico and the Caribbean Sea in 2 to 3 year cycles (USFWS, 2015l).

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

[100] Ocean convergence zone: “The quasi-horizontal flow of a fluid toward a common destination from different directions. When waters of different origins come together at a point or along a line (convergence line), the denser water from one side sinks under the lighter water from other side. The ocean convergence lines are the polar, subtropical, tropical, and equatorial.” (USEPA, 2015l)

[101] Herbivore: “An organism that eats plants.” (USFWS, 2015u)

exploitation. Outside of the U.S., a current threat is the collection for meat, eggs, and parts, which was the historic threat to this species causing their decline (USFWS, 2013b).

Leatherback Sea Turtle. The leatherback sea turtle (*Dermochelys coriacea*) is the largest, most migratory, deepest-diving, and most wide-ranging sea turtle, found in all of the world's oceans. It was listed as endangered in 1970 (35 FR 8491, June 6, 1970) and was grandfathered into the ESA (Harrington, 1982). The leatherback sea turtle ranges as far north as the Gulf of Maine and Newfoundland (USFWS, 2015m). Their diet consists of jellyfish and squid and while they may forage in coastal waters but they prefer open sea environments. The numbers of leatherback sea turtles in the Caribbean and the Atlantic are stable (NOAA, 2015c).

Female leatherback sea turtles nest at 2 to 3 year intervals (USFWS, 2015m). They nest on high energy beaches composed of coarse sand that are adjacent to deep water and subject to erosion. In New Hampshire, they may be found along the Gulf of Maine coastline in Rockingham County (USFWS, 2015n). Major threats to the species include harvesting of their eggs, hunting, their incidental capture in fishing gear, and consumption of plastics that were mistaken for jellyfish (NOAA, 2015c).

Invertebrates

One endangered invertebrate is federally listed for New Hampshire as summarized in Table 9.1.6-. The dwarf wedgemussel *(Alasmidonta heterodon)* is found in creeks and rivers of western New Hampshire. Information on the habitat, distribution, and threats to the survival and recovery of this species in New Hampshire is provided below.

Table 9.1.6-5. Federally Listed Invertebrate Species of New Hampshire

Common Name	Scientific Name	Federal Status [a]	Critical Habitat	Habitat Description
Dwarf Wedgemussel	*Alasmidonta heterodon*	E	No	Creek and river areas with slow to moderate current, gravel, and sand along the western border of New Hampshire.

[a] E = Endangered

Source: (USFWS, 2015c) (USFWS, 2015d)

Dwarf Wedgemussel. The endangered dwarf wedgemussel is a small, brown or yellowish-brown freshwater mussel that is usually less than 1.5 inches in length (USFWS, 2010a). It was federally listed as endangered in 1990 (55 FR 9447, March 14, 1990) throughout its range. In New Hampshire, it is known to occur in the counties of Cheshire, Coos, Grafton, and Sullivan (USFWS, 2015o).

Dwarf wedgemussels are sedimentary filter feeders that feed off suspended particles and algae. They inhabit creek and river areas with slow to moderate current and sand, gravel, or muddy bottoms. This species requires either the tessellated darter (*Etheostoma olmstedi*) or the mottled sculpin (*Cottus bairdi*) in order to complete their lifecycle. The current threats to this species include silt deposition, water quality degradation, sedimentation from development, and agricultural runoff (USFWS, 2010a).

Plants

Two endangered and one threatened plants are federally listed for New Hampshire as summarized in Table 9.1.6-. Jesup's milk-vetch (*Astragalus robbinsii var. jesupi*) and the northeastern bulrush (*Scirpus ancistrochaetus*) are found in western parts of the state along the Connecticut River. The small whorled pogonia *(Isotria medeoloides)* is found in forests throughout the state. Information on the habitat, distribution, and threats to the survival and recovery of each of these species in New Hampshire is provided below.

Table 9.1.6-6. Federally Listed Plant Species of New Hampshire

Common Name	Scientific Name	Federal Status [a]	Critical Habitat	Habitat Description
Jesup's Milk-vetch	*Astragalus robbinsii* var. *jesupi*	E	No	Bbanks of the Connecticut River
Northeastern Bulrush	*Scirpus ancistrochaetus*	E	No	Palustrine wetlands[102] and vernal ponds with seasonally fluctuating water levels in western New Hampshire
Small Whorled Pogonia	*Isotria medeoloides*	T	No	Hardwood stands in acidic soils throughout the state

[a] E = Endangered, T = Threatened

Sources: (USFWS, 2015c) (USFWS, 2015d)

***Jesup's Milk-vetch*.** Jesup's Milk-vetch is a member of the legume family and emerges from the banks of the Connecticut River in April every year (52 FR 21481, June 5, 1987) (USFWS, 2015p). The plant ranges from 8 inches to 24 inches in height and has 9 to 17 small leaflets with small violet flowers and seed pods. Typically, ice scouring and flooding of the rocky habitat have kept other non-native plant species from competing for habitat, but with damns restricting river flow and climate change, the species is becoming more scarce. This scarcity of the species further makes the plant susceptible to disease from lack of genetic variety. Additional threats include riverfront development and trampling by humans (USFWS, 2010b).

Northeastern Bulrush. The northeastern bulrush is a plant with narrow leaves and a drooping head with chocolate-brown florets. It is a wetland plant in the sedge family that is very similar to other bulrushes, but its flowers and seeds are structurally different. This species was federally listed as endangered in 1991 (56 FR 21091, May 5, 1991). The northeastern bulrush is known to occur from New Hampshire south to Virginia, with the most known occurrences in Pennsylvania (USFWS, 2010c) . In New Hampshire, the species is known to occur only in Sullivan County (USFWS, 2015q).

The northeastern bulrush occurs in palustrine wetlands and vernal ponds with seasonally fluctuating water levels. The current threats to the northeastern bulrush include alterations to the surrounding hydrology[103], either by drier or wetter conditions (USFWS, 2006) (USFWS, 2010c).

[102] Palustrine wetlands: "Palustrine wetlands include nontidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens." (USEPA 2015l)
[103] Hydrology: "Hydrology is the science that deals with the properties, movement, and effects of water found on the earth's surface, in the soil and rocks beneath the surface, and in the atmosphere." (USEPA 2015l)

Small Whorled Pogonia. The threatened small whorled pogonia is a member of the orchid family which grows between 10 to 14 inches in height with greenish yellow flowers. The small whorled pogonia was federally listed as endangered in 1982 (47 FR 39827, September 9, 1982) and in 1994 was reclassified as threatened (59 FR 50852, October 6, 1994) (USFWS, 2015r). Regionally this species is known to occur sparsely distributed from Maine south to Georgia and eastern to Illinois (USFWS, 2008).

Small whorled pogonia Photo credit:

The small whorled pogonia occurs in hardwood stands that include beech, birch, maple, oak, hemlock, and hickory that have an open understory, preferring acidic soils along small streams that have a thick layer of litter (USFWS, 2008). One distinct feature of this species is that it can remain dormant underground for multiple years before reappearing (USFWS, 1992). In Pennsylvania, populations are most abundant in dry east or southeast facing hillsides. Specific habitats are known to exist in three counties within New Hampshire: Belknap, Carroll, Grafton, Hillsborough, Merrimack, Rockingham, and Strafford counties (USFWS, 2015s). Current threats to small whorled pogonia include habitat loss due to urban expansion and forestry practices (USFWS, 2008).

9.1.7. Land Use, Recreation, and Airspace

9.1.7.1. Definition of the Resources

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

9.1.7.2. Land Use, Recreation, and Airspace

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 man-made development (USGS, 2012b).

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, beaches, caves, lakes, forests, recreational facilities, museums, historic sites, and other areas/facilities. Recreational resources are typically managed by federal, state, county, or local governments.

Descriptions of land uses are presented in three primary categories: forest and woodlands, agricultural, and developed. 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.

Airspace

Airspace is generally defined as the space lying above the earth, above a certain area of land or water, or above a nation and the territories that it controls, including territorial waters (Merriam Webster Dictionary, 2015a). Airspace is a finite resource that can be defined vertically and horizontally, as well as temporally, when discussing it in relation to aircraft activities. Airspace management addresses how and in what airspace aircraft fly. Air flight safety considers aircraft flight risks, such as aircraft mishaps and bird/animal-aircraft strikes. The U.S. Federal Aviation Administration (FAA) is responsible for the safe and efficient use of the nation's airspace and has established criteria and limits to its use.

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, 2014a). The ATO is comprised 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 and 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.

9.1.7.3. Specific Regulatory Considerations

Appendix C summarizes numerous federal laws and regulations that, to one degree or another, affect land use in New Hampshire. However, most site-specific land use controls and requirements are governed by local county, city, and village laws and regulations. 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.

Because the nation's airspace is governed by federal laws, there are no specific New Hampshire state laws that would alter the existing conditions relating to airspace for this PEIS.

9.1.7.4. Land Use and Ownership

For the purposes of this analysis, New Hampshire has been classified into three primary land use groups: forest and woodlands[104], agricultural[105], and developed land[106]. Land ownership within New Hampshire has been classified into four main categories: private, federal, state, and tribal.

Land UseTable 9.1.7-1 identifies the major land uses in New Hampshire. Forest and woodlands comprises the largest portion of land use with 77 percent of New Hampshire's total land occupied by this category (Figure 9.1.7-1). Developed land is the second largest area of land use with 7 percent of the total land area. Agricultural land accounts for approximately 4.6 percent of the total land area. The remaining percentage of land includes public land, surface water, and other land cover, shown in Figure 9.1.7-1, that are not associated with specific land uses (USGS, 2012c).

Table 9.1.7-1: Major Land Uses in New Hampshire

Land Use	Square Miles	Percent of Land
Forest and Woodland	7,882	77%
Agricultural Land	422	5%
Developed Land	606	7%
Surface Water	289	4%

Source: (USGS, 2012c)

Forest and Woodland

Forest and woodland areas can be found throughout the state, many of them interspersed with, and adjacent to, agricultural areas. Most forest and woodland areas throughout New Hampshire are privately owned. Section 9.1.6, Biological Resources, presents additional information about terrestrial vegetation.

State Forests

State Forests are under the administration of and managed by the New Hampshire Division of Forest and Lands. There are 212 state forests, totaling over 159,500 acres. Besides being used for recreational purposes, New Hampshire’s forests produce timber products and provide habitat for wildlife (New Hampshire Division of Forests and Lands, 2015).

Private Forest and Woodland

Approximately 5,500 square miles of New Hampshire's total forestland is privately owned. Private forestlands indirectly provide some public benefit, including forest products, wildlife habitat, jobs, scenic beauty, and outdoor recreation opportunities. Scattered throughout the state,

[104] Forest and woodlands: Areas characterized by tree cover (natural or semi-natural woody vegetation, generally greater than 6 meters tall); tree canopy accounts for 25-100 percent of the cover. (USGS, 2012c)
[105] Agricultural: Areas characterized by herbaceous vegetation that has been planted or is intensively managed for the production of food, feed, or fiber; or is maintained in developed settings for specific purposes. Herbaceous vegetation accounts for 75-100 percent of the cover. (USGS, 2012c)
[106] Developed: Areas characterized by a high percentage (30 percent or greater) of constructed materials (e.g., asphalt, concrete, buildings, etc). (USGS, 2012c)

forests and woodlands on private lands often border agricultural fields, suburban neighborhoods, and State Forest Preserves. For additional information regarding forest and woodland areas, see Section 9.1.6, Biological Resources, and Section 9.1.8, Visual Resources.

Agricultural Land

Agricultural land exists in every region of the state (Figure 9.1.7-1). Approximately 5 percent, or 1,318 square miles, of land in New Hampshire is classified as agricultural. In 2012, there were 4,391 farms in New Hampshire and most were owned and operated by small, family businesses, with the average farm size of less than 200 acres (USDA, 2012). Some of the state's largest agricultural uses include greenhouse and nursery products, Christmas trees, sweet corn, check eggs, and apples. Other agricultural uses include livestock for dairy and meat, goats, sheep and hogs. For more information by county, access the USDA Census of Agriculture website: http://www.agcensus.usda.gov/Publications/2012/Full_Report/Census_by_State/New_Hampshire/ .

Developed Land

Developed land in New Hampshire tends to be concentrated within major metropolitan areas and surrounding cities, towns, and suburbs (Figure 9.1.7-1). Although only 7 percent of New Hampshire land is developed, these areas are highly utilized for residential, commercial, industrial, recreational, and government purposes. Table 9.1.7-2 lists the top five developed metropolitan areas within the state and their associated population estimates, and shows where these areas are located within the Developed land use category.

Table 9.1.7-2: Top Five Developed Metropolitan Areas

Metropolitan Area	Population Estimate
Manchester	109,565
Nashua	86,494
Concord	42,695
Derry	33,109
Dover	29,987

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

Land Ownership

Land ownership within New Hampshire has been classified into four main categories: private, federal, state, and tribal (Figure 9.1.7-2).

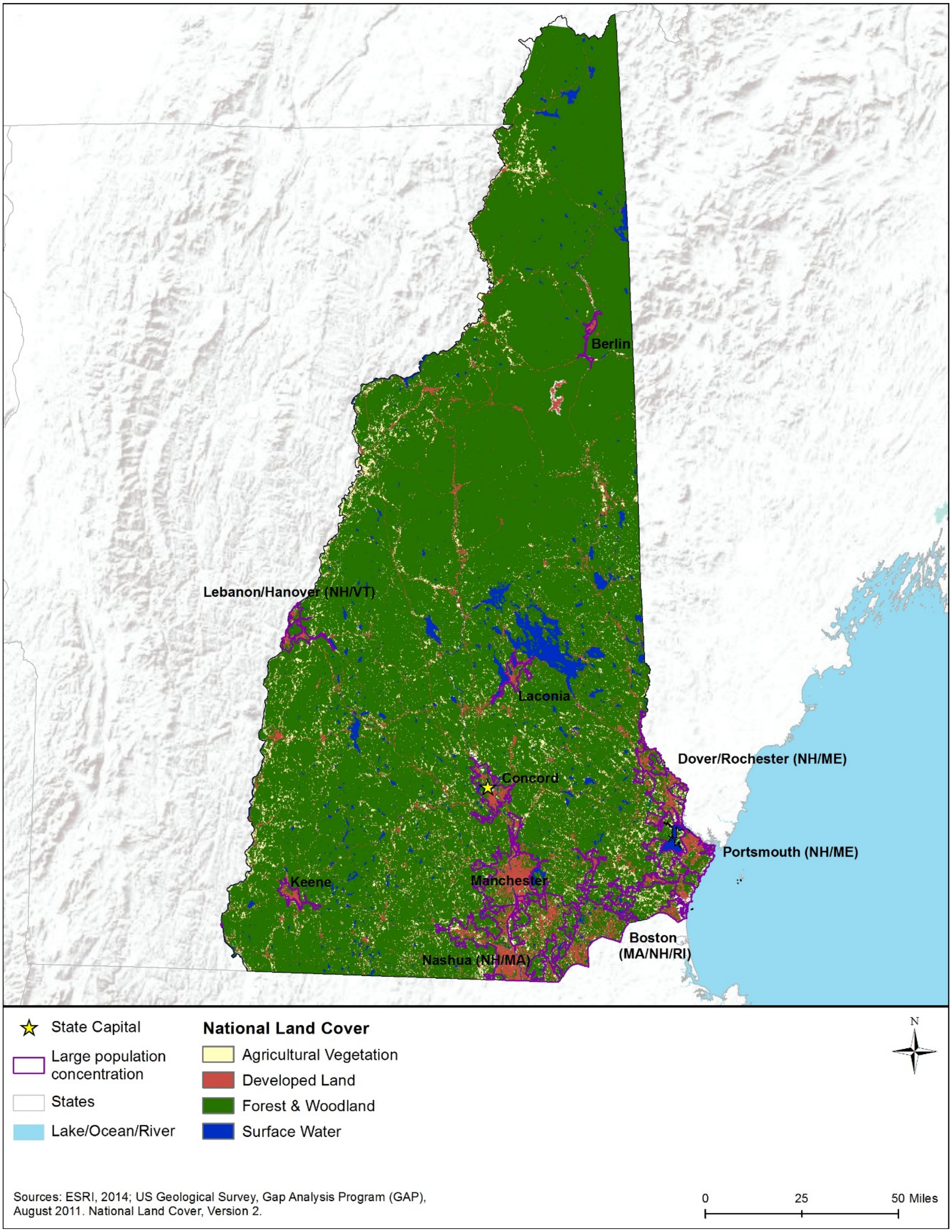

Figure 9.1.7-1: Land Use Distribution

Private Land

The majority of land in New Hampshire is privately owned, with most of this land falling under the land use categories of agricultural, forest and woodland, and developed (Figure 9.1.7-2). 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.[107]

Federal Land

The federal government manages a variety of land types and uses, including National Park Service (NPS) areas, monuments, historic sites, military bases, and national forests in New Hampshire (Figure 9.1.7-2). Table 9.1.7-3 identifies the federal agencies managing federal lands throughout the state. Some federal agencies only have small areas of federal lands scattered throughout the state.[108]

Table 9.1.7-3: Federal Land in New Hampshire

Agency[a]	Square Miles	Representative Type
Department of Defense (DOD)	4.5	Military Bases
USFWS	19.1	Wildlife Refuges
USFS	1,213.3	Wilderness and Forest Areas
NPS	0.29	Parks, Monuments, Historic Sites

a Table identifies land wholly managed by the Agency; additional properties may be managed by or affiliated with the Agency.

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

State Land

The New Hampshire state government owns approximately 32 square miles of land comprised of forests and woodlands, historic sites, state offices, and recreation areas. State parks contain natural, historic, cultural, and/or recreational resources of significance to New Hampshire residents and visitors. There are 92 state park properties throughout New Hampshire (New Hampshire Parks and Recreation, 2016a). The New Hampshire Division of Forests and Lands manages 212 state forests and other lands, which includes properties such as state parks, heritage parks, natural areas, historical sites, and recreational trails, totaling over 159,500 acres (New Hampshire Division of Forests and Lands, 2015).

No land in New Hampshire is held in trust by the federal or state government on behalf of a Native American tribe or tribes as permanent tribal homelands. New Hampshire does not have any federally recognized tribes currently located in the state, and the Bureau of Indian Affairs does not manage any land in the state (U.S. Census Bureau, 2014). For additional information on Native American tribes in New Hampshire, see Section 9.1.11, Cultural Resources.

[107] Total acreage of private land could not be obtained for the state.
[108] Not all Federal agency land is depicted in Figure 9.1.7-2 given the small size of some of the land acreage.

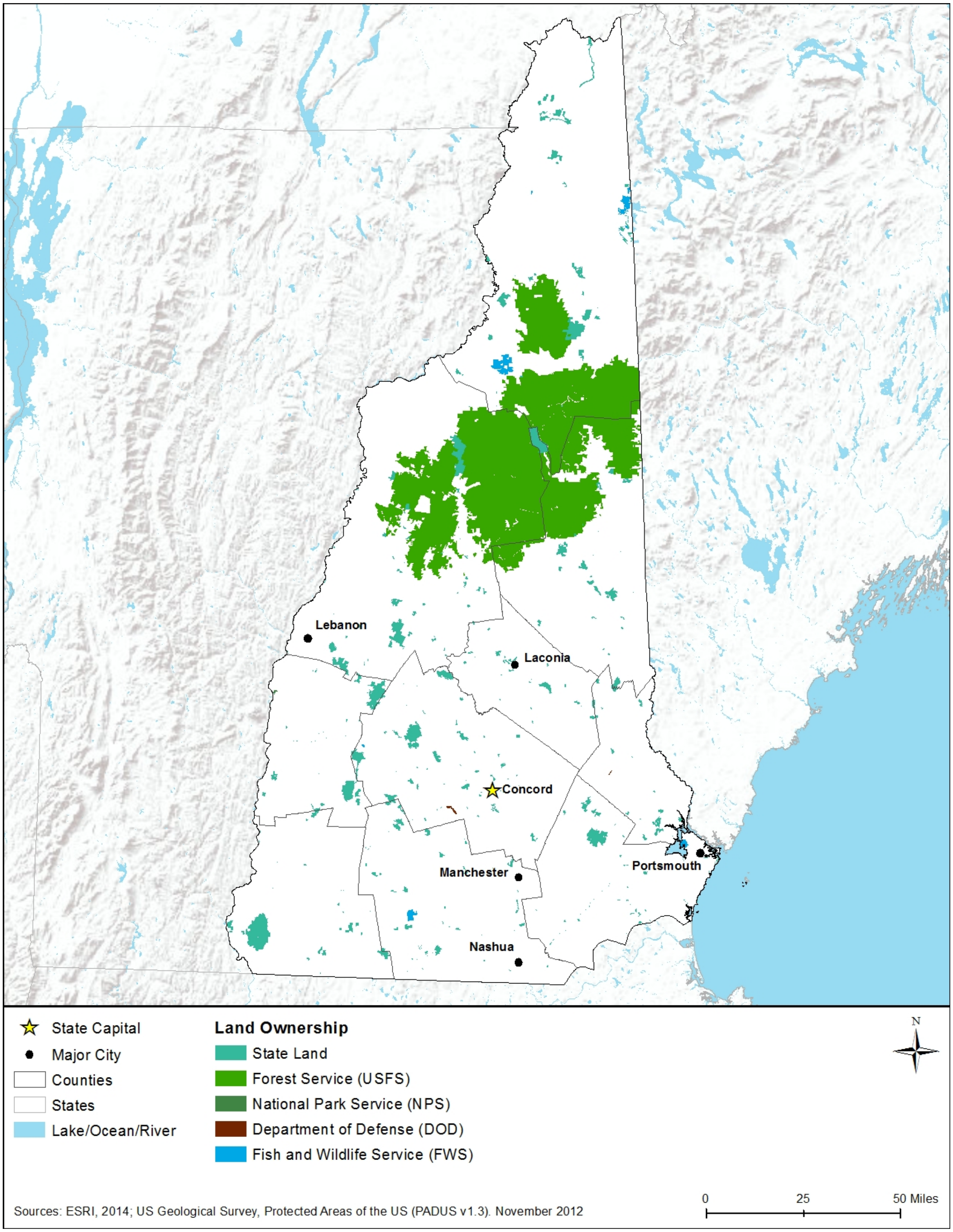

Figure 9.1.7-2: Land Ownership Distribution

Tribal Land

9.1.7.5. Recreation

New Hampshire is notable for having large expanses of wilderness, quaint towns, and only a few densely populated areas. On the community level, cities and towns provide an assortment of indoor and outdoor recreational facilities including: community and recreation centers, theaters, museums, athletic fields and courts, multi-use trails, playgrounds, picnicking areas, theme/amusement parks, alpine (downhill) ski resorts and Nordic (cross country skiing) centers, and boat launches and marinas. Availability of community-level facilities is typically commensurate to the population's distribution and interests, and the natural resources prominent in the vicinity.

This section discusses key recreational opportunities and activities representative of various regions of New Hampshire. The state can be categorized by five distinct recreational regions, each of which are presented in the following sub-sections. For information on visual resources such as National Scenic Byways and state-designated Byways, see Section 9.1.8, Visual Resources; and for information on culturally/historically significant resources (e.g., National Historic Sites, National Historic Landmarks, sites on the National Register of Historic Places, and Natural Heritage Areas), see Section 9.1.11, Cultural Resources.

Great North Woods Region

The Great North Woods Region occupies the northern-most part of the state (Figure 9.1.7-3) and is bordered by Vermont to the west, Quebec, Canada to the north, Maine to the east, and the White Mountains Region to the south. The terrain is rugged in this region and contains glacial lakes and the headwaters of the Connecticut River. It is best known for the Ride the Wilds Trails, over a thousand miles of off-highway recreational vehicle (OHRV) trails for all-terrain vehicles (ATVs) and snowmobile use. Boating/canoeing, swimming, fishing, hunting, hiking, camping, biking, and picnicking are also popular outdoor activities in this region. With an estimated 4,000 moose roaming the northern section, wildlife viewing is also popular (NH DRED, 2015a). There are nine state parks, the Connecticut Lake Headwaters Working Forest, and the Upper Coos Recreational Trail located in this region (New Hampshire State Parks, 2015).

White Mountain Region

This north central part of the state is named for the 800,000-acre White Mountains National Forest (Figure 9.1.7-3). It has 148,000 acres designated as Wilderness Areas, the Wildcat Wild and Scenic River (National Wild and Scenic Rivers System, 2015d), an internationally known sport rock climbing area, and eight ski areas that host approximately 1,000,000 skier visits annually (USFS, 2015). This region also contains most of the state’s 48 mountain peaks that exceed 4,000 feet of elevation; including 6,288 foot Mt. Washington. Alpine and Nordic skiing, snowshoeing, hut-to-hut trekking in the Presidential Range, snowmobiling, hiking, biking, camping, zip lining, gondola rides, and water parks are popular recreational activities (NH DRED, 2015b). The Appalachian Trail traverses for over 600 miles through this region, connecting with the Vermont and Maine segments. There are six state parks and three Recreational Trail segments in this region (New Hampshire State Parks, 2015).

Lakes Region

The Lakes Region occupies the southeast central part of the state (Figure 9.1.7-3). With over 250 distinct lakes and ponds in this region (Lake Winnipesaukee and Squam Lake are the largest); top outdoor recreational activities include boating, jet skiing, paddle boarding, swimming, and fishing. There are also many family oriented attractions associated with the beaches, boat launches, and boardwalks of these lakes. The Laconia Motorcycle Rally, World Championship Sled Dog Derby, Tamworth Barnstormers Summer Theater, and Sandwich's Columbus Day Weekend Fair are decades-old events that draw large numbers of visitors annually to the Lakes Region (NH DRED, 2015c). There are five state parks, the Madison Boulder Natural Area, and two Recreational Trail segments in this region (New Hampshire State Parks, 2015).

Dartmouth /Lake Sunapee, Monadnock and Merrimack Valley Region

This region occupies the southwestern and south central part of the state (Figure 9.1.7-3), bordered by Vermont to the west, and the Seacoast Region to the east. This area has diverse opportunities for outdoor recreation activities. The rural areas have mountains, lakes, trails, and opportunities for mineral collecting. Mount Monadnock provides terrain for numerous winter sports. The Fitzwilliam Rhododendron, Hillsborough Balloon, and Keene Ice and Snow Festivals are popular yearly events (NH DRED, 2015d). New Hampshire's largest cities, (including the capital) are also located in this region, making it the state's hub for cultural, arts, music, and sports entertainment. Formerly famous for water powered textile mills, this region's forests and rivers/streams provide ample opportunities for hiking, picnicking, fishing, biking, and winter and water sports (NH DRED, 2015e). The Saint-Gaudens National Historic Site (New Hampshire's only National Park property) is a popular destination for visitors interested in exploring the studio and artworks of one of America's greatest sculptors (NH DRED, 2015f). There are 16 state parks, the Sculptured Rocks Geologic Site, Chesterfield Gorge Natural Area, and 10 Recreational Trails/Rail Trails traversing this region (New Hampshire State Parks, 2015).

Seacoast Region

The Seacoast Region occupies the southeastern-most part of the state (Figure 9.1.7-3). Four of the five state parks in this region are located along the 13 miles of New Hampshire's Atlantic coast, supplementing the three state beaches there. In addition to all the leisure and sporting activities associated with the shoreline and ocean, there are also many cultural and entertainment attractions, including museums and casinos (NH DRED, 2015g). The Lamprey Wild and Scenic River (National Wild and Scenic Rivers System, 2015b) (National Wild and Scenic Rivers System, 2015d) and three Recreational Trail/Rail Trail segments are also located here (New Hampshire State Parks, 2015).

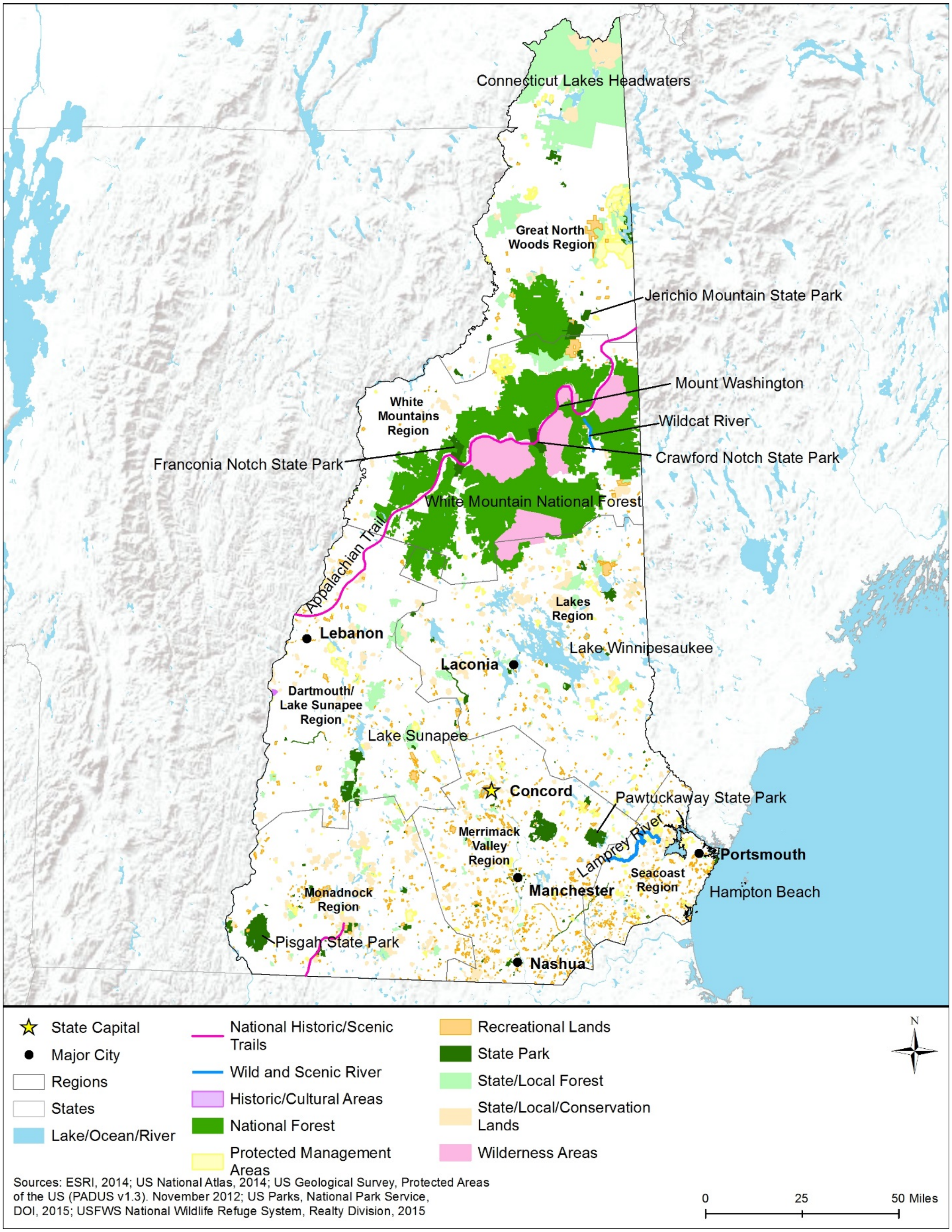

Figure 9.1.7-3: New Hampshire Recreation Resources

9.1.7.6. 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 Operation 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 9.1.7-4 depicts the different classifications and dimensions for controlled airspace. Air Traffic Control (ATC)[109] service is based on the airspace classification (FAA, 2008).

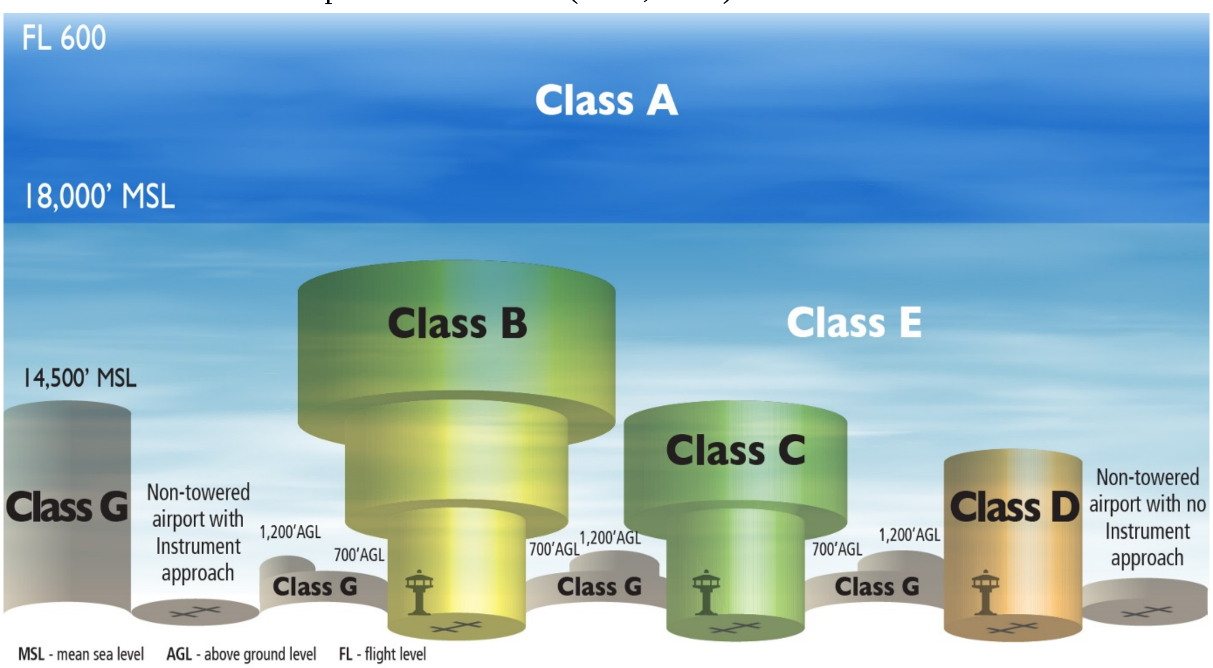

Figure 9.1.7-4: National Air Space Classification Profile

Source: Derived from (FAA, 2008)

[109] ATC – Approved authority service to provide safe, orderly and expeditious flow of air traffic operations. (FAA, Federal Aviation Administration Aeronautical Information Manual, 2014)

Controlled Airspace

- **Class A:** Airspace from 18,000 feet to 60,000 feet Mean Sea Level (MSL)[110]. 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).[111]
- **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).

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 Figure 9.1.7-1).

Table 9.1.7-4: SUA Designations

Representative 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."

[110] 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." (Sea Level 2015)
[111] IFR - Rules for the conduct of flights under instrument meteorological conditions. (FAA, 2015b)

Representative Type	Definition
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 voluntarily avoid 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."

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

Other Airspace Areas

Other airspace areas, explained in Table 9.1.7-5, 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 9.1.7-5: Other Airspace Designations

Type	Definition
Airport Advisory	There are 3 types: • Local Airport Advisory – Operated within 10 statute 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.

Source*:* (FAA, 2015d) (FAA, 2008)

9.1.7.7. 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 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).

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.

9.1.7.8. 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 or 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 AGL
- 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.

9.1.7.9. New Hampshire Airspace

The New Hampshire Bureau of Aeronautics is under the jurisdiction of the NHDOT. The Bureau of Aeronautics is responsible for preserving and promoting the state's airport system. Working with federal, state, and local aviation agencies, the Bureau of Aeronautics strives to assure future air transportation needs are met (New Hampshire Bureau of Aeronautics, 2015). There is no FAA FSDO for New Hampshire (FAA, 2015a).

New Hampshire 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 issues associated with their airports (National Association of State Aviation Officials [NASAO], 2015). Figure 9.1.7-5 presents the different aviation airports/facilities located in New Hampshire, while Figures 9.1.7-6 and 9.1.7-7 present the breakout by public and private airports/facilities. There are approximately 142 airports (public and private) within New Hampshire as presented in Table 9.1.7-6 and Figure 9.1.7-5 through Figure 9.1.7-7 (USDOT, 2015b).

Table 9.1.7-6: Type and Number of New Hampshire Airports/Facilities

Type of Airport or Facility	Public	Private
Airport	24	29
Heliport	0	81
Seaplane	1	7
Ultralight	0	0
Balloonport	0	0
Gliderport	0	0
Total	25	117

Source: (USDOT, 2015b)

There are Class C, D, and E controlled airports in New Hampshire as follows:

- One Class C –
  - Manchester
- Three Class D –
  - Lebanon Municipal
  - Nashua Boire Field
  - Portsmouth Pease International Tradeport
- Two Class E –
  - Concord Municipal
  - Manchester (FAA, 2014b)

SUAs (i.e., two MOAs) located in New Hampshire are as follows:

- Yankee 1 – 9,000 feet MSL to, but not including, FL 180
- Yankee 2 – 100 feet AGL to, but not including, 9,000 MSL (FAA, 2015f)

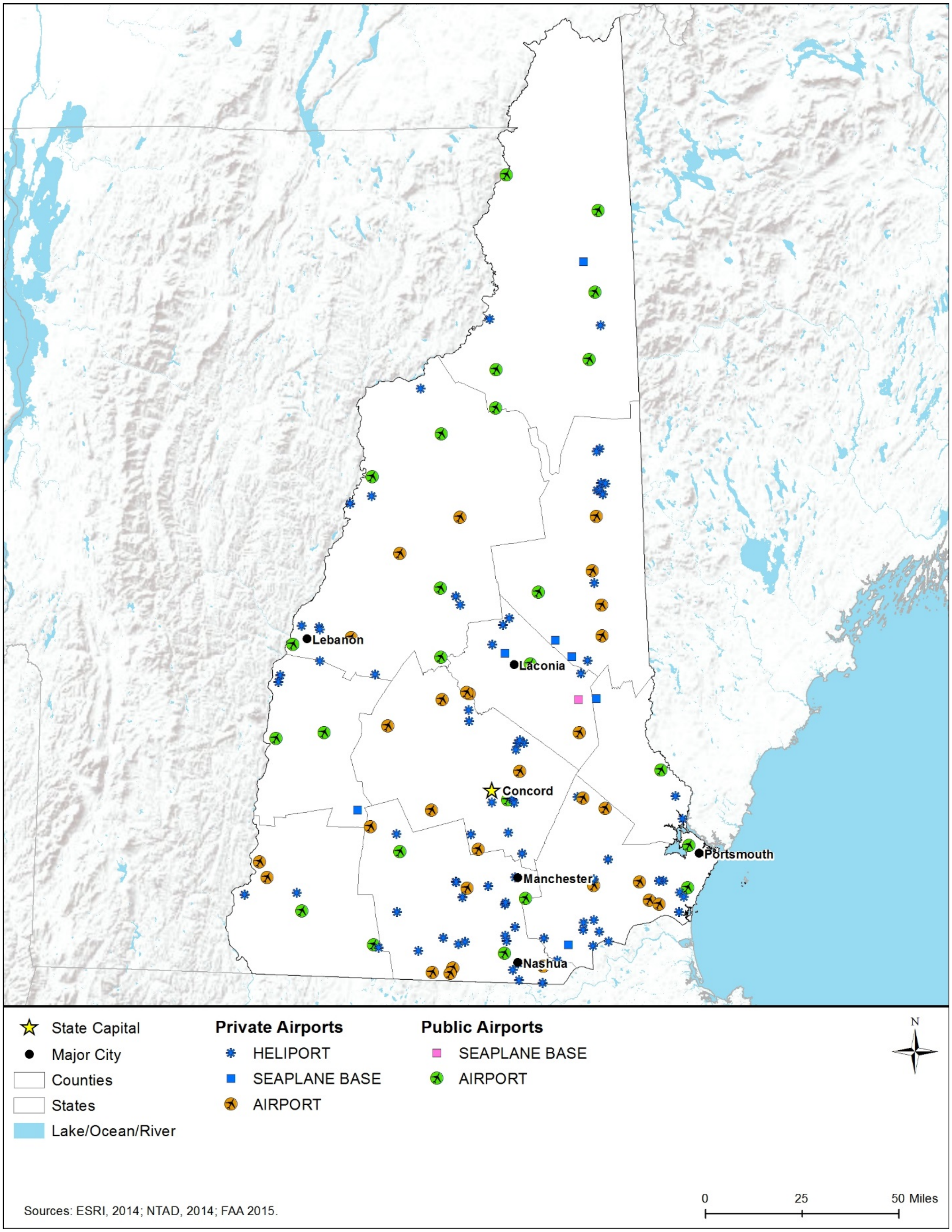

Figure 9.1.7-5: Composite of New Hampshire Airports/Facilities

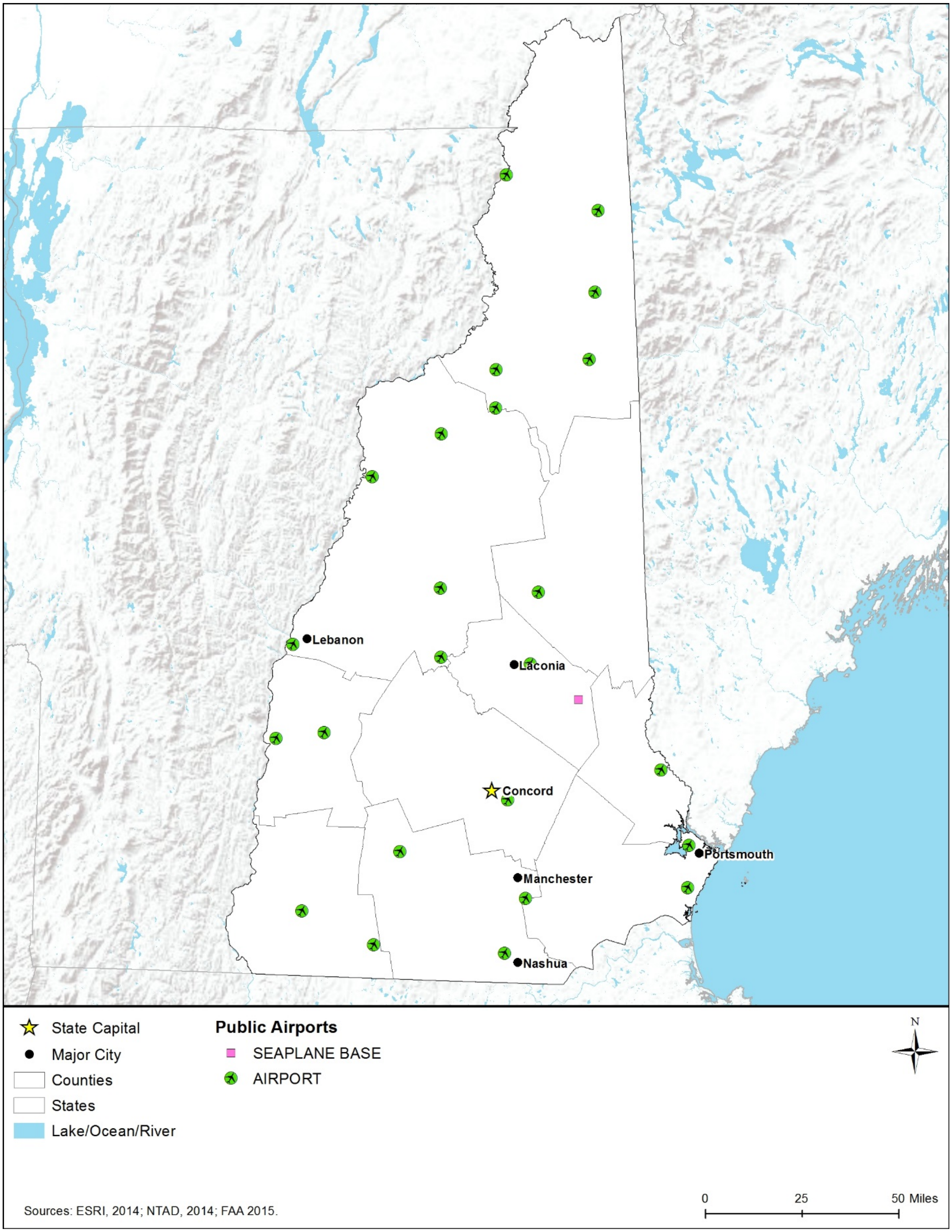

Figure 9.1.7-6: Public New Hampshire Airports/Facilities

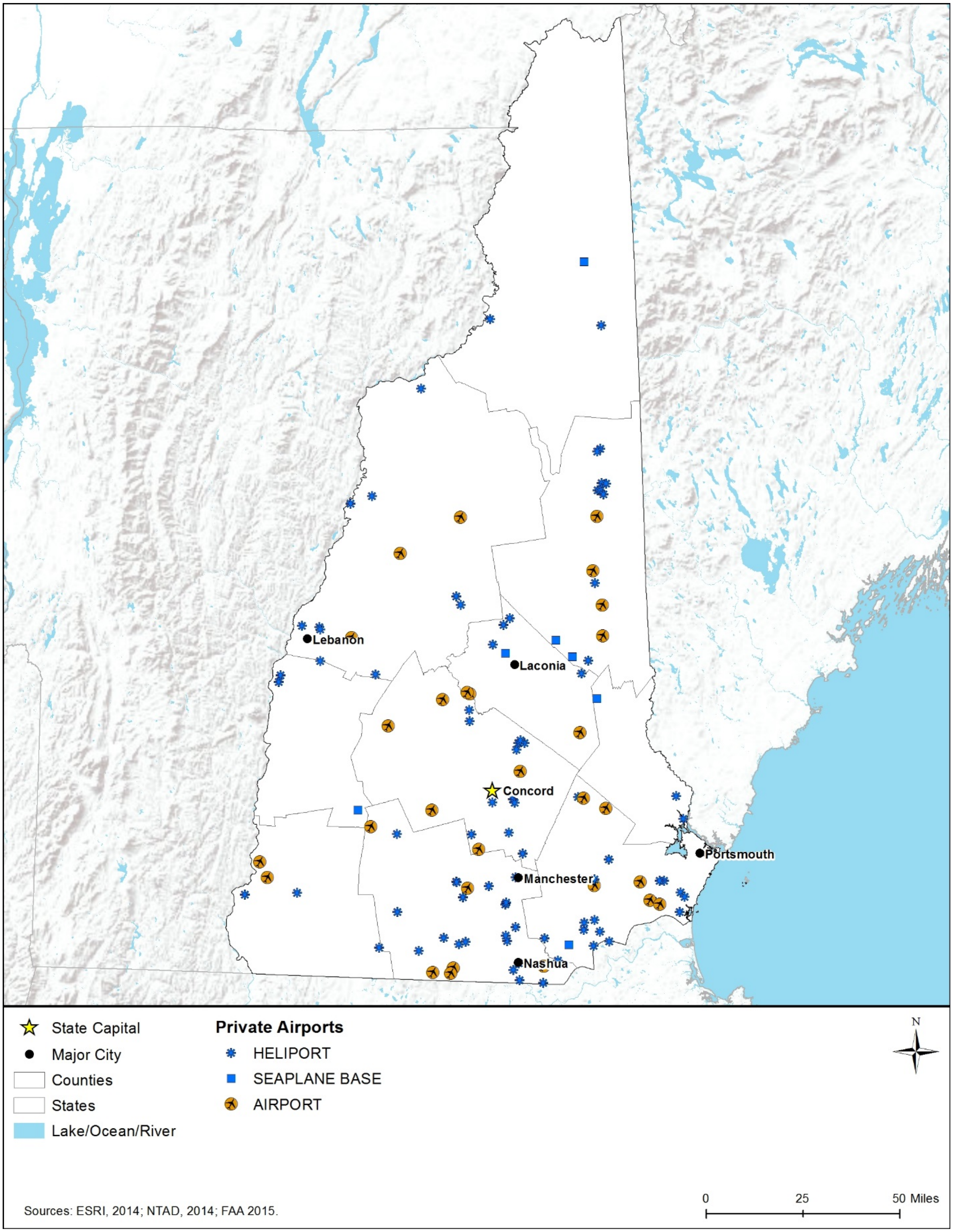

Figure 9.1.7-7: Private New Hampshire Airports/Facilities

The MOA of CONDOR 1 in the state of Maine extends into the upper eastern portion of New Hampshire. There is one Warning Area (W103) located off the coast of New Hampshire (FAA, 2015f). Figure 9.1.7-8 presents the SUAs in New Hampshire. There is one TFR (5/7942) located near Manchester (FAA, 2015g). MTRs for New Hampshire, presented in Figure 9.1.7-9, consist of one Slow Route 902 and one Instrument Route 800.

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, 2014b). The Saint-Gaudens National Historic Site in New Hampshire must comply with this agency directive (NPS, 2015a).

Obstructions to Airspace Considerations

Any proposed construction meeting the criteria of FAA regulations and state laws requires notification to the FFA and New Hampshire. Chapter 422-B of the New Hampshire Statues Title XXXIX: Aeronautics addresses the control of tall structures. Minimal new, replacement of existing structures, or extending the height of an existing structure can occur in New Hampshire until a permit is issued by the appropriate department (e.g., zoning, planning, etc.) based on the following criteria:

- Any structure extending more than 500 feet above the highest point of land within a one-mile radius from the structure,
- Any structure extending more than 1,000 feet above the highest point of land within a one-mile radius from the location of the structure, or

Local government zoning and ordinances surrounding public airports (New Hampshire General Court, 2015).

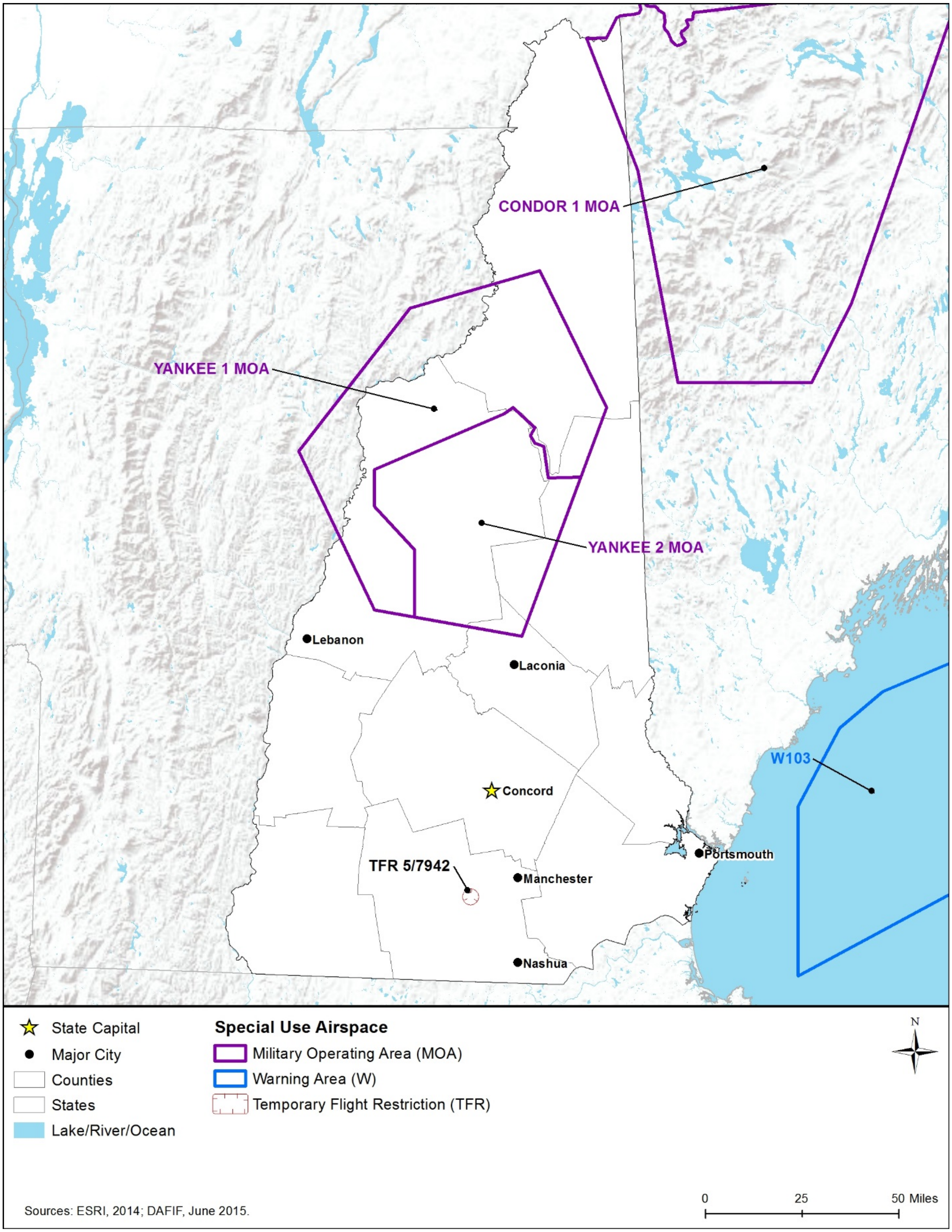

Figure 9.1.7-8: SUAs in New Hampshire

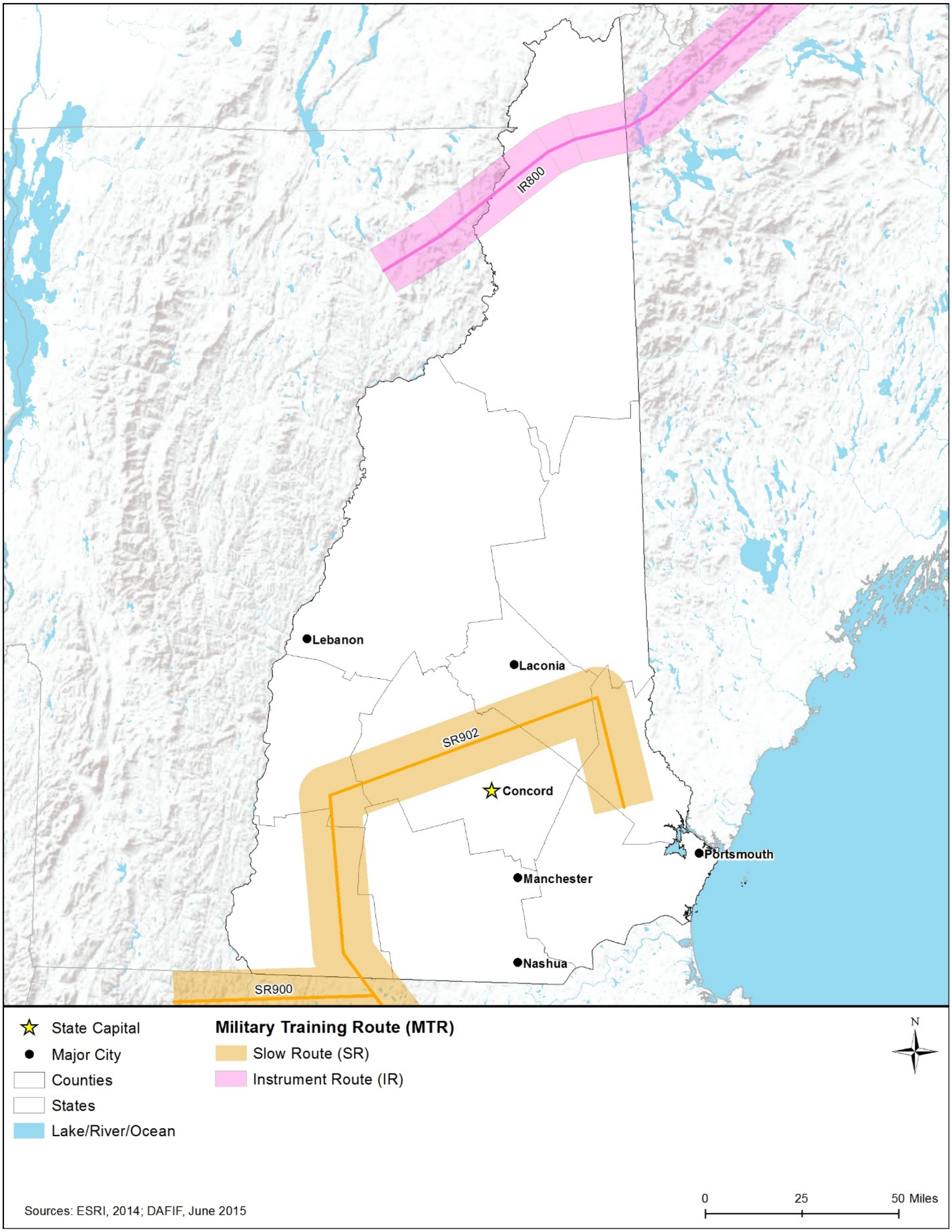

Figure 9.1.7-9: MTRs in New Hampshire

9.1.8. Visual Resources

9.1.8.1. 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; for others, views of natural areas are valued visual resources. 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. A general definition of visual resources used by the Bureau of Land Management (BLM) is “the visible physical features on a landscape (e.g., land, water, vegetation, animals, structures, and other features)” (BLM, 1984).

9.1.8.2. Specific Regulatory Considerations

Table 9.1.8-1 presents state and local laws and regulations that relate to visual resources.

Table 9.1.8-1: Relevant New Hampshire Visual Resources Laws and Regulations

State Law/Regulation	Regulatory Agency	Applicability
New Hampshire Title L, Water Management and Protection, Chapter 483 New Hampshire Rivers Management and Protection Program	Office of Energy and Environment	Established “to conserve and protect outstanding characteristics including recreational, fisheries, wildlife, environmental, hydropower, cultural, historical, archaeological, scientific, ecological, aesthetic, community significance, agricultural, and public water supply so that these valued characteristics shall endure as part of the river uses to be enjoyed by New Hampshire people.”
New Hampshire Clean Lakes Program, Section 487:15	Office of Energy and Environment	Established “to restore, preserve and maintain the state's lakes and ponds in order that these significant environmental, aesthetic and recreational assets will continue to benefit the social and economic well-being of the state's citizens.”
Preservation Easements	Cities and Towns	Established for “maintaining the historic rural character of the state's landscape, sustaining agricultural traditions, and providing an attractive scenic environment for work and recreation of the state's citizens and visitors.”

In addition to the state laws and regulations, local zoning laws may apply related to visual resources. Viewsheds and scenic vistas are increasingly important to the state’s towns, cities, and villages as they look at the future planning of their municipalities. Where counties, cities, towns, or villages have planning documents that address scenery, character, or visual resources, the placement of towers or temporary transmission structures would be required to comply with the management or provide mitigation measures to meet compliance.

9.1.8.3. Character and Visual Quality of the Existing Landscape

New Hampshire has a wide range of visual resources. The state is endowed with historic and natural resources, both of which provide scenic and aesthetic qualities for residents and visitors. With locations such as the Rhododendron Natural Area, the Saint-Gaudens National Historic Site, and landscapes containing pristine woodlands, beaches, and waterways, New Hampshire has many visually stunning attributes. Visual resources within the state are managed by agencies charged with land, vegetation, and wildlife preservation. These include the Office of Energy and Environment, the Department of Conservation and Recreation, the Division of Fisheries and Wildlife, the USFWS, the NPS, and several other state and federal agencies. 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.

9.1.8.4. 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. Viewsheds containing historic properties and cultural resources may be considered important because of their presence in the landscape.

Figure 9.1.8-1 shows areas that are included in the National Register of Historic Places (NRHP) that may be considered visually sensitive. In New Hampshire, there are 763 NRHP listed sites as of September 2015, which include 23 National Historic Landmarks, 1 National Historical Site, and 1 National Heritage Area (NPS, 2015b). Some State Historic Sites and Districts may also be included in the NRHP, whereas others may not.

The NPS is required to protect all aspects of historic landscapes considered significant, such as forests, gardens, trails, structures, ponds, and farming areas using *The Secretary of the Interior's Standards for the Treatment of Historic Properties and the Guidelines for the Treatment of Cultural Landscapes* (NPS, 2015c). The standards and guidelines "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 the historic properties and the visual resources therein (NPS, 2015c).

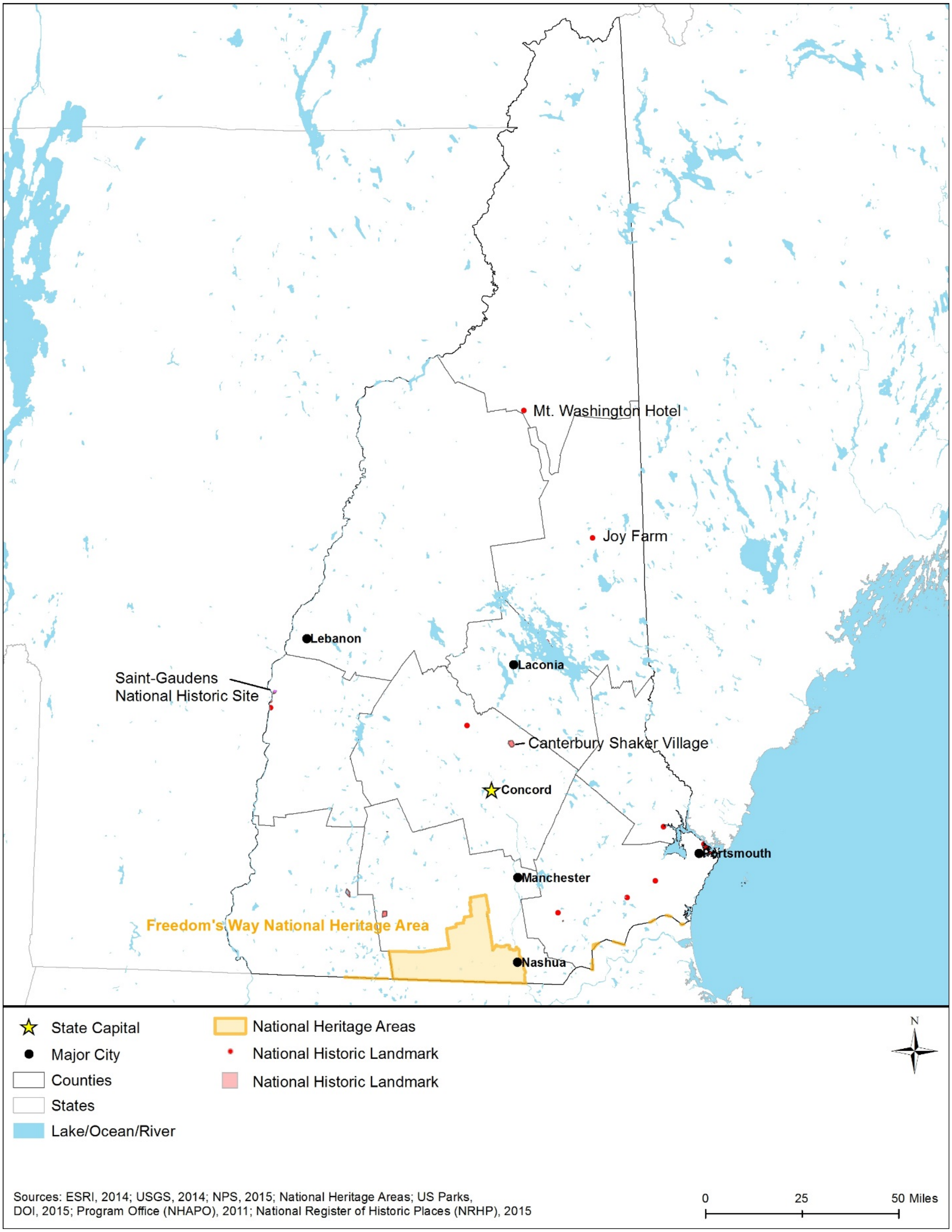

Figure 9.1.8-1: Cultural and Heritage Resources that May be Visually Sensitive

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, 2015d). Generally, NHLs are comprised of historic buildings such as residences, churches, civic buildings, and institutional buildings. Other types of historic properties include battlefields and canals. The importance of NHL-designated properties can be attributed to scenic or aesthetic qualities that may be considered visual resources or visually sensitive at these sites. In New Hampshire, there are 23 NHLs, including sites such as the E.E. Cummings House and the Wentworth-Coolidge Mansion (Figure 9.1.8-2 and Table 9.1.8-2) (NPS, 2015e). By comparison, there are over 2,500 NHLs in the U.S.

Table 9.1.8-2: New Hampshire National Historic Landmarks

NHL Name	
USS Albacore	Josiah Bartlett House
Canterbury Shaker Village	Salmon P. Chase Birthplace and Boyhood Home
E.E. Cummings House	The Epic of American Civilization Murals, Baker Library, Dartmouth College
Robert Frost Homestead	Harrisville Historic District
Richard Jackson House	John Paul Jones House
Ladd-Gilman House	Governor John Langdon Mansion
MacDowell Colony	MacPheadris-Warner House
Moffatt-Ladd House	Mount Washington Hotel
Franklin Pierce Homestead	Augusts Saint-Gaudens Memorial
John Sullivan House	Matthew Thornton House
Daniel Webster Family Home	Wentworth-Coolidge Mansion
Wentworth-Gardner House	

Source*:* (NPS, 2015e)

State Historic Sites and Historic Districts

New Hampshire's State Register of Historic Places lists 311 properties (New Hampshire Division of Historical Resources, 2015) (NHDLHR, 2016). Historic places in the state include buildings, farms, camps, districts, and burial grounds. State historic sites are likely to contain scenic or aesthetic components that may be considered visual resources or visually sensitive. For additional information regarding these properties and resources, see Section 9.1.11, Cultural Resources.

9.1.8.5. 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 9.1.8-2 identifies parks and recreational resources that may be visually sensitive in New Hampshire. For additional information about recreation areas, including national and state parks, see Section 9.1.7, Land Use, Recreation, and Airspace.

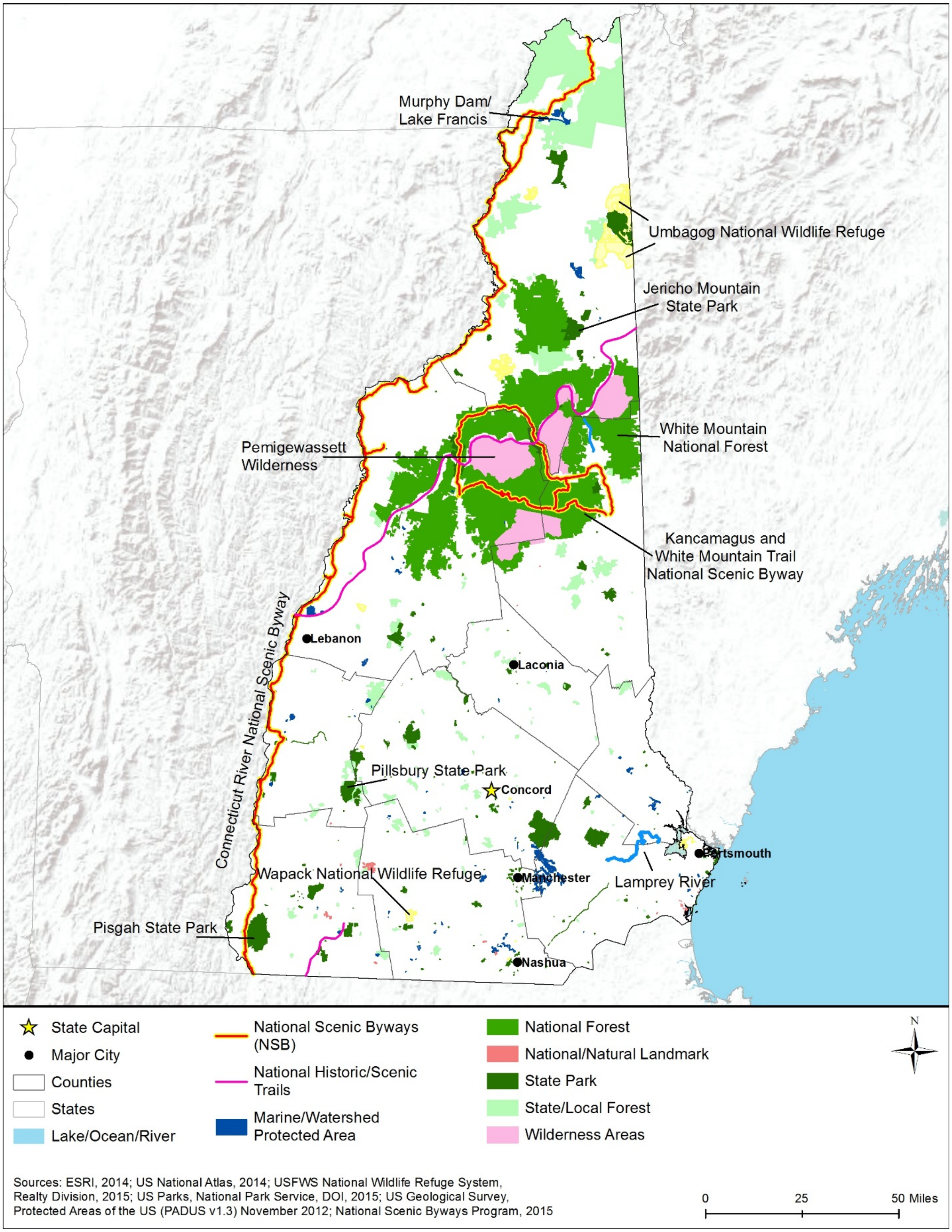

Figure 9.1.8-2: Natural Areas that May be Visually Sensitive

Figure 9.1.8-3: Greenfield State Park

Source: (New Hampshire Parks and Recreation, 2015)

State Parks

State parks contain natural, historic, cultural, and/or recreational resources of significance to New Hampshire residents and visitors. There are 92 state parks throughout New Hampshire, most of which contain scenic or aesthetic areas considered to be visual resources or visually sensitive, such as the Greenfield State Park (Figure 9.1.8-2) (New Hampshire Parks and Recreation, 2016a). For a complete list of state parks, visit the New Hampshire Parks and Recreation website (New Hampshire Parks and Recreation, 2016a).

U.S. National Park Service

The NPS manages natural, historic, cultural, visual, ecological, and recreational resources of significance to the nation. Owned by the U.S. government, these areas are maintained for the public's use. In New Hampshire, the only NPS unit is the Saint-Gaudens National Historic Site, the homestead of the American sculptor (NPS, 2015f). For additional information regarding parks and recreation areas, see Section 9.1.7, Land Use, Recreation, and Airspace.

State and Federal Trails

Designated under Section 5 of the National Trails System Act (16 USC 1241-1251, as amended), National Scenic Trails (NSTs) are defined as extended trails that "provide for maximum outdoor recreation potential and for the conservation and enjoyment of the nationally significant scenic, historic, natural, or cultural qualities of the areas though which they pass" (NPS, 2012a). There is one NST in New Hampshire, the Appalachian NST, administered by the NPS. The Appalachian NST is a 2,185-mile trail through the Appalachian Mountains (NPS, 2014c).

9.1.8.6. Natural Areas

Natural areas vary by state depending on the amount of public or state lands within each state. Although many areas may not be managed specifically for visual resources, these areas exist because of their natural resources, and the resulting management may also protect the scenic resources therein.

National Wilderness Areas

In 1964, Congress enacted the Wilderness Act of 1964 which defined wilderness 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 National Park System. These designated wilderness areas are managed by the USFS, BLM, USFWS, and NPS. (NPS, 2015g)

New Hampshire is home to five federally managed Wilderness Areas, including Great Gulf Wilderness, Pemigewasset Wilderness, Presidential Range-Dry River Wilderness, Sandwich Range Wilderness, and Wild River Wilderness. All of these Wilderness Areas are in the White Mountains (University of Montana , 2016).

State Forests

The New Hampshire Division of Forests and Lands manages 212 state forests and other state lands, totaling over 159,500 acres (New Hampshire Division of Forests and Lands, 2015). Visual resources within state forestlands include scenic foliage, meandering streams, grassy meadows, rocky outcrops, pond and lake views, and wildlife viewing.

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 USC 1271-1287). These rivers have outstanding natural, cultural, and recreational values, including potential visual resources. Portions of two rivers in New Hampshire have been designated as wild and scenic, the Lamprey River (Figure 9.1.8-4) and the Wildcat River, totaling 38 miles (National Wild and Scenic Rivers System, 2015b) (National Wild and Scenic Rivers System, 2015d). Figure 9.1.4-1 in Water Resources identifies these designated wild and scenic rivers.

Figure 9.1.8-4: Lamprey Wild and Scenic River Segment

Source: (National Wild and Scenic Rivers System, 2015b)

National Wildlife Refuges (NWRs) and State Wildlife Management Areas

The USFWS manages NWRs throughout the state. 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, 2015t). There are four NWRs in New Hampshire: Lake Umbagog, John Hay, Great Bay, and Wapack. Visual resources within the NWRs include views and sites of the coast, rocky beaches, wildlife, and naturally vegetated areas.

State Wildlife Management Areas (WMAs) are lands owned and managed by New Hampshire to "protect and improve habitat for wildlife" (NHFG, 2015b). There are 89 state WMAs within New Hampshire, totaling nearly 52,000 acres.

National Natural Landmarks

National Natural Landmarks (NNLs) are sites designated by the U.S. Secretary of the Interior that "contain outstanding biological and/or geological resources, regardless of land ownership, and are selected for their outstanding condition, illustrative value, rarity, diversity, and value to science and education" (NPS, 2014a). These landmarks may be considered visual resources or visually sensitive. In New Hampshire, 11 NNLs exist entirely or partially within the state (Table 9.1.8-3). Some of the natural features located within these areas include "the largest known glacial erratic in North America," a monadnock[112], (Figure 9.1.8-5), one of the most extensive talus slopes[113] in the eastern U.S., and what is considered the largest virgin tract of red spruce forest in the northeastern region. Madison Boulder, in addition to being the smallest site, was the first in New Hampshire to be designated a NNL in 1970. (NPS, 2014a).

Figure 9.1.8-5: Mount Monadnock NNL

Source: (NPS, 2012b)

Table 9.1.8-3: New Hampshire National Natural Landmarks

NNL Name	
East Inlet Natural Area	Floating Island
Pondicherry Wildlife Refuge	Franconia Notch
Nancy Brook Virgin Spruce Forest and Scenic Area	Madison Boulder
White Lake Pitch Pine	Heath Pond Bog
Spruce Hole Bog	Mount Monadnock
Rhododendron Natural Area	

Source: (NPS, 2012b)

[112] Monadnock: an isolated rock hill, knob, ridge, or small mountain that rises abruptly from a gently sloping or virtually level surrounding plain.

[113] Talus slope: a type of slope in which debris piles up to a characteristic angle of repose; when new debris is added, the slope adjusts by movement of the debris.

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. The FHA manages the National Scenic Byways Program (FHA, 2015a). New Hampshire has three designated National Scenic Byways: the Connecticut River Byway (498 miles), the Kancamagus Scenic Byway (26 miles), and the White Mountain Trail (100 miles) (FHA, 2015b) (FHA, 2015c) (FHA, 2015d) (FHA, 2015e).

Similar to National Scenic Byways, New Hampshire State Scenic Byways and Roads are transportation corridors that are of particular statewide interest. State Scenic Byways are roads with statewide interest; State Scenic Byways are designated and managed by NHDOT. New Hampshire has 15 State Scenic Byways covering over 1,000 miles across the entire state (NHDOT, 2015c):

- Moose Path Trail
- Woodland Heritage Trail
- Presidential Range Trail
- River Heritage Trail
- Lake Sunapee Scenic & Cultural Byway
- Lakes Tour
- Branch River Valley Trail
- The Appleway
- Amoskeag Millyard Scenic & Cultural Byway
- Currier & Ives Scenic Byway
- Canterbury Shaker Village Byway
- General John Stark Scenic Byway
- Coastal Byway
- Independence Byway
- Old Stagecoach Scenic Byway

9.1.9. Socioeconomics

9.1.9.1. 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 USC 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. When applicable, it includes qualitative factors such as community cohesion. Socioeconomics provides important context for analysis of FirstNet projects, as those projects 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 state and local taxes. The financial arrangements for deployment and operation of the FirstNet network have socioeconomic implications. Section 1.1 frames some of the public expenditure and public revenue considerations specific to FirstNet; however this is not intended to be either descriptive or prescriptive of FirstNet's financial model or anticipated total expenditures and revenues associated with the deployment of the Nationwide Public Safety Broadband Network (NPSBN). 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 (see Section 1.8). This PEIS addresses environmental justice in a separate section (Section 9.2.10). This PEIS also addresses the following topics, sometimes included within socioeconomics, in separate sections: land use and recreation (Section 9.1.7, Land Use, Recreation, and Airspace), infrastructure and public services (Section 9.1.1, Infrastructure), and aesthetic considerations (Section 9.1.8, Visual Resources).

Wherever possible, this section draws on nationwide datasets from federal sources such as the U.S. Census Bureau (Census Bureau) 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 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 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-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.

9.1.9.2. 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.

9.1.9.3. Communities and Populations

This section discusses the population and major communities of New Hampshire (NH). It includes the following topics:

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

Statewide Population and Population Growth

Table 9.1.9-1 presents the 2014 population and population density of New Hampshire in comparison to the East region[114] and the nation. The estimated population of New Hampshire in 2014 was 1,326,813. The population density was 148 persons per square mile (sq. mi.), which is lower than the population density of the region (312 persons/sq. mi.), but higher than that of the nation (90 persons/sq. mi.). In 2014, New Hampshire was the 42nd largest state by population among the 50 states and the District of Columbia, 44th largest by land area, and had the 22nd greatest population density (U.S. Census Bureau, 2015e; U.S. Census Bureau, 2015f).

Table 9.1.9-1: Land Area, Population, and Population Density of New Hampshire

Geography	**Land Area (sq. mi.)**	**Estimated Population 2014**	**Population Density 2014 (persons/sq. mi.)**
New Hampshire	8,953	1,326,813	147
East Region	237,157	73,899,862	312
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 9.1.9-2 presents the population growth trends of New Hampshire from 2000 to 2014 in comparison to the East region and the nation. The state's annual growth rate decreased in the 2010 to 2014 period compared to 2000 to 2010, from 0.63 percent to 0.20 percent. The growth rate of New Hampshire in the latter period was considerably less than the growth rate of the region (0.50 percent) and the nation (0.81 percent).

[114] The East region is comprised of the states of Connecticut, New Hampshire, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, Virginia, and West Virginia, as well as the District of Columbia. Throughout the socioeconomics section, figures for the East region represent the sum of the values for all "states" (including the District of Columbia) in the region, or an average for the region based on summing the component parameters. For instance, the population density of the East region is the sum of the populations of all its states, divided by the sum of the land areas of all its states.

Table 9.1.9-2: Recent Population Growth of New Hampshire

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
New Hampshire	1,235,786	1,316,470	1,326,813	80,684	10,343	0.63%	0.20%
East Region	69,133,382	72,444,467	73,899,862	3,311,085	1,455,395	0.47%	0.50%
United States	281,421,906	308,745,538	318,857,056	27,323,632	10,111,518	0.93%	0.81%

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

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 9.1.9-3 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. 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 New Hampshire's population will increase by approximately 150,000 people, or 11.1 percent, from 2014 to 2030. This reflects an average annual projected growth rate of 0.66 percent, which is greater than the historical growth rate from 2010 to 2014 of 0.20 percent. The projected growth rate of the state is somewhat higher than that of the region (0.57 percent) and lower than the projected growth rate of the nation (0.80 percent).

Table 9.1.9-3: Projected Population Growth of New Hampshire

Geography	Population 2014	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) 2014 to 2030
New Hampshire	1,326,813	1,569,218	1,380,056	1,474,637	147,824	11.1%	0.66%
East Region	73,899,862	78,925,282	82,842,294	80,883,788	6,983,926	9.5%	0.57%
United States	318,857,056	360,978,449	363,686,916	362,332,683	43,475,627	13.6%	0.80%

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

Population Distribution and Communities

Figure 9.1.9-1 presents the distribution and relative density of the population of New Hampshire. 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, 2015d). 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. Much of the sparsely populated area north of Lebanon/Hanover and Laconia, and south of Berlin, is within the White Mountain National Forest. The White Mountain National Forest is comprised of 800,000 acres, including 148,000 acres designated as Wilderness Areas (USFS, 2015). For more information about the White Mountain National Forest, see Section 9.1.7, Land Use, Recreation, and Airspace.

Table 9.1.9-4 provides the populations of the 10 largest population concentrations in New Hampshire, based on the 2010 census. It also shows the changes in population for these areas between the 2000 and 2010 censuses.[115] In 2010, the largest population concentration was the New Hampshire portion of Nashua area, which had 219,082 people. The state had one other area, the Manchester area, with a population between 100,000 and 500,000. The remaining eight areas had populations ranging from 11,159 (Berlin area) to 93,038 (Boston area, New Hampshire portion). The fastest growing area, by average annual rate of change from 2000 to 2010, was the New Hampshire portion of the Portsmouth area, with an annual growth rate of 5.60 percent (some of this may be due to a substantial enlargement of the Census Bureau's geographic definition of this area). The only other area with a growth rate over 1.00 percent was the New Hampshire portion of the Nashua area (1.06 percent). Several areas experienced population declines during this period, including the Berlin, Concord, and Laconia areas, as well as the New Hampshire portions of the Boston and Lebanon/Hanover areas.

[115] 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.

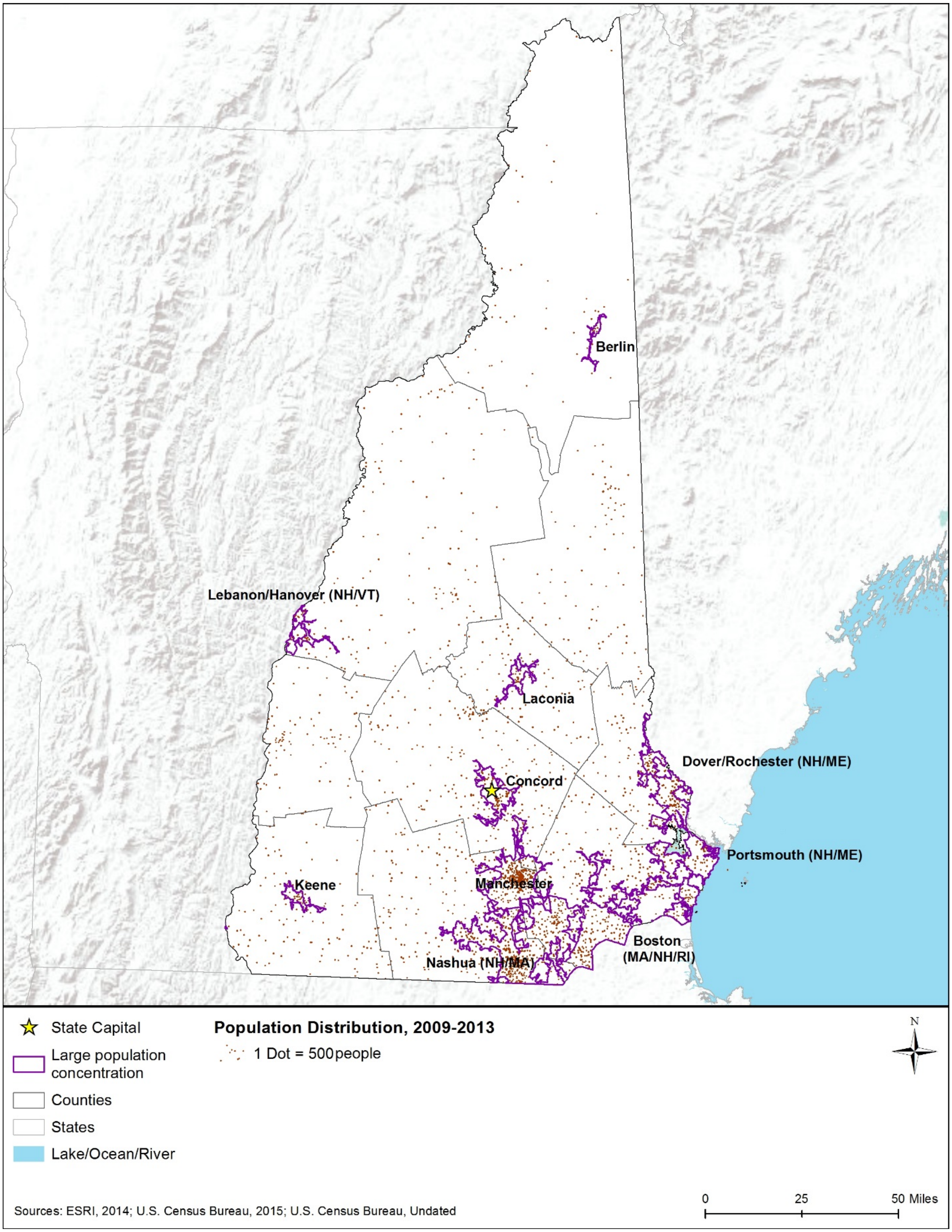

Figure 9.1.9-1: Population Distribution in New Hampshire, 2009–2013

Table 9.1.9-4 also shows that the top 10 population concentrations in New Hampshire accounted for 56.0 percent of the state's population in 2010. Further, population growth in the 10 areas from 2000 to 2010 amounted to 80.9 percent of the entire state's growth. These figures indicate that populations within these 10 population concentrations are growing at a faster rate than the population within the remainder of the state.

Table 9.1.9-4: Population of the 10 Largest Population Concentrations in New Hampshire

Area	Population				Population Change 2000 to 2010	
	2000	2010	2009–2013	Rank in 2010	Numerical Change	Rate (AARC)
Berlin	11,377	11,159	10,501	10	(218)	-0.19%
Boston (MA/NH/RI) (NH Portion)	96,114	93,038	94,060	3	(3,076)	-0.32%
Concord	46,449	42,611	43,335	6	(3,838)	-0.86%
Dover/Rochester (NH/ME) (NH Portion)	73,063	80,262	80,627	4	7,199	0.94%
Keene	21,436	22,510	22,893	7	1,074	0.49%
Laconia	20,302	18,636	17,881	9	(1,666)	-0.85%
Lebanon/Hanover (NH/VT) (NH Portion)	20,819	19,403	19,391	8	(1,416)	-0.70%
Manchester	143,549	158,377	158,572	2	14,828	0.99%
Nashua (NH/MA) (NH Portion)	197,119	219,082	220,702	1	21,963	1.06%
Portsmouth (NH/ME) (NH Portion)*	41,983	72,409	72,720	5	30,426	5.60%
Total for Top 10 Population Concentrations	672,211	737,487	740,682	NA	65,276	0.93%
New Hampshire (statewide)	1,235,786	1,316,470	1,319,171	NA	80,684	0.63%
Top 10 Total as Percentage of State	54.4%	56.0%	56.1%	NA	80.9%	NA

Sources: (U.S. Census Bureau, 2015i; U.S. Census Bureau, 2015j; U.S. Census Bureau, 2015k)
*The large population increase from 2000 to 2010 reflects a large increase in the area definition for the Portsmouth (NH Portion) urbanized area, from 35 sq. mi. in 2000 to 76 sq. mi. in 2010.
AARC = Average Annual Rate of Change (compound growth rate)

9.1.9.4. 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 FirstNet projects are public services such as medical and emergency medical services and facilities. This PEIS addresses public services in Section 9.1.1, Infrastructure. Project-level NEPA analyses may need to examine other institutions, depending on specific locations and specific types of actions.

Economic Activity

Table 9.1.9-5 compares several economic indicators for New Hampshire to the East region and the nation. The table presents two indicators of income[116] – 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 9.1.9-5, the per capita income in New Hampshire in 2013 ($33,269) was $417 higher than that of the region ($32,852), and $5,085 higher 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 9.1.9-5 shows that in 2013, the MHI in New Hampshire ($64,064) was $3,560 higher than that of the region ($60,504), and $11,814 higher 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 9.1.9-5 compares the unemployment rate in New Hampshire to the East region and the nation. In 2014, New Hampshire's statewide unemployment rate of 4.3 percent was considerably lower than the rates for both the region (6.0 percent) and the nation (6.2 percent).[117]

[116] 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, 2015s)

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

Table 9.1.9-5: Selected Economic Indicators for New Hampshire

Geography	Per Capita Income 2013	Median Household Income 2013	Average Annual Unemployment Rate 2014
New Hampshire	$33,269	$64,064	4.3%
East Region	$32,852	$60,504	6.0%
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)

Figure 9.1.9-2 and Figure 9.1.9-3 show how MHI in 2013 (U.S. Census Bureau, 2015l) and unemployment in 2014 (BLS, 2015b) varied by county across the state. These maps also incorporate the same population concentration data as Figure 9.1.9-1 (U.S. Census Bureau, 2015i; U.S. Census Bureau, 2015o). Following these two maps, Table 9.1.9-6 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 New Hampshire.

Figure 9.1.9-2 shows that, in general, counties with a MHI above the national median were located in the southeastern portions of the state, near the Boston metro area, and in Grafton County, where Lebanon/Hanover is located. Most of the remainder of the state had MHI levels below the national average. Coos County, in the northernmost part of the state, had the lowest MHI. Table 9.1.9-6 is consistent with those observations. It shows that MHI in population concentrations in the southeastern part of the state, including the New Hampshire portions of the Nashua, Portsmouth, and Boston areas, was above the state average. MHI in all other population concentrations was below the state average. MHI was lowest in the Berlin area, which is in the northern part of the state and is the smallest of the 10 areas.

Figure 9.1.9-3 presents variations in the 2014 unemployment rate across the state, by county. It shows that unemployment rates for counties are below the national average (that is, better employment performance) throughout the state. The highest unemployment rate was in Coos County, in the northernmost part of the state. When comparing unemployment in the population concentrations to the state average (Table 9.1.9-6), only three areas had unemployment rates that were lower than the state average, including the Concord area and the New Hampshire portions of the Lebanon/Hanover and Portsmouth areas. The Berlin and Keene areas had the highest 2009–2013 unemployment rates.

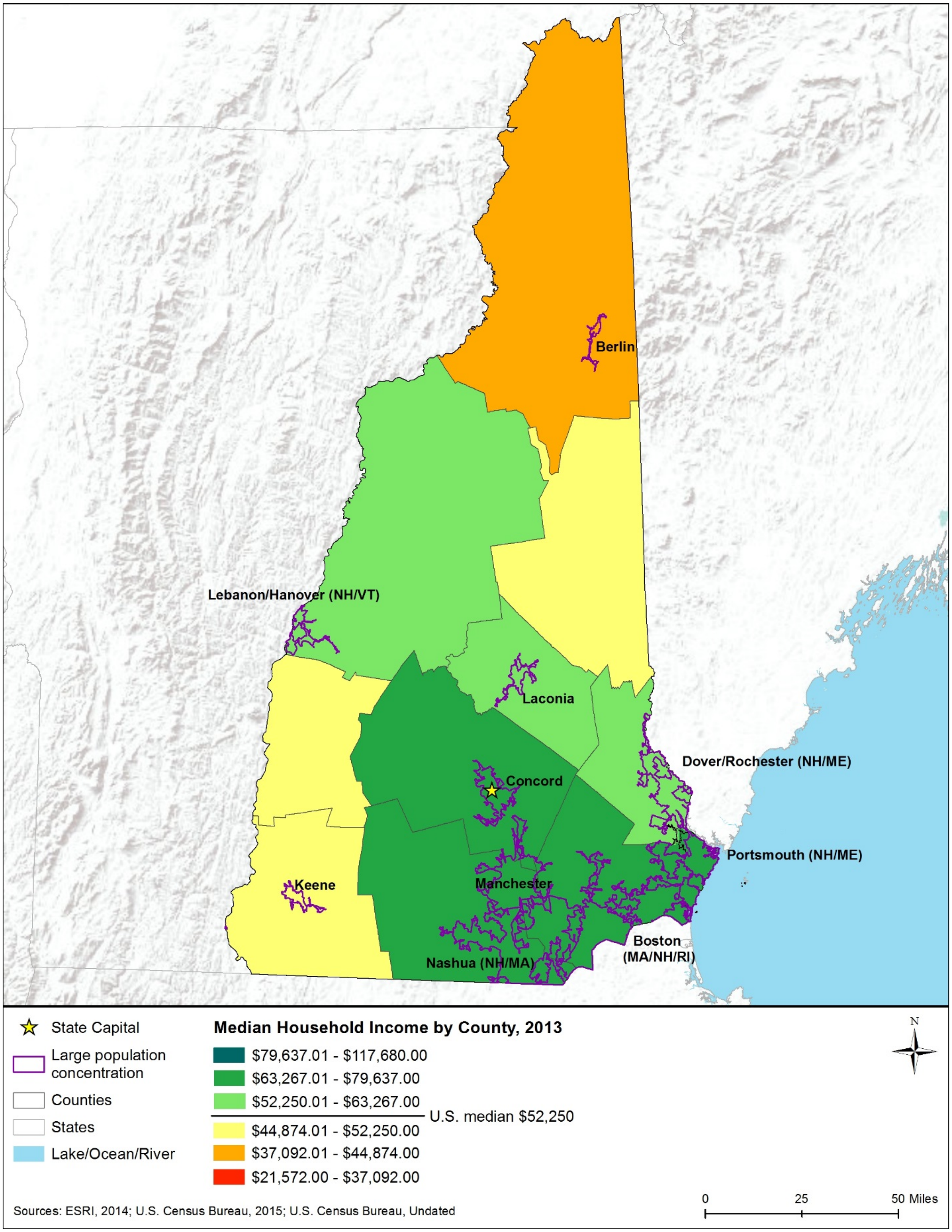

Figure 9.1.9-2: Median Household Income in New Hampshire, by County, 2013

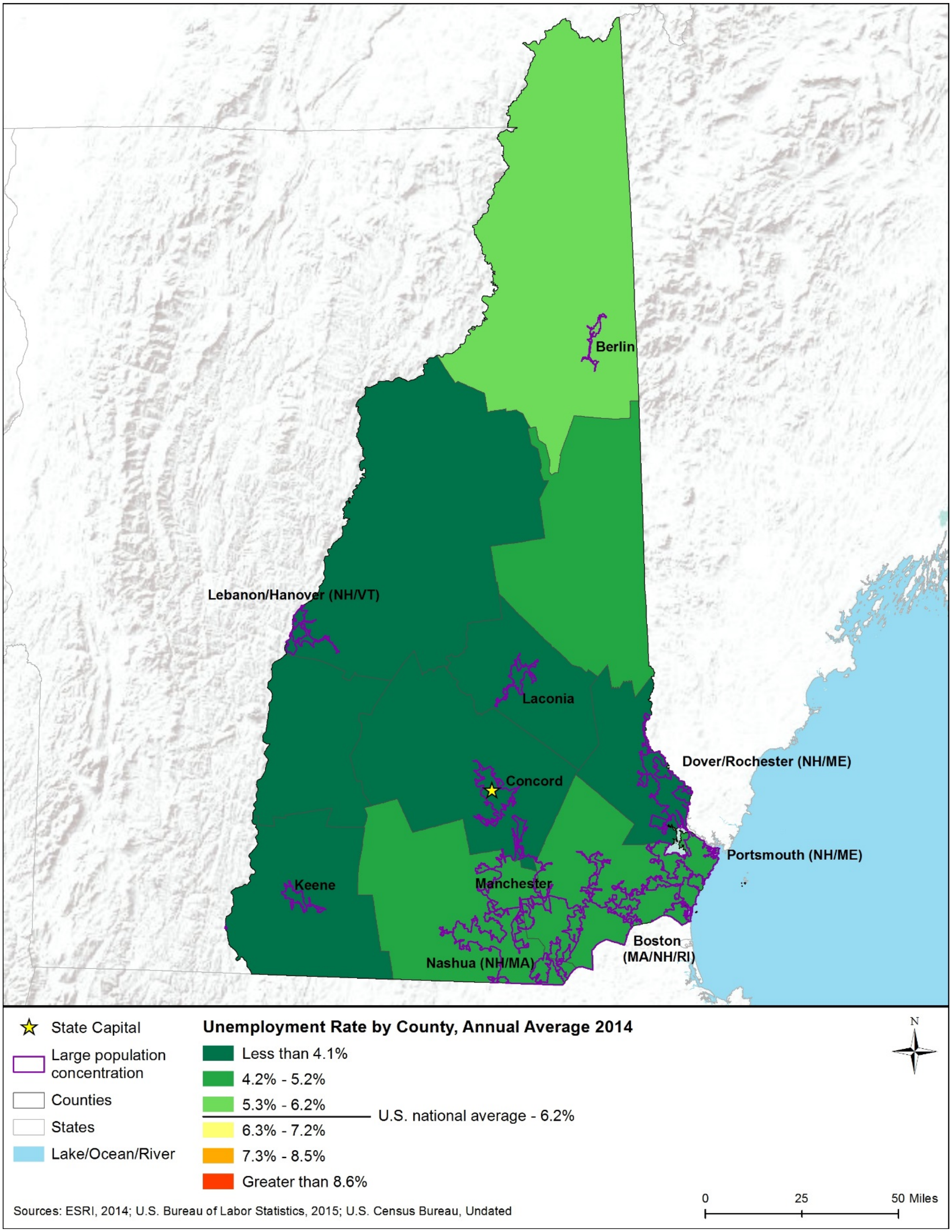

Figure 9.1.9-3: Unemployment Rates in New Hampshire, by County, 2014

Table 9.1.9-6: Selected Economic Indicators for the 10 Largest Population Concentrations in New Hampshire, 2009–2013

Area	Median Household Income	Average Annual Unemployment Rate
Berlin	$38,360	11.2%
Boston (MA/NH/RI) (NH Portion)	$74,284	7.5%
Concord	$52,959	6.9%
Dover/Rochester (NH/ME) (NH Portion)	$51,588	7.2%
Keene	$47,853	10.6%
Laconia	$46,497	8.0%
Lebanon/Hanover (NH/VT) (NH Portion)	$53,779	4.0%
Manchester	$60,512	7.5%
Nashua (NH/MA) (NH Portion)	$74,641	8.2%
Portsmouth (NH/ME) (NH Portion)	$71,065	5.6%
New Hampshire (statewide)	$64,916	7.0%

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

Table 9.1.9-7: Employment by Class of Worker and by Industry, 2013

Class of Worker and Industry	New Hampshire	East Region	United States
Civilian Employed Population 16 Years and Over	694,508	35,284,908	145,128,676
Percentage by Class of Worker			
Private wage and salary workers	79.7%	79.3%	79.7%
Government workers	13.3%	15.1%	14.1%
Self-employed in own not incorporated business workers	6.9%	5.4%	6.0%
Unpaid family workers	0.2%	0.1%	0.2%
Percentage by Industry			
Agriculture, forestry, fishing and hunting, and mining	0.8%	0.9%	2.0%
Construction	6.7%	5.8%	6.2%
Manufacturing	14.2%	8.5%	10.5%
Wholesale trade	2.7%	2.5%	2.7%
Retail trade	12.2%	11.1%	11.6%
Transportation and warehousing, and utilities	4.0%	4.6%	4.9%
Information	2.1%	2.3%	2.1%
Finance and insurance, and real estate and rental and leasing	5.8%	7.3%	6.6%

Class of Worker and Industry	New Hampshire	East Region	United States
Professional, scientific, management, administrative, and waste management services	10.6%	12.3%	11.1%
Educational services, and health care and social assistance	24.5%	25.6%	23.0%
Arts, entertainment, and recreation, and accommodation and food services	8.4%	8.9%	9.7%
Other services, except public administration	4.4%	4.9%	5.0%
Public administration	3.7%	5.5%	4.7%

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

Detailed employment data provides useful insights into the nature of a local, state, or national economy. Table 9.1.9-7 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 in New Hampshire was similar to the percentage in the East region and the nation. The percentage of government workers was lower in the state than in the region and nation. Self-employed workers comprised a higher percentage in the state than in the region and nation.

By industry, New Hampshire has a mixed economic base and some notable figures in the table were as follows. New Hampshire in 2013 had a considerably higher percentage of persons working in “manufacturing” than did the region or the nation. It also had a somewhat higher percentage of workers in “construction” and in “retail trade” than the region or nation. For all other industry classes, the percentage in the state was similar to, or somewhat lower than, the percentage in the region or nation.

Table 9.1.9-8 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 9.1.9-7 for 2013. The selected industries are those with the greatest relevance to FirstNet projects. In most of the 10 areas, the percentage of employment in the “Construction” industry was lower than the state average (6.9 percent), and was considerably lower (more than two percentage points) in four areas (Concord, Keene and the New Hampshire portions of Dover/Rochester and Lebanon/Hanover areas).

Table 9.1.9-8: Employment by Relevant Industries for the 10 Largest Population Concentrations in New Hampshire, 2009–2013

Area	Construction	Transportation and Warehousing, and Utilities	Information	Professional, Scientific, Management, Administrative and Waste Management Services
Berlin	7.3%	3.2%	1.3%	5.6%
Boston (MA/NH/RI) (NH Portion)	8.1%	3.9%	2.8%	10.0%
Concord	4.3%	3.2%	1.8%	9.1%
Dover/Rochester (NH/ME) (NH Portion)	4.6%	3.2%	1.9%	8.7%
Keene	3.4%	3.3%	1.6%	4.8%
Laconia	7.9%	1.8%	1.9%	10.1%
Lebanon/Hanover (NH/VT) (NH Portion)	3.8%	1.8%	2.0%	9.8%
Manchester	6.5%	5.3%	2.0%	10.8%
Nashua (NH/MA) (NH Portion)	5.8%	4.0%	2.6%	12.4%
Portsmouth (NH/ME) (NH Portion)	4.9%	3.9%	2.4%	12.0%
New Hampshire (statewide)	6.9%	4.0%	2.0%	10.1%

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

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 9.1.9-9 compares New Hampshire to the East region and nation on several common housing indicators.

As shown in Table 9.1.9-9, in 2013 New Hampshire had a lower percentage of housing units that were occupied (84.2 percent) than the region (88.4 percent) or nation (87.5 percent). Of the occupied units, New Hampshire had a higher percentage of owner-occupied units (70.2 percent) than the region (62.8 percent) or nation (63.5 percent). This is reflected in the higher percentage of detached single-unit housing (also known as single-family homes) in New Hampshire in 2013 (62.8 percent) compared to the region (52.7 percent) and nation (61.5 percent). The vacancy rate among rental units was also lower in New Hampshire (5.1 percent) than in the region (5.5 percent) or nation (6.5 percent).

Table 9.1.9-9: Selected Housing Indicators for New Hampshire, 2013

Geography	Total Housing Units	Housing Occupancy & Tenure				Units in Structure
		Occupied Housing	Owner-Occupied	Homeowner Vacancy Rate	Rental Vacancy Rate	1-Unit, Detached
New Hampshire	616,496	84.2%	70.2%	1.3%	5.1%	62.8%
East Region	31,108,124	88.4%	62.8%	1.6%	5.5%	52.7%
United States	132,808,137	87.5%	63.5%	1.9%	6.5%	61.5%

Source: (U.S. Census Bureau, 2006a)

Table 9.1.9-10 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 9.1.9-10: Selected Housing Indicators for the 10 Largest Population Concentrations in New Hampshire, 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
Berlin	5,705	85.7%	60.3%	0.0%	5.5%	49.4%
Boston (MA/NH/RI) (NH Portion)	38,862	93.3%	78.4%	1.5%	1.5%	67.0%
Concord	18,821	93.0%	53.5%	0.7%	6.0%	41.7%
Dover/Rochester (NH/ME) (NH Portion)	33,130	92.6%	55.7%	0.8%	5.0%	44.9%
Keene	9,792	92.7%	53.4%	0.0%	4.5%	44.7%
Laconia	9,838	80.5%	59.3%	3.5%	7.1%	50.9%
Lebanon/Hanover (NH/VT) (NH Portion)	7,830	91.3%	44.6%	1.6%	6.8%	40.2%
Manchester	67,297	93.1%	57.4%	1.2%	6.4%	45.1%
Nashua (NH/MA) (NH Portion)	89,721	95.1%	69.4%	0.9%	4.3%	55.1%
Portsmouth (NH/ME) (NH Portion)	36,909	86.5%	66.1%	0.8%	7.2%	51.3%
New Hampshire (statewide)	615,204	84.2%	71.4%	1.5%	5.4%	63.4%

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

Property Values

Property values have important relationships to both the wealth and affordability of communities.

Table 9.1.9-11 provides indicators of residential property values for New Hampshire and compares these values to values for the East 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, 2015s).

The table shows that the median value of owner-occupied units in New Hampshire in 2013 ($233,300) was lower than the corresponding values for the East region ($249,074), but higher than the value for the nation ($173,900).

Table 9.1.9-11: Residential Property Values in New Hampshire, 2013

Geography	Median Value of Owner-Occupied Units
New Hampshire	$233,300
East Region	$249,074
United States	$173,900

Source*:* (U.S. Census Bureau, 2006a)

Table 9.1.9-12 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. Four of the ten areas had a median value higher than the state median value ($239,900), including the three areas in the southeastern portion of the state (New Hampshire portions of Boston, Nashua, and Portsmouth areas), which had median values ranging from $249,700 to $329,600. The Lebanon/Hanover area (New Hampshire portion, $250,800) also had a median property value that was higher than the state value. The six other population concentrations had property values below the state value, including the Berlin area, which had a particularly low median property value ($94,700). The Berlin area, in the northernmost part of the state, also had the lowest median household income (Table 9.1.9-6).

Table 9.1.9-12: Residential Property Values for the 10 Largest Population Concentrations in New Hampshire, 2009–2013

Area	Median Value of Owner-Occupied Units
Berlin	$94,700
Boston (MA/NH/RI) (NH Portion)	$273,200
Concord	$217,000
Dover/Rochester (NH/ME) (NH Portion)	$208,900

Area	Median Value of Owner-Occupied Units
Keene	$181,200
Laconia	$178,600
Lebanon/Hanover (NH/VT) (NH Portion)	$250,800
Manchester	$229,400
Nashua (NH/MA) (NH Portion)	$249,700
Portsmouth (NH/ME) (NH Portion)	$329,600
New Hampshire (statewide)	$239,900

Source: (U.S. Census Bureau, 2006a)

Government Revenues

State and local governments obtain revenues from many sources. FirstNet 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 includes taxes on providers of land and mobile telephone, telegraph, cable, and internet services (U.S. Census Bureau, 2006b). 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 9.1.9-13 presents total and selected state and local government revenue sources as reported by 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 telecommunications infrastructure.

Table 9.1.9-13 shows that state and local governments in New Hampshire received less revenue in 2012 on a per capita basis than their counterpart governments in the region and nation. Additionally, New Hampshire state and local governments had lower levels of intergovernmental revenues[118]. State and local governments in New Hampshire obtained higher levels of property taxes per capita than counterpart governments in the region or nation. New Hampshire state and local governments obtained no revenue from general sales taxes, and local governments in the state obtained no revenue from selective sales taxes and income taxes. Selective sales taxes, and public utility taxes specifically, were higher on a per capita basis for the New Hampshire state government than counterpart state governments in the region and nation. Individual income tax revenues, on a per capita basis, were much lower for the New Hampshire state government than

[118] 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, 2006b)

for other state governments in the region and nation. Corporate income tax revenues per capita were higher for the New Hampshire state government than for counterparts in the region and nation.

Table 9.1.9-13: State and Local Government Revenues, Selected Sources, 2012

Type of Revenue		New Hampshire		Region		United States	
		State Govt. Amount	Local Govt. Amount	State Govt. Amount	Local Govt. Amount	State Govt. Amount	Local Govt. Amount
Total Revenue	($M)	$7,153	$5,352	$522,354	$431,898	$1,907,027	$1,615,194
	Per capita	$5,416	$4,052	$7,132	$5,897	$6,075	$5,145
Intergovernmental from Federal	($M)	$1,693	$154	$135,435	$20,289	$514,139	$70,360
	Per capita	$1,282	$116	$1,849	$277	$1,638	$224
Intergovernmental from State	($M)	$0	$1,469	$0	$120,274	$0	$469,147
	Per capita	$0	$1,113	$0	$1,642	$0	$1,495
Intergovernmental from Local	($M)	$178	$0	$9,810	$0	$19,518	$0
	Per capita	$135	$0	$134	$0	$62	$0
Property Taxes	($M)	$381	$3,031	$2,215	$144,319	$13,111	$432,989
	Per capita	$288	$2,295	$30	$1,971	$42	$1,379
General Sales Taxes	($M)	$0	$0	$49,123	$15,874	$245,446	$69,350
	Per capita	$0	$0	$671	$217	$782	$221
Selective Sales Taxes	($M)	$875	$0	$38,070	$5,996	$133,098	$28,553
	Per capita	$663	$0	$520	$82	$424	$91
Public Utilities Taxes	($M)	$84	$0	$4,314	$2,261	$14,564	$14,105
	Per capita	$64	$0	$59	$31	$46	$45
Individual Income Taxes	($M)	$82	$0	$102,813	$18,838	$280,693	$26,642
	Per capita	$62	$0	$1,404	$257	$894	$85
Corporate Income Taxes	($M)	$521	$0	$14,112	$6,733	$41,821	$7,210
	Per capita	$395	$0	$193	$92	$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.

9.1.10. Environmental Justice

9.1.10.1. Definition of the Resource

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. The fundamental principle of environmental justice as stated in the EO 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, 2016a). 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” (USEPA, 2016a). In response to the EO, the DOC developed an Environmental Justice Strategy in 1995, and published an updated strategy in 2013 (U.S. Department of Commerce, 2013).

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 (Council on Environmental Quality, 1997). Additionally, the U.S. Environmental Protection Agency’s (USEPA) Office of Environmental Justice (USEPA, 2015d) offers guidance on Environmental Justice issues and provides an “environmental justice screening and mapping tool,” EJSCREEN (USEPA, 2015e).

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.” (Council on Environmental Quality, 1997)

9.1.10.2. Specific Regulatory Considerations

The NHDES adopted an Environmental Equity Policy in 1994. The policy states that NHDES “will, within its authority, ensure fair and equitable treatment of all New Hampshire citizens in the implementation of federal and state environmental laws, rules, programs, and policies” (Godlewski, 2015). Likewise, NHDES has a Public Participation Policy that also commits the agency to ensuring “fair and equitable treatment of all New Hampshire citizens” in its public participation efforts. NHDES is currently working to update its Environmental Equity Policy. (Godlewski, 2015)

9.1.10.3. Environmental Setting: Minority and Low-Income Populations

Table 9.1.10-1 presents 2013 data on the composition of New Hampshire's population by race and by Hispanic origin. The state's population has substantially lower percentages of individuals who identify as Black/African American (1.2 percent), Asian (2.4 percent), or Some Other Race (0.8 percent) than the populations of the East region and the nation. (Those percentages are, for Black/African American, 14.4 percent for the East region and 12.6 percent for the nation; for Asian, 5.8 percent and 5.1 percent respectively; and for Some Other Race, 4.8 percent and 4.7 percent respectively.) The population of individuals identifying as Two or More Races is somewhat lower in New Hampshire (1.9 percent) than in the East region (2.7 percent) or nation (3.0 percent). The state's population of persons identifying as White (93.4 percent) is substantially larger than that of the East region (72.1 percent) and the nation (73.7 percent).

The percentage of the population in New Hampshire that identifies as Hispanic (3.2 percent) is substantially smaller than in the East region (12.2 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. New Hampshire's All Minorities population percentage (8.6 percent) is substantially lower than that of the East region (34.0 percent) and the nation (37.6 percent).

Table 9.1.10-2 presents the percentage of the population living in poverty in 2013, for the state, region, and nation. The figure for New Hampshire (8.7 percent) is substantially lower than that for the East region (13.3 percent) and the nation (15.8 percent).

Table 9.1.10-1: Population by Race and Hispanic Status, 2013

Geography	Total Population (estimated)	Race							Hispanic	All Minorities
		White	Black/ African Am	Am. Indian/ Alaska Native	Asian	Native Hawaiian /Pacific Islander	Some Other Race	Two or More Races		
New Hampshire	1,323,459	93.4%	1.2%	0.2%	2.4%	0.0%	0.8%	1.9%	3.2%	8.6%
East Region	73,558,794	72.1%	14.4%	0.3%	5.8%	0.0%	4.8%	2.7%	12.2%	34.0%
United States	316,128,839	73.7%	12.6%	0.8%	5.1%	0.2%	4.7%	3.0%	17.1%	37.6%

Source: (U.S. Census Bureau, 2015k)
"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.

Table 9.1.10-2: Percentage of Population (Individuals) in Poverty, 2013

Geography	Percent Below Poverty Level
New Hampshire	8.7%
East Region	13.3%
United States	15.8%

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

9.1.10.4. 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 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 9.1.10-1 visually portrays the results of the environmental justice population screening analysis for New Hampshire. 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, 2015w; U.S. Census Bureau, 2015x; U.S. Census Bureau, 2015y) and Census Bureau urban classification data (U.S. Census Bureau, 2015z; U.S. Census Bureau, 2015o).

Figure 9.1.10-1 shows that New Hampshire has several areas with high potential for environmental justice populations. These areas occur most frequently in the more densely populated parts of the state, such as in or near the 10 largest population concentrations. By land area, the majority of the state is categorized as moderate potential for environmental justice populations; these moderate potential areas are more evenly distributed across the state than the high potential areas.

It is important to understand how the data behind Figure 9.1.10-1 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 9.1.10-1 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 projects, 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 projects 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, significant (according to NEPA criteria), and “appreciably exceeds or is likely to appreciably exceed the risk or rate to the general population or other appropriate comparison group” (Council on Environmental Quality, 1997). The Environmental Consequences section (Section 9.2.10) addresses the potential for disproportionately high and adverse environmental or human health impacts on environmental justice populations.

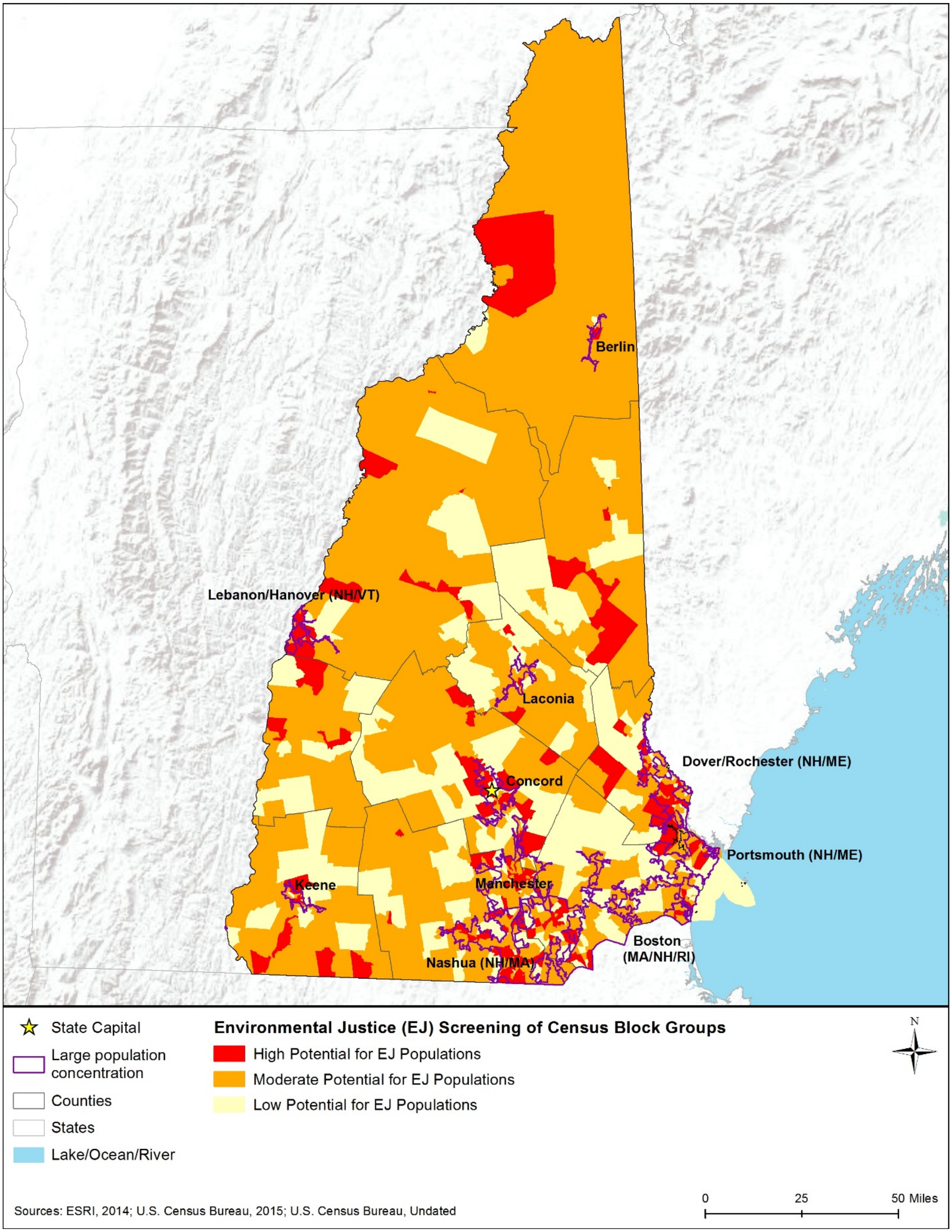

Figure 9.1.10-1: Potential for Environmental Justice Populations in New Hampshire, 2009–2013

9.1.11. Cultural Resources

9.1.11.1. Definition of the 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 National Register of Historic Places (NRHP).

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

- Statutory language and implementing regulations for Section 106 of the National Historic Preservation Act of 1966, as amended (NHPA), formerly 16 USC 470a(d)(6)(A) (now 54 USC 306131(b)) and 36 CFR 800.16(l)(1);
- Statutory language and Implementing regulations for the Archaeological Resources Protection Act of 1979 (ARPA), 16 USC 470cc(c) and 43 CFR 7.3(a);
- Statutory language and implementing regulations for the Native American Graves Protection and Repatriation Act (NAGPRA), 25 USC 3001(3)(D) and 43 CFR 10.2(d);
- NPS's program support of public and private efforts to identify, evaluate, and protect America's historic and resources (NPS, 2016b); 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).

9.1.11.2. Specific Regulatory Considerations

Applicable federal laws and regulations that apply to Cultural Resources include the NHPA (detailed in Section 1.8), the American Indian Religious Freedom Act (AIRFA), ARPA, and NAGPRA. Appendix C summarizes these pertinent federal laws.

New Hampshire has a state law that is similar to NEPA (Table 9.1.11-1). However, federal laws and regulations supersede state laws and regulations. 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 9.1.11-1: Relevant New Hampshire Cultural Resources Laws and Regulations

State Law/Regulation	Regulatory Agency	Applicability
Preservation of State Historic Resources, Section 227-C:9	New Hampshire State Historic Preservation Office (SHPO)	This law requires state agencies to submit projects to the SHPO for “for a determination of whether such proposed actions are located in, or may affect, historical resources.”

9.1.11.3. Cultural Setting

New Hampshire has been inhabited by human beings for some 12,000 years (Pauketat, 2012). However, due to a relatively wet climate that degrades and moves artifacts, the state's archaeological record is less reliable than that of more arid parts of the United States (Ritchie, William, 1969). The majority of New Hampshire's early human habitation evidence 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 14 archaeological sites and archaeological districts listed on the NRHP in New Hampshire, of which there are four prehistoric, seven historic, and three mixed components. (NPS, 2015b)

Archaeologists typically divide large study areas by physiographic regions. As shown in Figure 9.1.3-2, New Hampshire is within the Appalachian Highlands physiographic region and the New England physiographic province. The New Hampshire portion of the New England province is further subdivided into the sections. White Mountain section is the northern most of the sections encompassing the northern tip of the state. The New England Upland section contains all of the land south of White Mountain and North of the Seaboard Lowland. The Seaboard Lowland section is in the southeastern corner of the state, occupying the area bordering the Atlantic Ocean. Each physiographic region may be associated with different phases of human development, or there may be overlap within the regions (USGS, 2003b).

9.1.11.4. Prehistoric Setting

The New Hampshire region has been inhabited by human beings for at least 12,000 years (Noble Keegan, 1999). The majority of the evidence early human habitation of New Hampshire and the surrounding region comes from the study of archeological sites of pre-European contact within New Hampshire and adjoining states.

Materials from many archeological sites are displayed and interpreted at various locations across the state. The New Hampshire SHPO is responsible for protecting, preserving and making sure such sites are documented for future generations. Archeological sites within the state can be found in a wide variety of settings, from forests and flood plains to waterways and mountaintops. Pre-historic archeological sites range from temporary fishing encampments to large permanent villages (Moeller, Roger W., 1980). There are also many "resource procurement sites" or areas where the activity appears to have consisted of a single action lasting for perhaps just a few hours, such as hunting sites that typically identify where animals were killed and butchered or well-established waterfront locations where groups of people gathered for a limited time on a regular basis to harvest and process fish and shellfish (Custer, Jay F, 1994). Evidence at archaeological sites in New Hampshire may be found in relatively shallow deposits, within one to two feet of the surface. However, in many cases throughout the state, natural factors have caused sites to be buried under multiple layers of sediment, such as floodplain deposits, often found along streams, rivers, and coastal plains. These deposits can range between one and ten feet below the current surface, with older sites in the deeper sediments. Disturbed ground, such as urban areas, may contain archaeological resources within the deeper or shallower strata than in undisturbed areas (Harris, Edward C., 1979).

There are three distinct periods associated with the prehistoric human populations that inhabited New Hampshire and the greater northeast geography of North America: The Paleoindian period (12,000 to 10,000 B.C.); Archaic (10,000 to 3,000 B.C.); and Woodland (3,000 B.C. to A.D. 1600). Figure 9.1.11-1 shows a timeline representing the periods that represent the evolving culture that existed within this region. During early archaeological research, there was often no clear distinction between prehistoric periods in the archaeological record, due to overlaps between phases of cultural development (Ritchie, William, 1969). Due to advancements in radiocarbon dating techniques, dates of each period in the archaeological record have been increasingly more accurate, and there is no longer such a significant overlap in the timeline of human occupation in North America (Pauketat, 2012). The dates associated with each period are estimated using either radio carbon dating techniques, or by associating the artifacts discovered with those of similar ones, which have been previously assigned to a particular period (Kerber, 2012; Noble Keegan, 1999; Lavin, 2013; Holiday, Johnson, & Stafford, 1999; Institute of Maritime History, 2015; Pauketat, 2012).

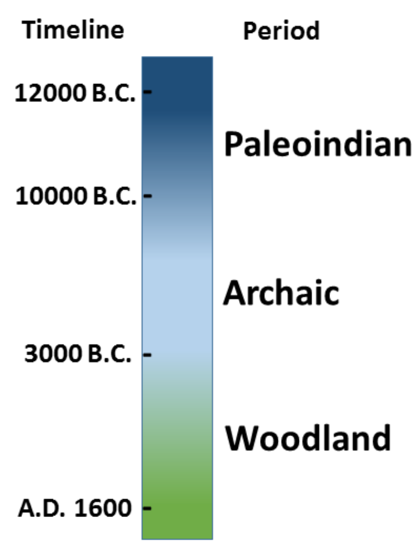

Figure 9.1.11-1: Timeline of Prehistoric Human Occupation

Source: (Institute of Maritime History, 2015; Pauketat, 2012)

Native Americans have hunted and fished throughout New Hampshire since about 12,000 B.C. The Paleoindian Period represents the earliest human habitation of the state and the greater northeastern United States. Evidence of early humans is based on a variety of sources, including published site reports and technical reports that have been prepared for various state agencies. Archaeologists also use unpublished data to help better understand the people who lived during this period. The discovery of fluted projectile points (arrowheads) scattered on the ground, prehistoric campsites, and other more prominent sites throughout the state allow archaeologists to further their understanding of these early inhabitants and to protect important sites that are discovered (Stanzeski 2006).

Archeological evidence suggests Paleoindians were a highly nomadic and sparsely populated group of people. Early hypotheses in American archaeology suggested that the Clovis fluted point was not invented until prehistoric people reached North America and began hunting the large game of that period (Stanzeski 2006). However, recent studies show that such technology was prevalent in northeastern Asia, the Arabian Peninsula, and Spain prior to human arrival into North America (Charpentier and Inizan 2002). Most of the oldest known evidence of human settlement in New Hampshire is based on the discovery of fluted points throughout the state (Gingerich 2007, Stanzeski 2006). People of this period probably ranged across the state in small bands ion pursuit of migratory game. Early Paleoindian settlers used the Clovis fluted point technology to hunt large game such as mastodon, caribou, stag-moose, and giant beaver (Laub 2000).

Paleoindian camps appear to have been occupied seasonally, with some sites that may have formed the basis for more permanent settlements. No skeletal remains of these people have been identified to date within New Hampshire. This group of hunters and gatherers were related to a population of inhabitants that spread into North America via a land bridge at the Bering Strait during the latter part of the last ice age (Late Pleistocene epoch) (Ritchie, William, 1969) (Laub, 2000) (Robinson, 2011).

The retreat of the last glaciers from New Hampshire about 10,000 years ago was followed by a by 5,000-yeear period of gradual warming and an increase in precipitation across the region. As temperatures rose, vegetation began to increase and hardwood forests started to become established. Forests of hemlock (later of oak) began to emerge over widespread areas, similar to environmental conditions of present day New Hampshire. Seasonal differences became prevalent, and correspondingly the lifestyle and practices of the Early Archaic period inhabitants changed as well. (Noble Keegan, 1999) (Custer, Jay F, 1994).

By the Middle Archaic Period, the climate in New Hampshire had changed significantly to support an ecological environment very much like those that exist today. There was an abundance of wild game, fowl, edible nuts, berries, tubers, roots, and various herbs, all of which could have supported larger populations of semi-nomadic peoples. Some Middle Archaic groups made camps along rivers, where they could fish for salmon, shad, and sturgeon, and other freshwater fish and shellfish (Stanzeski, 2006; Doucette, Dianna L, 2015).

By the Late Archaic Period, seasonal exploitation of the flora and fauna life were becoming the predominant way of life for New Hampshire inhabitants. The forests were dominated by oak, alder, birch, pine, hemlock, beech, hickory, and chestnut. The warmer climate and abundance and variety of food sources led to population increases, either through new migration of extant groups within the region, increase of indigenous populations, or both. Large Late Archaic Period sites have been documented throughout the state, particularly along major rivers, where large populations gathered during various times of the year. These large camps presumably facilitated sharing of ideas and information, which was the basis for the development of a more sophisticated social life, including the marrying of partners (Noble Keegan, 1999).

Other activities associated Late Archaic sites include the use of a more advanced tool assemblage. Projectile points, scrapers, adzes, gouges, axes, drills, blades, weights, pendants, pestles, and atlatl weights for spear throwing have been found at these sites. Flint artifacts begin to show up in the archaeological record, indicating there was trading with distant populations, because flint is not naturally found in New Hampshire. (Noble Keegan, 1999).

One of the most important indicators that the people of this region were changing was their preference in site locations. People began to locate their campsites in more diverse environmental settings and in different locations than the Paleoindians that preceded them (Noble Keegan, 1999).

The Woodland Period was approximately 3000 B.C. to A.D. 1600 in New Hampshire. Similar to the Archaic Period, the Woodland Period is divided into three sequential sub-periods: Early, Middle, and Late. The sub-periods are defined by cultural differences that can be distinguished by their temporal (place in time) location and adaptive details that come from close scientific examination. The Woodland Period in New Hampshire was a time for increasing contact and trade with more distant peoples, which influenced changes in lifestyle of the state's inhabitants.

During the Early Woodland Period, the interior lakes and streams of modern day New Hampshire drained through watersheds in other states. The region was teaming with wildlife during this time. The glacial ice sheets had melted enough to leave the area with a climate that could support an enormous variety of food sources and access to other natural resources. Tool technology continued to advance. The development of such technologies as ceramics is a good indicator that the people were developing a semi-sedentary lifestyle, and living in small villages (Noble Keegan, 1999).

The Middle Woodland Period is distinguished from the Archaic Period by the development of pottery. The influence of migrations from the southern regions of North America are also prevalent in the archaeological record. Artifacts such as the elbow pipe, and the platform pipe, which are part of the Hopewellian mound-building complex (and are associated with the practice of mortuary ceremonialism), begin to appear in the archaeological record (Lake Champlain Maritime Museum 2015).

The Middle Woodland Phase is generally associated with a variety of plain and decorated ceramic types as well as numerous lithic and bone tool types (Lake Champlain Maritime Museum 2015). The archaeological record reveals a continuing change of lifestyle for the people in New Hampshire during the Late Woodland Period. The inhabitants of this time were able to exploit a variety of resources due to their ability to establish organized seasonal settlements. Wild and domesticated plants and animals provided the subsistence they needed for survival. Pottery of traditional classic Woodland lineage continued to undergo progressive modifications. This period is denoted distinctively by an increased dependence on horticulture (Lake Champlain Maritime Museum 2015).

9.1.11.5. Federally Recognized Tribes of New Hampshire

According to the Bureau of Indian Affairs and the National Conference of State Legislators, there are no federally recognized Tribes in New Hampshire. Historically, the Abenaki and

Pennacook tribes have been known to exist in this region. The map depicts the approximate historic boundaries of these tribal nations (Figure 9.1.11-2). The other tribes depicted on the figure are general locations of tribes that were known to exist in this region of the United States, but are not officially federally recognized.

9.1.11.6. Significant Archaeological Sites of New Hampshire

As previously mentioned in Section 9.1.11.3 there are 14 archaeological sites in New Hampshire listed on the NRHP. Table 9.1.11-2 lists 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 can be found on the NPS NRHP website at http://www.nps.gov/nr/ (NPS, 2015b).

New Hampshire State Cultural Resources Database and Tools

New Hampshire Division of Historical Resources (MACRIS)

The Division of Historic Resources (DHR) is New Hampshire's State Historic Preservation Office (SHPO). Under various state and federal laws, the DHR works with other governmental agencies to review publicly assisted projects that may affect historical or archeological resources. Its website provides the public with numerous resources; publications, consultant lists, preservation news, and links to related resources. http://www.nh.gov/nhdhr/ (New Hampshire Division of Historical Resources, 2016).

New Hampshire Archeological Society (NHAS)

In 1947, a group of professional archeologists, amateurs, history buffs, and relic collectors formed the New Hampshire Archeological Society to provide a place to pool their experience, their knowledge, and their enthusiasm. Since then, the Society has supported the formation of the New Hampshire Division of Historical Resources (NHDHR) and the State Conservation and Rescue Archaeology Program (SCRAP) a public participation program for archaeological research, management, and education, administered by the Archaeology Bureau of the NHDHR. Their website (http://www.nhas.org) provides information on upcoming events as well as provides digital copies of its publication, The *New Hampshire Archeologist*. (New Hampshire Archaeological Society, 2016)

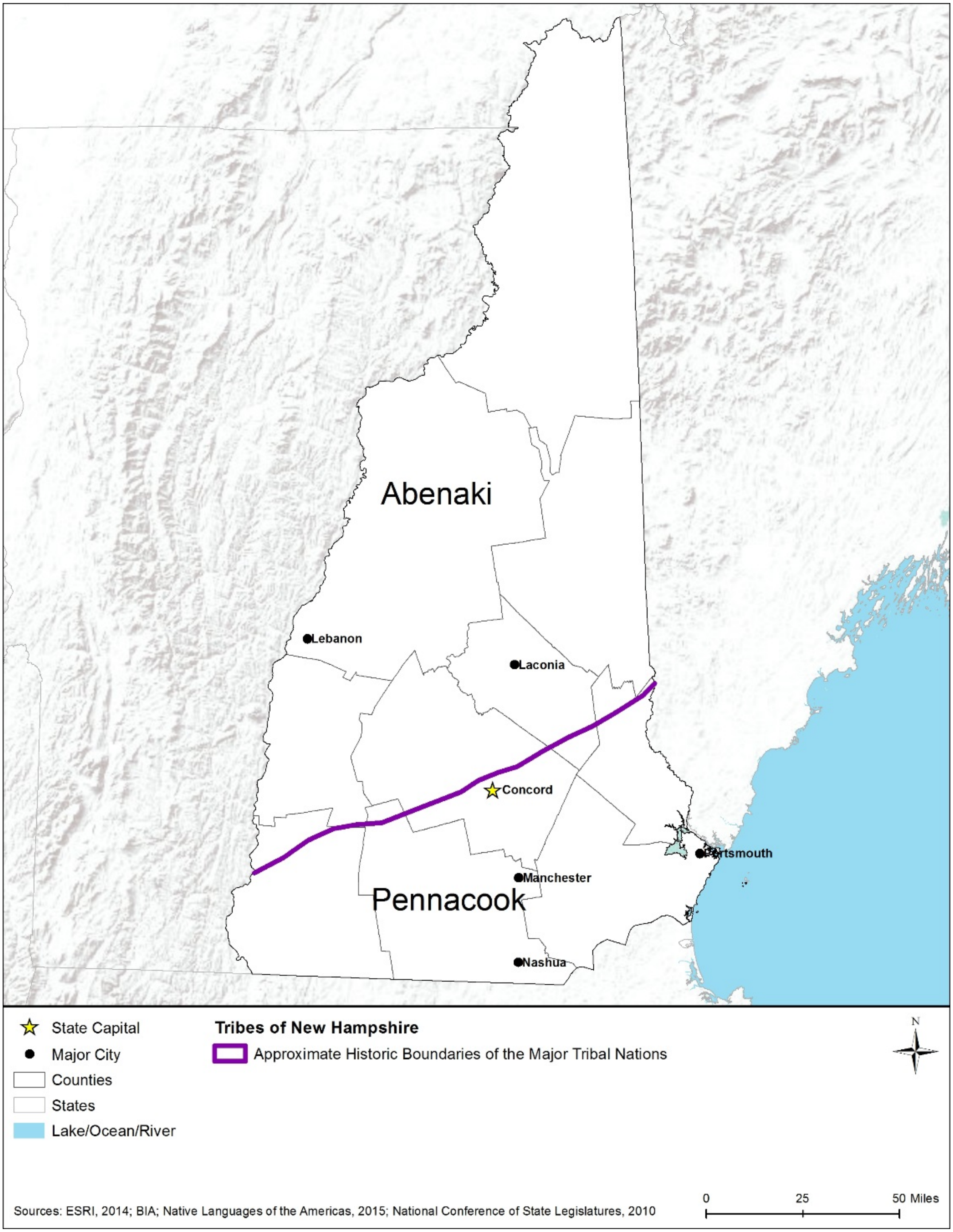

Figure 9.1.11-2: Approximate Historic Boundaries for Tribes in New Hampshire

Table 9.1.11-2: Archaeological Sites on the National Register of Historic Places in New Hampshire

Closest City	Site Name	Type of Site
Laconia	Endicott Rock	Prehistoric
Tilton	Lochmere Archeological District	Historic, Prehistoric
Laconia	The Weirs	Historic, Prehistoric, Historic - Aboriginal
Harrisville	Pottersville District	Historic
Dublin	Stonehenge	Prehistoric
Berlin	Mt. Jasper Lithic Source	Prehistoric
Enfield	Enfield Shaker Historic Distric	Historic
Enfield	Enfield Village Historic District	Historic
Temple	New England Glassworks Site	Historic
Concord	Beaver Meadow Brook Archeological Site (27MR3)	Prehistoric
Rye	Isles of Shoals	Historic
Dover	First Parish Church Site-Dover Point	Historic
Durham	Wiswall Falls Mills Site	Historic
Claremont	Hunter Archeological Site	Historic - Aboriginal, Prehistoric

Source: (NPS, 2013b)

9.1.11.7. Historic Context

English fishermen first established a settlement in New Hampshire near the mouth of the Piscataqua River in the 1620s. However, the colony was not formally established until 1629 by Captain John Mason who, along with Sir Ferdinando Georges, had been granted a charter for the area in 1622. Settlers from Massachusetts Bay, as well as new arrivals from England, soon expanded the population of the settlement. While fishermen had likely explored the area much earlier in the 17th century, no permanent European settlements are known to have occurred (Heffernan and Stecker 2004). Towns that became prominent include Hampton, Exeter, Portsmouth, and Dover, all of which were involved in maritime activities. In 1641, New Hampshire came under the control of the Massachusetts Bay Colony (Daniell 1981).

In 1679, New Hampshire was brought under the direct control of the English crown as a royal province. The structure of government changed many times over the next decades, but continued to be tied to neighboring Massachusetts. The two shared several governors, and were involved in numerous border disputes during the first half of the 18th century. The New Hampshire state government was involved in several Indian conflicts, including King Phillip’s War and the French and Indian War (Daniell 1981). In a similar fashion to neighboring Maine, New Hampshire was heavily involved in the timber industry due to its abundant natural resources. Sawmills were common throughout the state, with one of New Hampshire’s largest exports being white pine trees for ship masts (Heffernan and Stecker 2004).

During the American Revolution, New Hampshire was the first state to establish its own constitution, although it was drafted as a temporary document in case the revolution proved unsuccessful. New Hampshire was involved in the conflict and supplied troops and supplies to the Continental Army. In the 19th century New Hampshire continued to industrialize, with railroads growing in prominence to facilitate the production and movement of both raw materials and finished goods; shipbuilding remained important as well. During the Civil War, New Hampshire produced wartime goods for the Union Army (Heffernan and Stecker 2004)

During the latter part of the 19th century, heavy industry began to decline as southern factories brought increased competition. These trends were temporarily rebuffed during World War I (WWI) and World War II (WWII), as textile factories produced uniforms and timber and pulp mills produced wooden and paper objects for the troops. Following WWII, recreational tourism continued to grow, having emerged during the latter part of the 19th century. Coinciding with this was the rise of the conservation movement in an attempt to preserve natural and cultural resources that drew visitors to the state (Heffernan and Stecker 2004).

New Hampshire has 763 National Register of Historic Places (NRHP) listed sites, as well as 23 National Historic Landmarks (NHLs) (NPS, 2015b). New Hampshire has one National Heritage Area (NHA), the Freedom's Way National Heritage Area (NPS, 2015h). Figure 9.1.11-3 shows the NHA and NRHP site locations within the state of New Hampshire.[119]

9.1.11.8. Architectural Context

Figure 9.1.11-4 illustrates several representative architectural styles found in New Hampshire. The earliest forms of European architecture in New Hampshire were utilitarian structures meant to address the most pressing needs of the settlers, which were to have shelter and sustain their settlement. Basic shelters would have been common, as would trading posts and early mill facilities (both lumber and grist mills). As the colony grew, houses became more permanent and commercial buildings, mill complexes in particular, continued to be built (Heffernan and Stecker 2004). Post-Medieval architecture would have been common in a similar fashion to other neighboring First Period settlements (ca. pre-1725). These buildings had steeply pitched roof, asymmetrically placed casement windows with diamond shaped panes, and large central chimneys (McAlester, V., 2013). Georgian architecture became popular during the second quarter of the 18th century, as houses became symmetrical, sash windows replaced casement windows, and cornice lines received decorative treatments (Garvin 2001).

Following the American Revolution, the Federal style became popular. Decorative details became lighter and more refined, buildings became taller, and roofs became shallower as building technology improved. During the second quarter of the 19th century, Greek Revival architecture became common. As with previous styles, Greek Revival appeared on a variety of building types ranging from residential housing, to factory and mill buildings, to civic architecture. Greek Revival sought to make building appear more like Greek temples, harkening back to the democratic past of the Greeks. Wide friezes, large columns, and decorative temple fronts, particularly on large two story porches, typified these buildings (Garvin 2001).

[119] See Section 9.1.7 for a more in-depth discussion of additional historic resources as they relate to recreational resources.

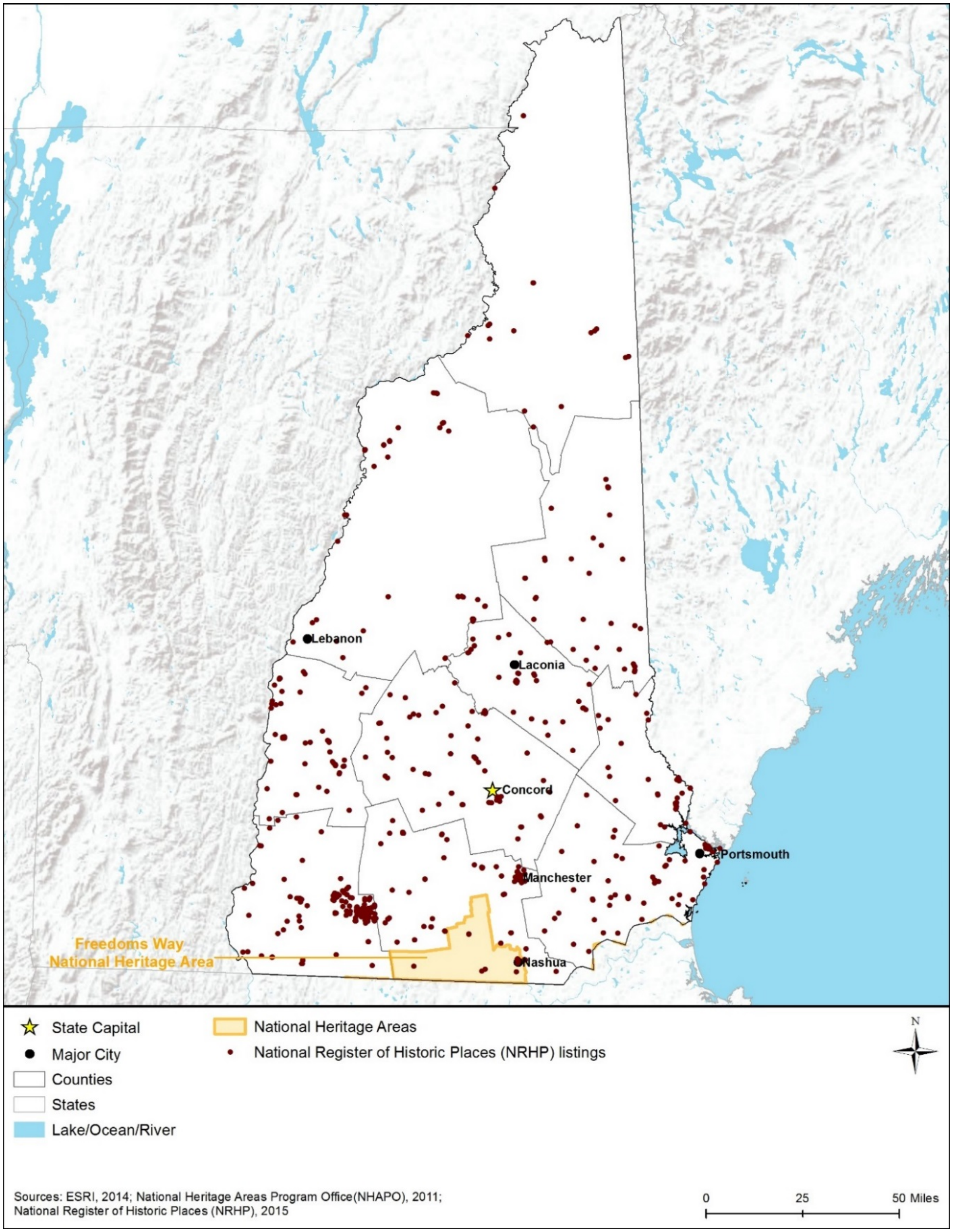

Figure 9.1.11-3: National Heritage Area (NHA) and National Register of Historic Places (NRHP) in New Hampshire

Romantic styles became popular beginning in the middle of the 19th century. Gothic Revival was popular early on, but Italianate and Second Empire appeared over the next few decades.

These styles came to characterize the Victorian Era, and includes styles such as Romanesque Revival, Stick, Shingle, and Queen Anne. While the popularity of Victorian styles lasted into the early 20th century, Colonial Revival architecture became popular during that time as well. Following WWI, bungalows came to replace the Victorian Era building types, Colonial Revival buildings continued to be built, and Tudor Revival building became popular (Garvin 2001). Minimal traditional houses were built following WWII, but were replaced by the ranch house as suburban development came to dominate the nation.

One building type that was common in New Hampshire was the connected farm building, which was popular throughout New England and featured a series of structures connected in a linear fashion. The first was called the "Big House," followed by the "Little House," the "Back House," and finally the barn. The Big House was the main house the contained the sleeping quarters and received guests, the Little House often contained the kitchen and served a more utilitarian purpose, the Back House might contain a shop or privy, and the barn housed the animals. These buildings are still common throughout the landscape today and are easily recognizable by their unique form (Hubka 1984). "Connected Farms are more commonly found in Southwestern New Hampshire" (New Hampshire Department of Safety, 2013).

Mill buildings are common in New Hampshire and were significant to the development of the state. Mills can take a variety of styles and are often found near waterways, particularly earlier examples that were constructed prior to steam technology. Shipbuilding was crucial to New Hampshire, and the prosperity experienced by towns such as Portsmouth and Dover resulted largely from this industry (Heffernan and Stecker 2004). New Hampshire also includes multiple historic colleges, with Dartmouth College, dating to the 18th century, being most prominent.

Mid-century architecture is common and takes a variety of forms. In order to address the needs of returning WWII veterans, along with an increase in Cold War activities, many federal buildings relating to military activities were constructed. The Veterans Administration Hospital in Manchester is an early example that was constructed between 1948 and 1950. Mid-century schools were constructed as well in order to accommodate population growth following the war, as were commercial and industrial complexes, hospitals, and transportation related facilities. These examples of Mid-century architecture are significant, as they illustrate how post-WWII growth manifested itself in New Hampshire (Mausolf 2012).

Figure 9.1.11-4: Representative Architectural Styles of New Hampshire

- Top Left – First Wentworth House (Portsmouth, NH) – (Detroit Publishing Company 1907)
- Bottom Left – Enos Snow Farm (Lame, NH) – (Historic American Buildings Survey 1933a)
- Center – Bartlett Hall, Dartmouth College (Hanover, NH) – (Detroit Publishing Company 1900)
- Top Right – Bath-Haverhill Bridge (Woodsville, NH) – (Historic American Engineering Record 1968)
- Bottom Right – Winnicut Grist Mill (Stratham, NH) – (Historic American Buildings Survey, 1933b)

9.1.12. Air Quality

9.1.12.1. 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[120] 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)[121] or micrograms per cubic meter ($\mu g/m^3$) determined over various periods of time (averaging time).[122] This section discusses the existing air quality in New Hampshire. The USEPA designates areas within the United States as attainment,[123] nonattainment,[124] maintenance,[125] or unclassifiable[126] depending on the

[120] Topography: The unique features and shapes of the land (e.g., valleys and mountains).

[121] Equivalent to 1 milligram per liter. (mg/L)

[122] 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, 2015m)

[123] Attainment areas: Any area that meets the national primary or secondary ambient air quality standard for the pollutant. (USEPA, 2015n)

[124] 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, 2015n)

[125] 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, 2015n)

[126] 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, 2015n)

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.

9.1.12.2. 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[127] or secondary,[128] 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 NH 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, 2011). 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. NH Appendix E presents a list of federally regulated HAPs.

In conjunction with the federal NAAQS, New Hampshire maintains its own air quality standards. Table 9.1.12-1 presents an overview of New Hampshire Ambient Air Quality Standards as defined by NHDES.

[127] 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, 2014e)
[128] 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, 2014e)

Table 9.1.12-1: New Hampshire Ambient Air Quality Standards

Pollutant	Averaging Time	Primary Standard		Secondary Standard		Notes
		µg/m³	ppm	µg/m³	ppm	
CO	8-hour	-	9	-	-	Not more than once per calendar year.
	1-hour	-	35	-	-	
Lead	3-month	0.15	-	Same as Primary		3-month arithmetic mean concentration.
NO_2	1-hour	-	0.100	-	-	3-year average of the annual 98th percentile of the daily maximum 1-hour average.
	Annual	-	0.053		0.053	Annual arithmetic mean concentration in a calendar year.
PM_{10}	24-hour	150	-	Same as Primary		24-hour average concentration.
$PM_{2.5}$	Annual	15.0	-	Same as Primary		Annual arithmetic mean concentrations.
	24-hour	35	-	Same as Primary		98th percentile 24-hour concentration.
O_3	8-hour	-	0.075	Same as Primary		3-year average of the annual fourth-highest daily maximum 8-hour average ozone concentration.
SO_2	1-hour	-	0.075	-	-	3-year average of the annual 99th percentile of the daily maximum 1-hour average concentrations.
	3-hour	-	-	-	0.5	Not more than once per calendar year.

Source: (New Hampshire Code of Administrative Rules, 2015a)

Title V Operating Permits/State Operating Permits

New Hampshire has authorization to issue CAA Title V operating permits on behalf of the USEPA, as outlined in 40 CFR 70 and New Hampshire Code of Administrative Rules, Part 609 (Env-A 609). 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, 2015f). The overall goal of the Title V program is to "reduce violations of air pollution laws and improve enforcement of those laws" (USEPA, 2015f). Env-A 609 describes the applicability of Title V operating permits (New Hampshire Code of Administrative Rules, 2015b). New Hampshire 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 9.1.12-2). The permit issued to a facility contains both state and federal portions and incorporates a reporting schedule (USEPA, 2014b).

Table 9.1.12-2: Major Air Pollutant Source Thresholds

Any Pollutant	100 Tons per Year
Single Hazardous Air Pollutant (HAP)	10 Tons per Year
Total/Cumulative HAPs	25 Tons per Year

Source: (USEPA, 2014b)

Exempt Activities

The New Hampshire Code of Administrative Rules, Part Env-A 609.03 lists the following activities as exempt from operating permits:

- "The venting of emissions from mobile equipment and off-road equipment such as automobiles, forklifts, trucks, and construction equipment, except for air conditioning systems regulated under section 609 [Motor Vehicle Air Conditioning] of the CAA Act." (New Hampshire Code of Administrative Rules, 2015b)

Temporary Emissions Sources Permits

The New Hampshire Code of Administrative Rules, Part Env-A 607, states that the owner or operator of a new or modified stationary source, area source, or device is required to obtain a temporary permit prior to the construction or installation of the source or device if it is any of the following:

- "An external combustion device with a design gross heat input greater than or equal to 10 million British thermal units (BTUs) per hour that combusts:
  - Gaseous fuel;[129] and
  - Liquefied petroleum gas.
- One or more internal combustion devices at a source where:
  - Each device combusts liquid fuel oil and has a design gross heat input greater than 0.15 million BTUs per hour, and the combined total design gross heat input for all such devices is greater than or equal to 1.5 million BTUs per hour; or
  - Each device combusts gaseous or liquefied propane gas fuel and has a design gross heat input greater than 1.5 million BTUs per hour, and the combined total design gross heat input of all such devices is greater than or equal to 10 million BTUs per hour.
- A stationary source, area source, or device choosing to limit its potential to emit by accepting enforceable permit conditions, including but not limited to any restrictions on the following:
  - The hours of operation of the source or device;
  - The type or amount of material combusted, stored, or processed; or
  - The level or production.
- A stationary source, area source, or device:
  - Subject to the NESHAP contained in 40 CFR 61, except for sources and source categories subject to 40 CFR 61 solely for Subpart M, NESHAP for asbestos;
  - Subject to rules governing prevention of significant deterioration as specified in Env-A 619 [Prevention of Significant Deterioration];
  - Subject to rules governing nonattainment areas as specified in Env-A 618 [Nonattainment New Source Review]; and
  - Where a permit is required under the rules governing toxic air pollutants specified in Env-A 1400 [Regulated Toxic Air Pollutants]" (New Hampshire Code of Administrative Rules, 2015b).

[129] Gas or gaseous fuel: "natural gas, liquid petroleum gas, or gasous substances produced synthetically from coal or oil, or derived from the decomposition of organic matter, or derived as a by-product of a manufacturing process, and which can be used to create useful head and/or mechanical energy." (New Hampshire Code of Administrative Rules, 2015c)

State Preconstruction Permits

The New Hampshire Code of Administrative Rules, Part Env-A 608.01 requires a state permit for minor sources identified in Env-A 607.01 (see Section 9.12.2.4) that are applicable for temporary permits and do not meet the requirements of Title V Permits (identified in Env-A 609) (New Hampshire Code of Administrative Rules, 2015b).

Temporary permits, defined by the New Hampshire Code of Administrative Rules, Part Env-A 607, are required before construction or modification of stationary emission sources. New Hampshire requires preconstruction permits for major stationary sources in nonattainment and attainment areas in accordance with the CAA. The Nonattainment New Source Review permitting program applies to nonattainment areas and allows construction of air pollution, but regulates air emissions to attain the NAAQS. The Prevention of Significant Deterioration permitting program applies to stationary sources in attainment areas and allows construction of new sources of air pollution while continuing to protect air quality and uphold the NAAQS (NHDES, 2015i).

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, 2013b). 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 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 (U.S. Government Publishing Office, 2010).

The estimated pollutant emissions are compared to *de minimis*[130] levels. These values are the minimum thresholds for which a conformity determination must be performed (see Table 9.1.12-3). All New Hampshire counties lie in the Ozone Transport Region (OTR). As a result, lower *de minimis* thresholds for VOCs and NO_X could apply depending on the attainment status of a county.

If an action does not result in an emissions increase above the *de minimis* levels in Table 9.1.12-3, 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 9.1.12-3, 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.

[130] Small amount or minimal.

Table 9.1.12-3: *De Minimis* Levels

Pollutant	Area Type	TPY
Ozone (VOC or NO_X)	Serious Nonattainment	50
	Severe Nonattainment	25
	Extreme Nonattainment	10
Ozone (NO_X)	Marginal and Moderate Nonattainment inside an OTR	100
	Maintenance	100
Ozone (VOC)	Marginal and Moderate Nonattainment inside an OTR	50
	Maintenance within an OTR	50
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: (U.S. Government Publishing Office, 2010)

To demonstrate conformity,[131] 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;
- 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

New Hampshire's SIP is composed of many related actions to ensure ambient air concentrations of the six criteria pollutants comply with the NAAQS. New Hampshire's SIP is a conglomeration of separate actions taken for each of the pollutants. All of New Hampshire's SIP actions are codified under 40 CFR Part 52 Subpart EE. The state is currently revising their SIP to include updated information for the six criteria pollutants. A list of all SIP actions and

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

revisions for all six criteria pollutants can be found on the NHDES website (http://des.nh.gov/organization/divisions/air/do/sip/) (NHDES, 2015j).

9.1.12.3. 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 9.1.12-1 and Table 9.1.12-4, below, present the current nonattainment areas in New Hampshire as of January 30, 2015. Table 9.1.12-4 contains a list of the counties and their respective current nonattainment status of each criteria pollutant. The year(s) listed in the table for each pollutant indicate the date(s) when USEPA promulgated an ambient air quality standard for that pollutant. Note certain pollutants have more than one standard in effect (e.g. O_3 and SO_x). Unlike Table 9.1.12-4, Figure 9.1.12-1 does not differentiate between standards for the same pollutant. Additionally, given that particulate matter is the criteria pollutant of concern, PM_{10} and $PM_{2.5}$ are merged in the figure and presented as a single pollutant.

Table 9.1.12-4: New Hampshire Nonattainment and Maintenance Areas by Pollutant Standard and County

County	Pollutant and Year USEPA Implemented Standard										
	CO	Lead		NO_X	PM_{10}	$PM_{2.5}$		O_3		SO_X	
	1971	1979	2008	1971	1987	1997	2006	1997	2008	1971	2010
Hillsborough	M							M			X-6
Merrimack								M			X-6
Rockingham								M			X-6
Strafford								M			

Source: (USEPA, 2015g)

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

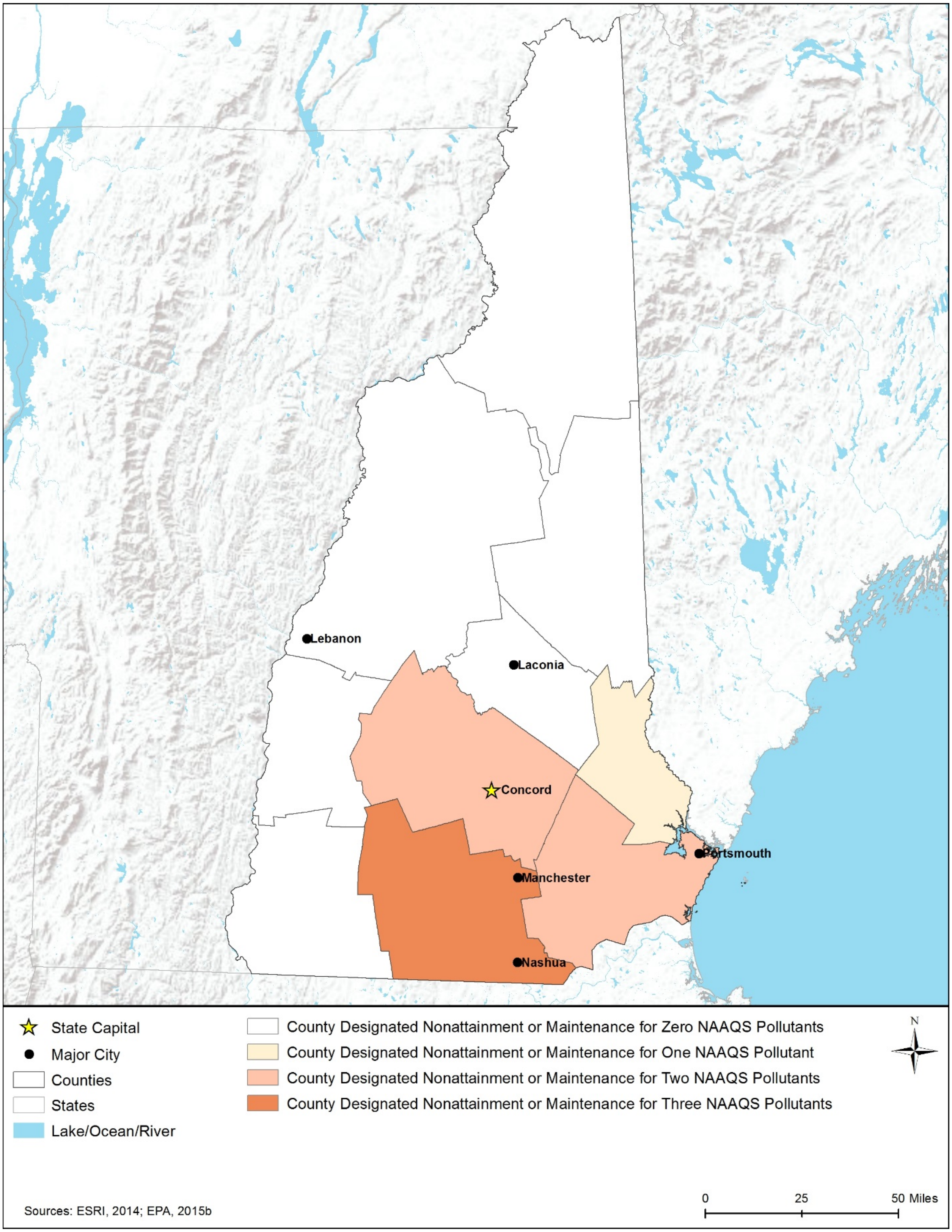

Figure 9.1.12-1: Nonattainment and Maintenance Counties in New Hampshire

Air Quality Monitoring and Reporting

The NHDES measures air pollutants at 14 sites across the state as part of the National Air Monitoring Stations Network and the State and Local Air Monitoring Stations Network (NHDES, 2015k). Annual New Hampshire State Ambient Air Quality Reports are prepared, containing pollutant data summarized by region. (NHDES, 2015l)

Throughout 2014, O_3 measurements exceeded the federal standard of 0.075 ppm once, at the Pack Monadnock station (NHDES, 2015l). The NHDES reports real-time pollution levels of O_3 and $PM_{2.5}$ on their website (http://www2.des.state.nh.us/airdata/) to inform the public, as O_3 is the main pollutant of concern in New Hampshire.

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). 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 (USEPA, 2013c).

In a 1979 USEPA memorandum, the Assistant Administrator for Air, Noise, and Radiation (Hawkins, 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[132] 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 EPA 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 50 kilometers[133] (the normal useful range of EPA-approved Gaussian plume models" (USEPA, 1992).

New Hampshire has two Class I areas, the Great Gulf Wilderness and the Residential Rage-Dry River Wilderness Areas, and Vermont has one Class I area (Lye Brook Wilderness) where the

[132] The memorandum and associated guidance use kilometers. 100 kilometers is equal to about 62 miles.
[133] The memorandum and associated guidance use kilometers. 50 kilometers is equal to about 31 miles.

100-kilometer buffer intersects New Hampshire counties. If an action is considered major source and consequently subject to PSD requirements, the air quality impact analysis need only to analyze the impacts to air quality within 100 kilometers from the source (USEPA, 1992). Figure 9.1.12-2 provides a map of New Hampshire highlighting all relevant Class I areas and all areas within a 100-kilometer radius. The numbers next to each of the highlighted Class I areas in Figure 9.1.12-2 correspond to the numbers and Class I areas listed in Table 9.1.12-5.

Table 9.1.12-5: Relevant Federal Class I Areas

#	Area	Acreage	State
1	Great Gulf Wilderness Area	5,552	NH
2	Presidential Range-Dry River Wilderness Area	20,000	NH
3	Lye Brook Wilderness	12,430	VT

Source: (USEPA, 2012b)

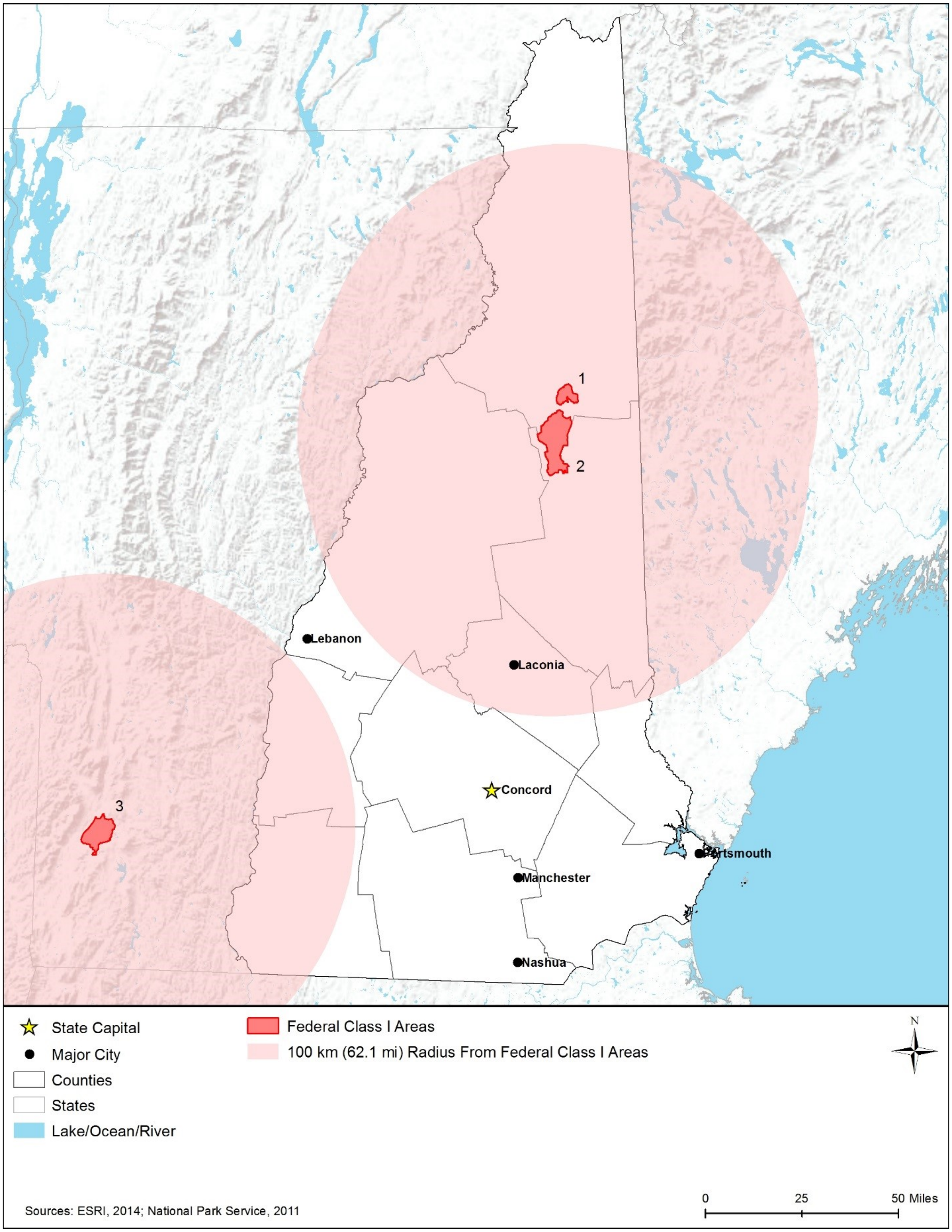

Figure 9.1.12-2: Federal Class I Areas with Implications for New Hampshire

9.1.13. Noise

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

9.1.13.1. Definition of the Resource

Noise is caused by pressure variations that the human ear can detect and is often defined as unwanted sound (USEPA, 2012c). 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"). 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, 2013).

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

- The vibration frequency characteristics of the sound, measured as sound wave cycles per second [Hertz (Hz)], determines the pitch of the sound.
- 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 9.1.13-1 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 (OSHA, 2013).

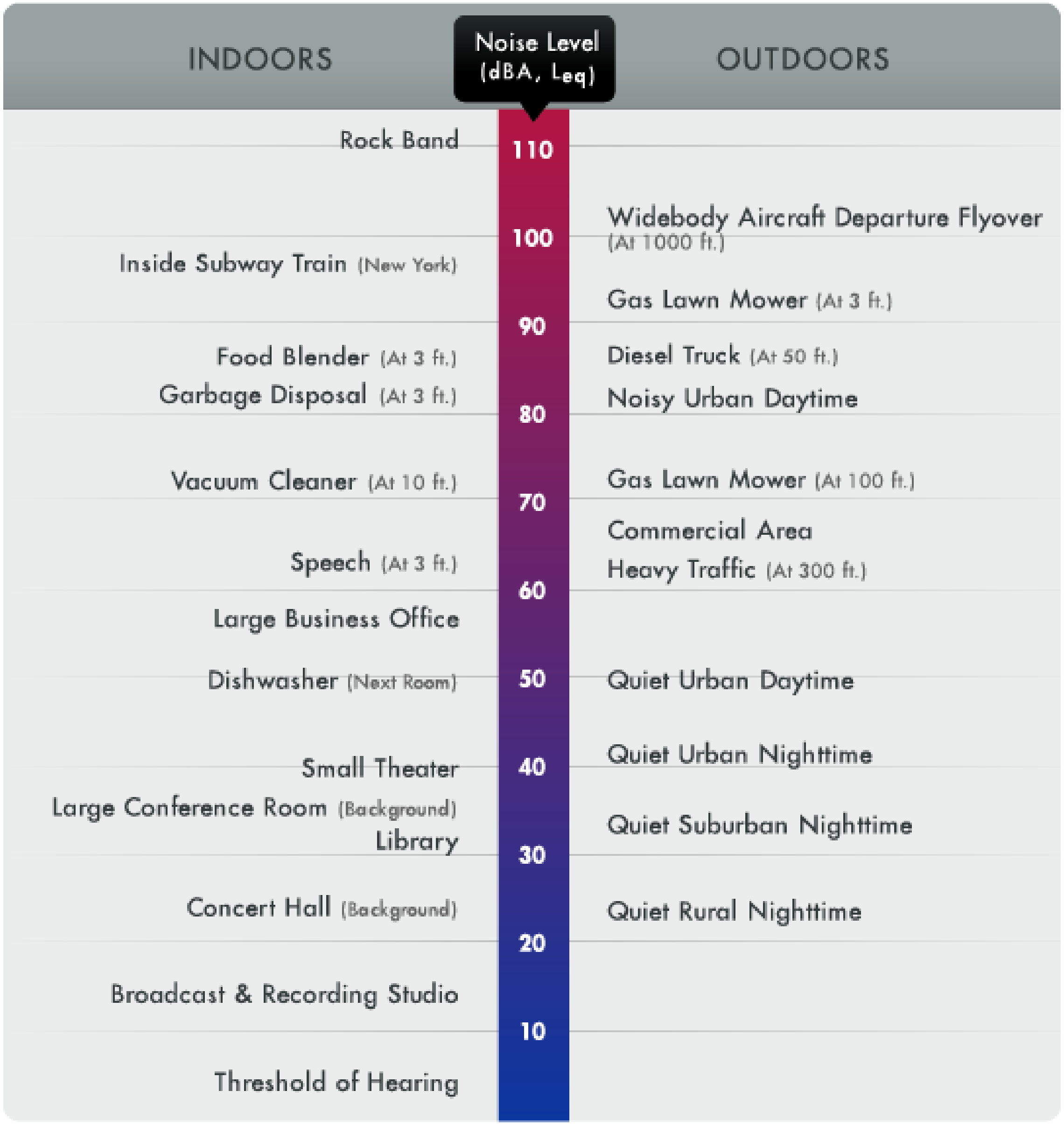

Figure 9.1.13-1. Sound Levels of Typical Sounds

Source: (Sacramento County Airport System, 2015)

Prepared by: Booz Allen Hamilton, 2005

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 three 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).

The changes in human response to changes in dB levels is categorized as follows (Federal Transit Authority, 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.

9.1.13.2. Specific Regulatory Considerations

As identified in Appendix C, 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.

New Hampshire does not have any applicable statewide noise laws; 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 Manchester, are likely to have different regulations than rural or suburban communities largely due to the population density and difference in ambient noise levels (FHWA, 2011a).

9.1.13.3. Ambient Noise

The range and level of ambient noise in New Hampshire varies widely based on the area and environment. The population of New Hampshire can choose to live and interact in areas that are large cities, rural communities, or national and state parks. Figure 9.1.13-1 illustrates noise values for typical community settings and events that are representative of what the population of New Hampshire may experience on a day-to-day basis. These noise levels represent a wide range and are not specific to New Hampshire. As such, this section describes the areas where the population of New Hampshire 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) (U.S. Department of Interior, 2008). The areas that are likely to have the highest ambient noise levels in the state are Manchester, Nashua, Concord, and Derry.

- **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 New Hampshire, Manchester International Airport (MHT), Portsmouth International at Pease (PSM), and Lebanon Municipal Airport (LEB) have more than 81,000 annual operations combined, with MHT accounting for approximately 51,000 operations annually (FAA, 2015b). These operations result in increased ambient noise levels in the surrounding communities. See Section 9.1.1, Public Safety Infrastructure 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, 2015). 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, 2015). See Section 9.1.1, Public Safety Infrastructure 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 (Federal Transit Authority, 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 (Federal Railroad Administration , 2015). New Hampshire has multiple rail corridors with high levels of commercial and commuter rail traffic. These major rail corridors extend from Manchester to Montreal, Canada; Manchester to Boston, MA; Manchester to Washington, DC; Concord to Portsmouth; Concord to Lebanon; and Concord to Franconia. There are also a number of other rail corridors that join these major rail lines and connect with other cities (NHDOT, 2013). See Section 9.1.1, Infrastructure 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, which are regions that are given legal safeguards in order to maintain biological diversity and natural resources (NPS, 2013c). These areas typically have lower noise levels, as low as 30 to 40 dBA (NPS, 2014d). New Hampshire has one NPS unit (the Saint-Gaudens National Historic Site) and 11 NNLs (National Parks Conservation Association, 2015) (NPS, 2015a). Visitors to these areas expect lower ambient noise conditions than the surrounding urban areas. See Section 9.1.8, Visual Resources for more information about national and state parks for New Hampshire.

9.1.13.4. 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 New Hampshire 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 the New Hampshire.

9.1.14. Climate Change

9.1.14.1. 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, 2012d). 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[134]), 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 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" with "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

[134] CO_2e refers to Carbon Dioxide Equivalent, "A metric measure used to compare the emissions from various greenhouse gases 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, 2015o)

(see Section 9.2.14, 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).

9.1.14.2. Specific Regulatory Considerations

The pertinent federal laws relevant to the protection and management of climate change are summarized in Appendix C. New Hampshire has also established goals to reduce GHG emissions to combat climate change. As shown in Table 9.1.14-1, Executive Order 2007-3 is the primary policy drivers on climate change preparedness and GHG emissions.

Table 9.1.14-1: Relevant New Hampshire Climate Change Laws and Regulations

State Law/Regulation	Regulatory Agency	Applicability
Executive Order 2007-3 (December 2007)	New Hampshire State	Established a Climate Change Policy Task Force to develop a Climate Action Plan. (NHDES, 2014g) The "New Hampshire Climate Action Plan: A Plan for New Hampshire's Energy, Environmental and Economic Development Future" sets forth the goal to achieve a long-term reduction in GHG emissions of 80 percent below 1990 levels by 2050. (The New Hampshire Climate Change Policy Task Force, 2009).

In addition, New Hampshire is a part of other organizations which have set GHG emissions targets. In July 1999, then-Governor Jeanne Shaheen signed into law the New Hampshire Greenhouse Gas Reduction Registry. This registry is intended to quantify and submit GHG emissions reduction actions to a state database for safekeeping against some future federal requirements (NHDES, 2014h). New Hampshire is also one of nine states participating in the Regional Greenhouse Gas Initiative (RGGI). RGGI is a CO_2 emissions trading scheme, launched in 2008, which sets an annual cap on CO_2 emissions from power plants over 25 MW capacity within those nine states. The cap for 2015 was set at 88.7 million short tons of CO_2, with an annual reduction of 2.5 percent per year until 2020 (RGGI, 2015).

9.1.14.3. New Hampshire Greenhouse Gas Emissions

Estimates of New Hampshire'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 methane (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, 2015h). Individual states have developed their own GHG inventories, which are updated with different frequencies and trace GHGs in a variety of ways.

For the purposes of this PEIS, the EIA data on CO2 emissions from fossil fuels 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 CH4, they are described and cited.

According to the EIA, New Hampshire emitted a total of 14.2 MMT of CO2 in 2013. Transportation was the largest emitter, accounting for almost 68 percent of total CO_2 emissions (Table 9.1.14-2) (EIA, 2015d). New Hampshire's CO_2 emissions increased from 1980 to a high of 21.8 MMT in 2004, then declined to their current levels. Overall increases were driven by petroleum and, in the early 2000s, natural gas. Declines subsequent to 2004 were almost entirely in petroleum products, with decreases in coal-related emissions beginning in 2007. In 2013, New Hampshire ranked 47th among the 50 states and the District of Columbia for total CO_2 emissions, and 40th for per-capita CO_2 emissions (EIA, 2015e).

Table 9.1.14-2: New Hampshire CO_2 Emissions from Fossil Fuels by Fuel Type and Sector, 2013

Fuel Type (MMT)		Source (MMT)	
Coal	1.6	Residential	2.3
Petroleum Products	9.4	Commercial	1.3
Natural Gas	3.0	Industrial	0.8
		Transportation	6.3
		Electric Power	3.3
TOTAL	13.9	TOTAL	13.9

Source: (EIA, 2015d)

New Hampshire does not have an official state-level inventory and bases a majority of its information and projections off of the USEPA's *State Greenhouse Gas Inventory Tool*, with the most recent GHG estimates for 2004 (NHDES, 2015m). The majority of New Hampshire GHG emissions (96 percent) is CO_2. Other GHGs emitted in New Hampshire are methane (1 percent), nitrous oxide (1 percent), and synthetic gases such as hydrofluorocarbons (HFCs) sulfur hexafluoride (SF_6) and, perfluorocarbons (PFCs) totaling 2 percent (NHDES, 2015m). Total U.S. GHG greenhouse were 6,673 million metric tons in 2013 (USEPA, 2015i).

Because more than half of the population relies on petroleum to heat their homes during the long winter months, the state's residential petroleum consumption is one of the highest in the nation (EIA, 2015b). New Hampshire's GHG emissions remained constant between 1990 and 1995 however, in 2004 there was a spike of 48 percent. A majority of this increase occurred in the electric generation sector as a result of two natural gas generation stations opening in the past decade. Approximately half of New Hampshire's electricity comes from Seabrook Nuclear Power Station (EIA, 2015b). New Hampshire projects that the electricity sector will continue to grow yearly by 1.45 percent. The transportation sector will likely increase by 102 percent between 2004 and 2030 and fuel consumption will increase by 2.8 percent per year (Skoglund, 2015).

New Hampshire is second among the states only to Maine in the percentage of forested land (EIA, 2015b). Net GHG emissions are in fact negative because these forests are a carbon sink (NHDES, 2015m).

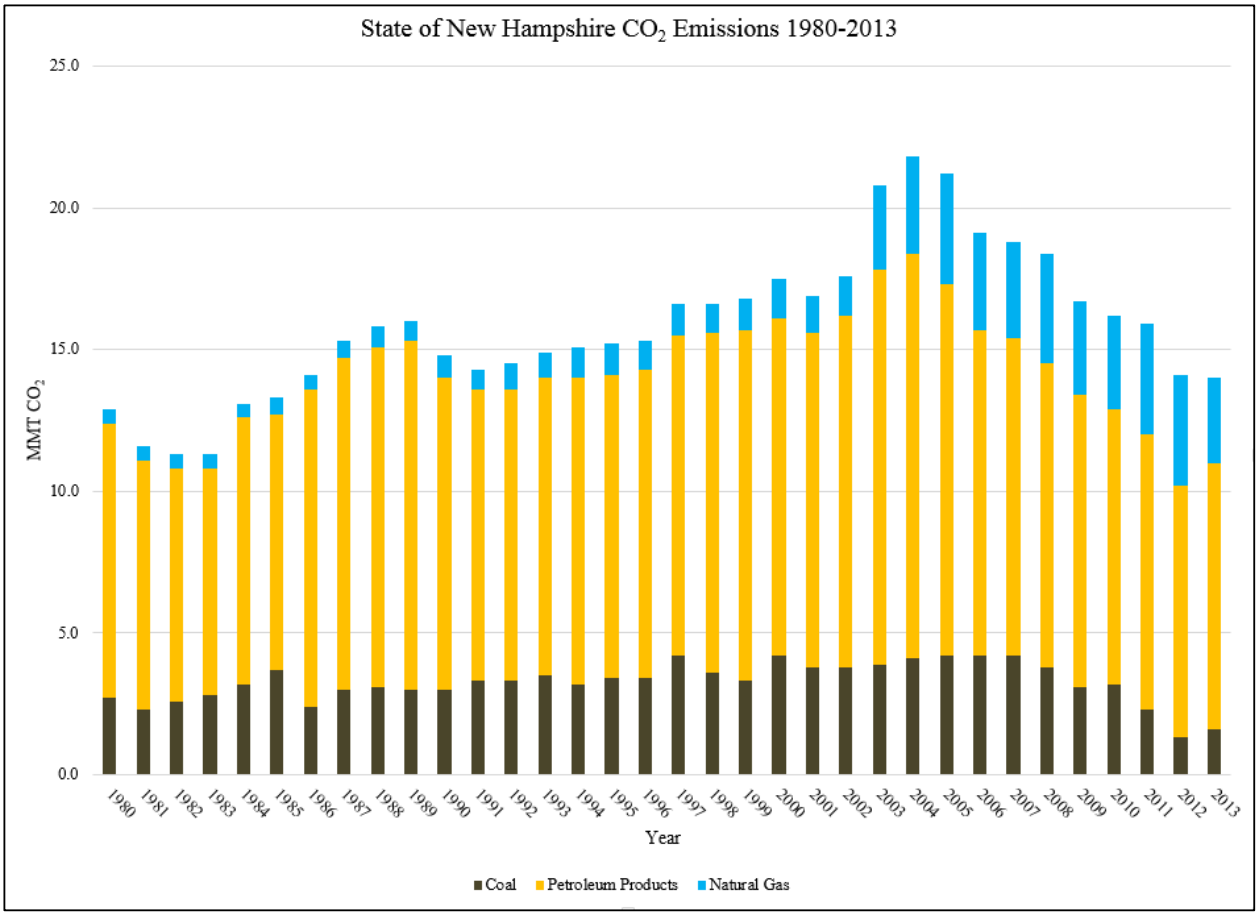

Figure 9.1.14-1: New Hampshire CO_2 Emissions from Fossil Fuels by Fuel Type 1980-2013

Source: (EIA, 2015d)

9.1.14.4. Environmental Setting

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).

The state of New Hampshire falls into climate group (D) (Figure 9.1.14-2). Climates classified as (D) are "moist continental mid-latitudinal climates," with "warm to cool summers and cold winters" (NWS, 2011a) (NWS, 2011b). In (D) climates, the "average temperature of the warmest month is greater than 50 degrees Fahrenheit (oF), while the coldest month is less than negative 22 °F" (NWS, 2011a) (NWS, 2011b). Winter months in (D) climate zones are cold and severe with “snowstorms, strong winds, and bitter cold from Continental Polar or Arctic air masses” (NWS, 2011a) (NWS, 2011b).

Dfb – The entirety of New Hampshire is classified as (Dfb). Climates classified as (Dfb) are characterized as humid, with warm summers and snowy winters (see Figure 9.1.14-2). New Hampshire’s secondary classification indicates substantial precipitation during all seasons. New Hampshire’s tertiary classification indicates that at least four months out of the year averaging above 50 °F (NWS, 2011a) (NWS, 2011b).

9.1.14.5. Existing Climate

This section discusses the current state of New Hampshire’s climate with regard to air temperature, precipitation, sea level, and extreme weather events (e.g., tropical storms, tropical cyclones, and hurricanes) in New Hampshire’s climate region, (Dfb).

As a New England state, New Hampshire has four distinct seasons: spring, summer, fall, and winter. As with many other New England states, climate throughout the state of New Hampshire is controlled by topography, latitude, and proximity to the coast, lakes, rivers, and mountains. New Hampshire’s climate is also classified as “humid continental,” meaning precipitation is often year round. The “greatest variable” in New Hampshire’s climate is the air temperature (NH DRED, 2015h). “New Hampshire also lies below three major storm tracks, with has an important influence on the amount, type, and distribution of precipitation” (Stampone, 2015). Summers in New Hampshire are “warm and humid,” while winters are colder with abundant snowfall.

Air Temperature

Dfb – “Statewide, temperature is dominated by the mid-latitude seasonal cycle but may vary significantly from one place to another depending on latitude, elevation, and direction of airflow” (Stampone, 2015). Average annual temperatures in New Hampshire are typically cooler in the north and at higher elevations, than in southern areas of the state. For example, the annual average temperature in First Connecticut Lake, located in northern New Hampshire, is 37 °F (Stampone, 2015). In comparison, the annual average temperature at higher elevations, such as Mount Washington, is 27 °F (Stampone, 2015). Concord, located in southern New Hampshire, has an average temperature of 46 °F (Stampone, 2015). “Seacoast portions of the state are strongly influenced by coastal waters, which tend to moderate seasonal temperatures for coastal town and cities” (Stampone, 2015).

Statewide, the average annual temperature is approximately 44.2 °F (NOAA, 2015d). There are slight average temperature differences between northern and southern regions of the state. The average annual temperature is approximately 39.4 °F within the northern region and 43.8 °F within the southern region (NOAA, 2015d). Concord, the capital of New Hampshire, is located within the climate classification zone (Dfb). The average annual temperature in Concord, located in southern New Hampshire, is 46.4°F; 23.9 °F during winter months; 67.8 °F during summer months; 44.7 °F during spring months; and 48.8 °F during autumn months (NOAA, 2015e). The highest temperature to occur in New Hampshire was on July 4, 1911 with a record high of 106 °F (SCEC, 2015). The coldest temperature to occur in New Hampshire was on January 22, 1885 with a record low of negative 50 °F (SCEC, 2015).

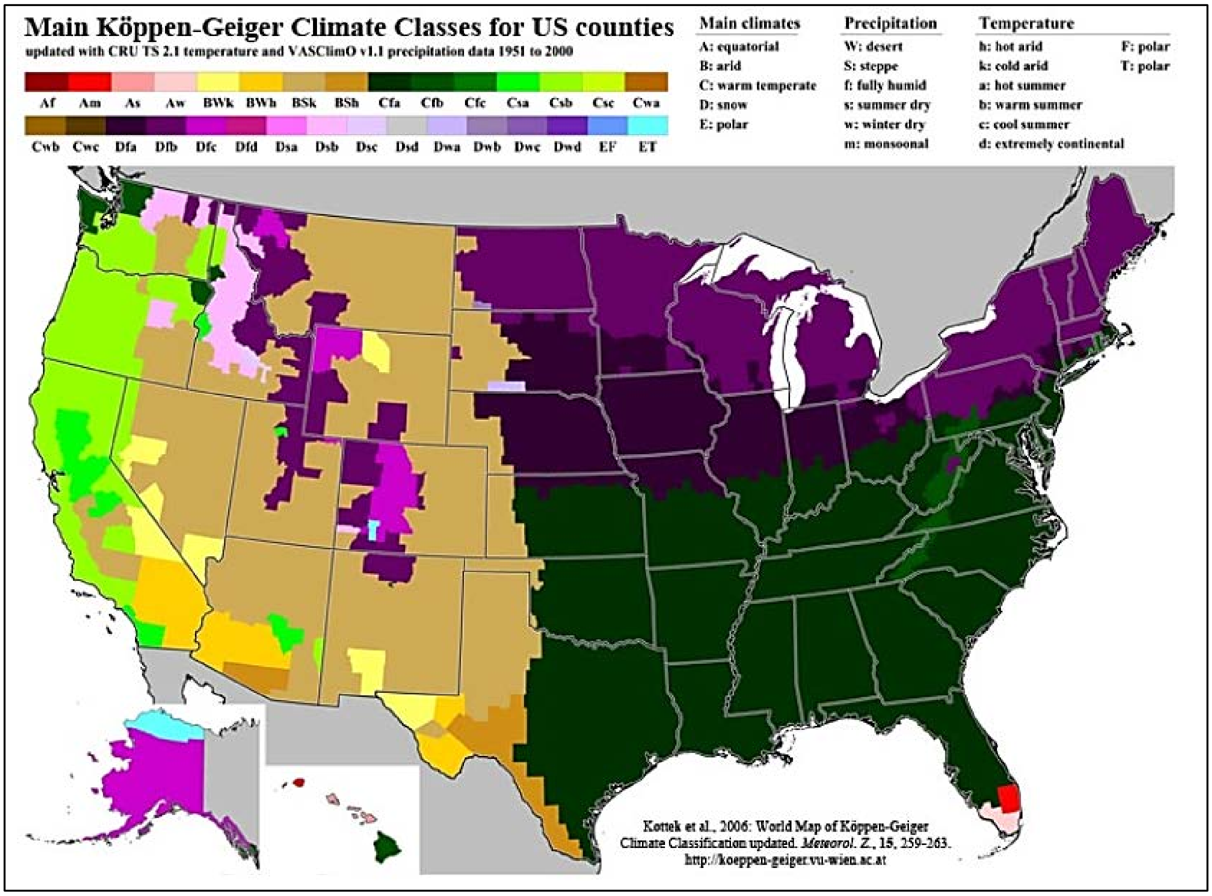

Figure 9.1.14-2: Köppen-Geiger Climate Classes for U.S. Counties

Source: (Kottek, Grieser, Beck, Rudolf, & Rubel, 2006)

Precipitation

New Hampshire's topography as well as proximity to large water bodies, such as the Atlantic Ocean, strongly influences the distribution of rainfall (Stampone, 2015). Overall, New Hampshire has an even distribution of precipitation throughout the year with no distinct wet or dry season (NOAA, 2015e). Statewide, average monthly precipitation values range from 2.62 inches in February to 3.95 inches in February to 3.95 inches in October. Total annual average precipitation is approximately 43.42 in New Hampshire. In southeastern parts of the state, annual averages are slightly higher (Nashua: 45.21 inches) than statewide averages, "due to the frequency of coastal storms and the impact of nor'easters and the occasional hurricane" (Stampone, 2015). "For example, a coastal storm may result in two or three times as much precipitation for Portsmouth (3/14/2010: 4.61 inches) than Concord (3/14/2010: 1.81 inches), which is further inland" (Stampone, 2015). "Average total annual precipitation decreases north (Berlin: 39.92 inches) and west (Concord: 37.59 inches) but snowfall generally increases from areas southeast (Epping: 55.4 inches) to the north (Berlin: 78.9 inches) and west (Concord: 63.1

inches; Lebanon 71.0 inches)" (Stampone, 2015). Since 1895, the "mean annual precipitation in the Northeast has increased by approximately 5 inches, more than 10%" (Kirshen, Wake, Huber, Knuuti, & Stompone, 2014).

Dfb – Concord, the capital of New Hampshire, is located within the climate classification zone (Dfb). The average annual precipitation accumulation in Concord is approximately 40.61 inches; 8.52 inches during winter months; 10.61 inches during summer months; 10.34 inches during spring months; and 11.14 inches during autumn months (NOAA, 2015e). In addition to rainfall, New Hampshire receives an abundant amount of snow. On average Concord receives an average of 65 inches per year. Mountainous areas farther north receive approximately 100 inches per year. The highest recorded snowfall accumulation was on Mt. Washington, with a total of 281.2 inches. The second highest recorded snowfall accumulation was in Franconia, with a total of 160 inches. The highest recorded snowfall accumulation in Concord was 61.4 inches (NH DRED, 2015h).

Sea Level

New Hampshire has approximately 13 miles of coastal shoreline and 131 miles of tidal shoreline (NMFS, 2015). Although the state is only comprised of approximately 144 miles of shoreline, much of this shoreline is at risk for damage from strong winds, heavy rainfall, flooding, and the occasional hurricanes. Since 1927, relative sea level at the Portsmouth Naval Shipyard tide gauge has risen approximately 5.3 inches, "at a rate of 0.7 inches per decade (1.76±0.30 mm/yr.)" (Kirshen, Wake, Huber, Knuuti, & Stompone, 2014). Sea level rise in New Hampshire is mostly due to thermal expansion and melting land-based ice sheets. As sea level continues to rise, the risks associated with living along the coast also rise. Specifically, New Hampshire is "threatened by both extratropical storms (known locally as nor'easters) and tropical storms (locally known as hurricanes when they become particularly strong)" (Kirshen, Wake, Huber, Knuuti, & Stompone, 2014). "Over the past ten years, the largest storm surges observed at Fort Point, New Hampshire occurred during nor'easters" (Kirshen, Wake, Huber, Knuuti, & Stompone, 2014).

Severe Weather Events

"Local geographic influences on atmospheric temperature and moisture coupled with the frequent passage of storm systems, New Hampshire weather can change quickly from one extreme to the next" (Stampone, 2015). During spring and summer months, "southwesterly winds bring warm, humid subtropical air into the state," which can lead to severe and frequent thunderstorms, "heavy rain, strong winds, hail, and tornadoes (Northwood Tornado 07/24/2008)" (Stampone, 2015). During winter months, "northeasterly flow ushers in cool to cold damp and dreary weather conditions and often occurs prior to the arrival of nor'easters capable of producing heavy rain, snow, and ice" (Stampone, 2015).

Flooding in New Hampshire most often occurs during the spring, when heavy rains combine with rapid and excessive snowmelt. While severe flooding events do not routinely occur in New Hampshire, a few historical floods have been particularly damaging and severe. One of the most damaging floods to occur in New Hampshire was in March of 1936. This flood "occurred in central and southern New Hampshire and affected the Saco, Connecticut, Merrimack, Androscoggin, and Piscataqua Rivers" (NWS, 2015). This flood was the result of two separate rain events. The first occurred on between March 9 through 13, with a total rainfall accumulation of four to eight inches across most of central and southern New Hampshire (NWS, 2015). The second occurred on March 16 through 19, with another four to 10 inches of rainfall accumulation. "The rain fell on a ripe snowpack that melted quickly" (NWS, 2015). "The rivers still had a thick ice cover and as the ice was lifted and moved downstream, bridges were damaged or destroyed" (NWS, 2015). This flooding event resulted in approximately $25 million worth in public damages (1936 dollars). In May of 2006, a low-pressure storm system caused extensive flooding in parts of central and southern New Hampshire. In total, this storm produced approximately 12-inches of rainfall within a 72-hour period. Throughout the event, two dams along the Salmon Falls River were monitored, as they were at risk for overflowing. This flooding event caused many homes, buildings, roads, and bridges to be destroyed and resulted in approximately $10 million worth in public damages (NWS, 2015). The following year, in April 2007, a flood was caused due to a "strong coastal low pressure system that produced 4 to 8 inches of rain over a 3-day period resulting in rapid runoff and snowmelt" (NWS, 2015). Throughout the state, damage to infrastructure (e.g., roads, bridges, wastewater treatment plants, and public buildings) was the most severe (NWS, 2015). In total, this storm caused approximately $8 million in public damages (NWS, 2015).

Studies show that coastal storms (e.g., tropical cyclones, hurricanes, and Nor'easters) "may be intensifying and will interact with sea level rise to increase the vulnerability of coastlines and coastal habitats" (MassWildlife, 2015). "Furthermore, in low-lying areas, rainfall flooding may become worse not only due to heavier rain events, but because high sea levels will reduce drainage to the ocean" (MassWildlife, 2015). Although it is uncommon for hurricanes to travel inshore once they make landfall, storms can re-intensify if they come into contact and combine with pre-existing low-pressure storms (Ho, Su, Hanevich, Smith, & Richards, 1987). As was observed during Hurricane Sandy, inland properties and structures may be more vulnerable to hurricanes and inland flooding than those in coastal areas may, as building codes are sometimes less strict, since inland properties and structures do not have to endure the same magnitude and frequency of severe weather events as coastal properties. (NOAA, 2004).

9.1.15. Human Health and Safety

9.1.15.1. Definition of the Resource

The existing environment for health and safety is defined by occupational and environmental hazards likely to be encountered during the construction, 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 implementation 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, vehicular traffic, or the transportation of hazardous materials and wastes. RF is evaluated in Section 2.4, Radio Frequency Transmissions. Vehicle traffic and the transportation of hazardous materials and wastes are evaluated in Section 9.1.1, Infrastructure.

9.1.15.2. Specific Regulatory Considerations

Federal organizations, such as the U.S. 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 New Hampshire, public sector occupational safety is regulated by the New Hampshire Department of Labor (NHDOL), and NHDES regulates waste and environmental pollution. Federal OSH regulations apply to workers through either OSHA, or stricter state-specific plans, which must be approved by OSHA. New Hampshire does not have an OSHA-approved "State Plan," so federal employees, as well as most private sector regulations in New Hampshire are enforced by OSHA. Health and safety of the general public is regulated by the New Hampshire Department of Health and Human Services (NHDHHS).

Federal laws relevant to protecting occupational and public health and safety are summarized in Appendix C. Table 9.1.15-1 below summarizes the major New Hampshire laws relevant to the state's occupational health and safety, hazardous materials, and hazardous waste management programs.

Table 9.1.15-1: Relevant New Hampshire Human Health and Safety Laws and Regulations

State Law/Regulation	Regulatory Agency	Applicability
New Hampshire Code of Administrative Rules, Chapter Env-Hw 100	NHDES	Ensures the proper management of hazardous waste to minimize the risks to the environment and public health.
New Hampshire Code of Administrative Rules, Chapter Env-Or 600	NHDES	Details procedures for the investigation, management, and remediation of regulated contaminants discharged from human operations, which may negatively affect human health or the environment.
New Hampshire Statutes, Chapter 277	New Hampshire Department of Labor (NHDOL)	Describes regulations pertaining to OSHA certification, sanitation, inspections, and enforcement of laws.

9.1.15.3. 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 water bodies, and on communication towers. Tasks are often performed at dangerous heights, inside trenches or 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, 2016). 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 (OSHA, 2015). 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 general public who may be observing the work or transiting the area.

Trenches and confined spaces – Installation of underground utilities, building foundations, and work in utility manholes[135] 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.

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

[135] 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.

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 (TWA) (see Section 9.1.13, Noise) (OSHA, 2002). 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. Hazardous waste is likely to be stored properly in containers onsite, whereas less obvious hazardous materials might also be present, such as lead-based paint on old tower equipment and asbestos tiles and insulation in equipment sheds. The general 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 waterways and wetlands, such as lakes, rivers, ponds, or 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 BLS uses established industry and occupational codes to classify telecommunications workers. For industry classifications, 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), and 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, New Hampshire employed 550 telecommunication line installers and repairers, and 1,230 telecommunication equipment installers and repairers (BLS, 2015c). Nonfatal occupational injuries or illnesses data are not available for New Hampshire (BLS, 2013a). In 2013, the most recent data available, there were only 2.1 nonfatal occupational injuries or illnesses nationwide per 100 full-time workers in the telecommunications industry (BLS, 2015d).

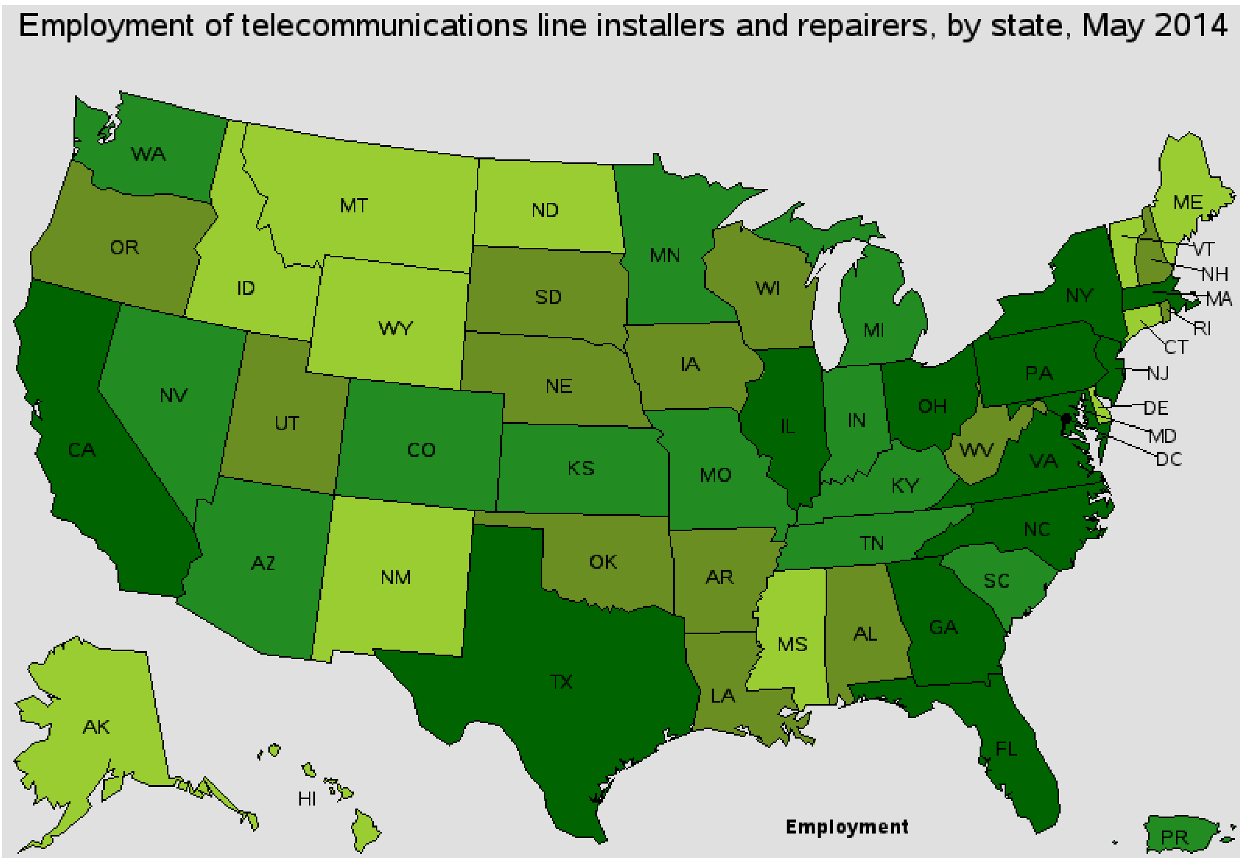

Figure 9.1.15-1: Number of Telecommunication Line Installers and Repairers Employed

Source: (BLS, 2015d)

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 total occupational fatalities (4,585 total). New Hampshire has not reported fatalities in the telecommunications industry or telecommunications occupations since 2003, when data are first available (BLS, 2015d).

Public Health and Safety

The general public are not likely to encounter occupational hazards at telecommunication sites, due to limited access. New Hampshire has not recorded incidents of injuries from the public to these sites. Among the general public, trespassers entering telecommunication sites would be at the greatest risk for exposure to health and safety hazards.

9.1.15.4. Environmental Setting: Contaminated Properties 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 site occupants at telecommunication sites, prior to creation of 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 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.

New Hampshire's Superfund program assists the USEPA with cleaning up sites in the state that pose a current or future threat to human health or the environment (NHDES, 2014i). The state Hazardous Waste Remediation Bureau regulates sites that have had a release of hazardous substances, and manages extended remediation projects. The Hazardous Waste Remediation Bureau does not oversee Superfund sites, or sites contaminated by petroleum products, which are handled by the Petroleum Remediation Program (NHDES, 2014j). As of September 2015, New Hampshire had 11 RCRA Corrective Action sites[136], 221 brownfield sites, and 22 proposed or final Superfund/NPL sites (USEPA, 2015j). Based on a September 2015 search of USEPA's Cleanups in My Community (CIMC) database, one Superfund site still exists in New Hampshire where contamination has been detected at an unsafe level, or a reasonable human exposure risk (General Electric Fletcher's Paint Works & Storage) (USEPA, 2015k). Brownfield sites in New Hampshire's State Brownfields Program encourage the redevelopment of contaminated properties through several strategies that help address liability concerns (NHDES, 2014k).

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 Toxics Release Inventory (TRI), administered by the USEPA under the Emergency Planning and Community Right to Know Act (EPCRA) of 1986. As of September 2015, New Hampshire had 138 TRI reporting facilities

[136] Data gathered using USEPA's Cleanups in My Community (CIMC) search on September 23, 2015, for all sites in New Hampshire, where cleanup type equals 'RCRA Hazardous Waste – Corrective Action,' and excludes sites where cleanup phase equals 'Construction Complete' (i.e., no longer active).

(USEPA, 2014c). According to the USEPA, in 2013, the most recent data available, New Hampshire released 726,528 pounds of toxic chemicals through onsite and offsite disposal, transfer, or other releases, largely from the electric utilities industry. This accounted for 0.02 percent of total nationwide TRI releases, ranking New Hampshire 52 of 56 states and territories (USEPA, 2014c).

Another USEPA program is the National Pollution Discharge Elimination System (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.

The National Institute of Health (NIH), 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 Institute of Health, 2015a). Figure 9.1.15-2 provides an overview of potentially hazardous sites in New Hampshire.

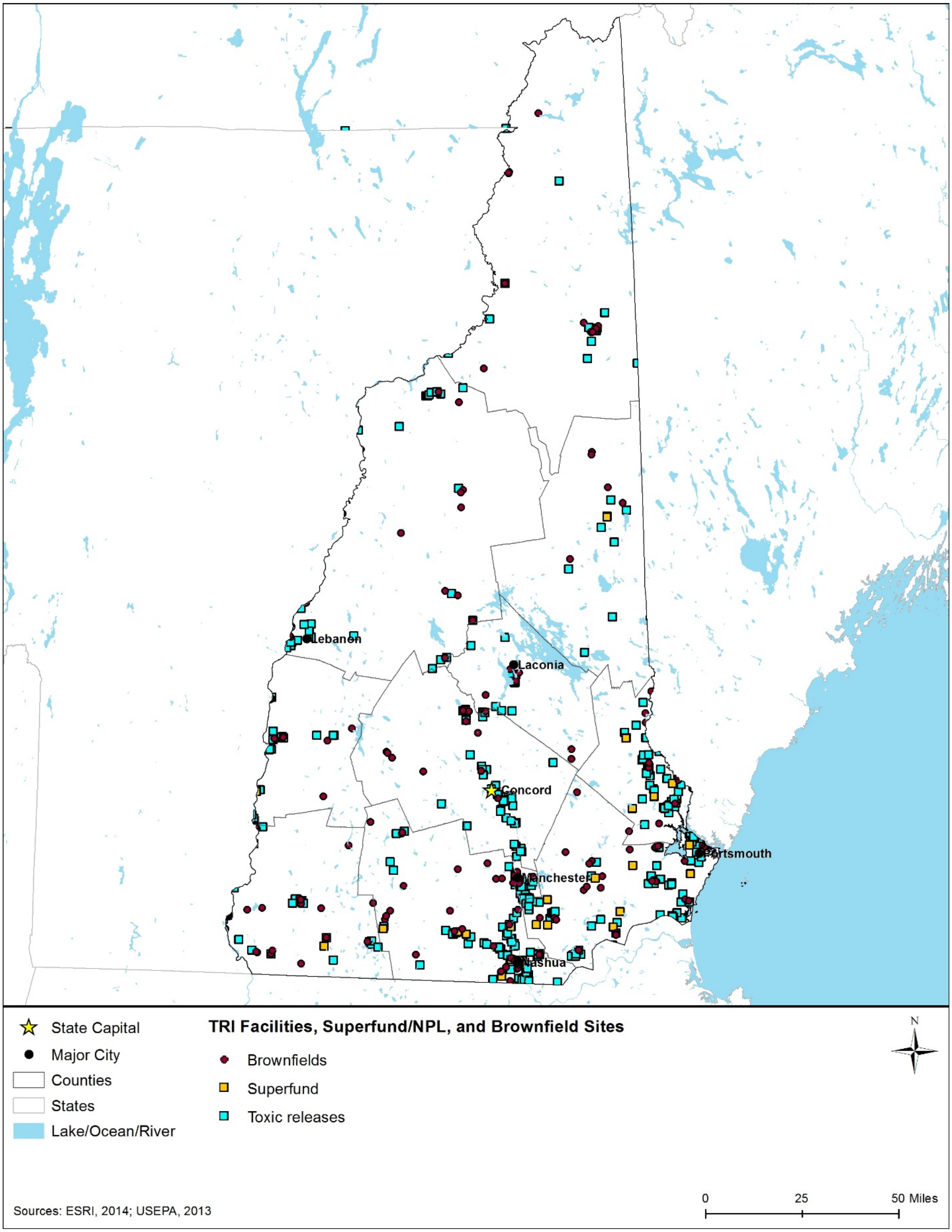

Figure 9.1.15-2 TOXMAP Superfund/NPL and TRI Facilities in New Hampshire (2013)

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 water bodies. Indoor air quality may be impacted from vapor intrusion infiltrating indoors from contaminated soil or groundwater that are present beneath a building's foundation. According to the NHDHHS, there were 10 cases of occupational exposure to hazardous vapors and over 35 chemical exposure incidents, with 184 total cases of occupational poisoning in 2011, the most recent data available (NHDHHS, 2013). However, according to the BLS data for 2011, there were no fatalities in New Hampshire from occupational exposure to "harmful substances or environments" (BLS, 2013c). By comparison, BLS reported three fatalities in 2011 and three "preliminary" fatalities 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 "preliminary" 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).

Spotlight on New Hampshire Superfund Sites: Fletcher's Paint Works & Storage
Fletcher's Paint Works is a 2-acre site consisting of two lots in a densely populated residential area of Milford, NH. Fletcher's Paint Works was a manufacturer of paints and stains from 1949 until 1991. The State of New Hampshire inspected the site in 1982 and found over 800 drums of resins and solvents, many open or leaking onto the soil. A subsequent USEPA investigation discovered volatile organic compounds (VOCs) in a nearby municipal water well. Soon after, access controls were constructed on the property, asphalt was placed over contaminated soil to direct surface water away from residences, and contaminated soil was removed from three adjacent houses. (USEPA, 2015p)

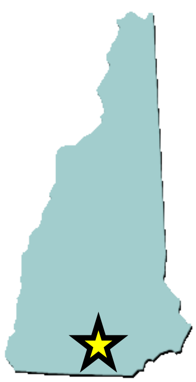

Figure 9.1.15-3. Aerial Photo of Fletcher's Paint Works site

Public Health and Safety

As described earlier, access to telecommunication sites is nearly always restricted to occupational workers. Although site access control is one of the major reasons telecommunication sites present an inherent low risk to non-occupational workers, the general 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 NHDHHS is responsible for collecting public health data resulting from exposure to environmental contamination, and provides publicly available health assessments and consultations for documented hazardous waste sites (NHDHHS, 2009).

9.1.15.5. Environmental Setting: Natural and 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 general 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 incidents 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.). Floodwaters are often contaminated by hazardous chemicals and sanitary wastes, 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, NHDOL and BLS do not report data specific to injuries or fatalities among telecommunication workers responding to natural or manmade disasters. 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. For example, in June 2013, during a period of severe storms and flooding, a pole-mounted transformer was knocked over by a tree, releasing transformer oil onto the ground in Franklin, NH (U.S. Coast Guard, 2013). Such incidents present unique, hazardous challenges to telecommunication workers responding during natural disasters.

Spotlight on New Hampshire Natural Disasters: October 2005 Flooding

During and after a natural disaster event, telecommunications workers may be required to perform maintenance activities in hazardous environments, such as severe flooding. In October 2005, southwestern New Hampshire was inundated with a storm producing over 7 inches of rain in 30 hours. The intense rainfall caused severe flooding in regions of steep terrain, creating large washout sections along roadways, including Route 123 along Warren Brook, in Alstead, NH. Water levels downstream from the confluence of Cold River and Warren Brook exceeded the 500-year flood level. (USGS, 2006b)

Source: (NOAA, 2015g)

Figure 9.1.15-4: Warren Brook in Alstead, NH

Public Health and Safety

Hazards present during natural and manmade disasters are often ubiquitous, affecting large geographic areas and affecting all populations living within the area. Similar to telecommunication workers, the general 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. Infrastructure damage was extensive during Hurricane Irene in 2012, with several storage tank spills due to flooding and fallen transformers. That same year, New Hampshire experienced four weather-related injuries and one fatality (NWS, 2013). For comparison, in 2011 there were only two weather-related injuries and one fatality (NWS, 2012).

9.2. 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 categories of impacts are 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, include 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 as a result of construction activity. 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.

9.2.1. Infrastructure

9.2.1.1. Introduction

This section describes potential impacts to infrastructure in New Hampshire associated with construction, deployment, and operation of the Proposed Action and alternatives. See Chapter 17, 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.

9.2.1.2. Impact Assessment Methodology and Significance Criteria

The impacts of the Proposed Action on infrastructure were evaluated using the significance criteria presented in Table 9.2.1-1. As described in Section 9.2, 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.

Table 9.2.1-1: 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 county or county-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 adverse 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, County/Region, or State/Territory		Local/City, County/Region, or State/Territory	Local/City, County/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 adverse 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, County/Region, or State/Territory		Local/City, County/Region, or State/Territory	Local/City, County/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, County/Region, or State/Territory		Local/City, County/Region, or State/Territory	Local/City, County/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

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.

9.2.1.3. 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 deployment phases of specific projects. 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 9.2.1-1, such impacts would be less than significant due to the temporary nature of the deployment activities, even if such impacts would be realized at one or more isolated locations. Such 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 during deployment 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 – and that is 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 first responders 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 9.2.1-1, such potential negative and positive impacts would be less than significant.

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 9.2.1-1, 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 compliment such practices and SOPs in a positive manner; therefore, only beneficial or complimentary impacts would be anticipated. Public safety communication capabilities and response times would be expected to also experience such beneficial impacts through enhance 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.

Effects to Commercial Telecommunication Systems, Communications, or Level of Service

Commercial telecommunication systems, communications, or level of service would experience no impacts, as such commercial assets would be using a different spectrum for communications. 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[137]. Such leases would then have less than significant positive impacts on commercial telecommunication systems, communications, or level of service, per the impact significance criteria presented in Table 9.2.1-1.

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, 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.

[137] 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.

9.2.1.4. *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 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 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 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 (POPs)[138], huts, or other associated facilities or hand-holes[139] 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.
  - 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 poles requiring ground disturbance.
  - New Build – Submarine Fiber Optic Plant: The installation of cables in limited nearshore or inland 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 shore to accept 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

[138] Points of Presence are connections or access points between two different networks, or different components of one network.
[139] A small hole typically large enough for one to insert a hand and arm into for inspection and maintenance activities.

corridors, disruption of service to telecommunications infrastructure, or other temporary impacts.

- 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, which would result in localized impacts to that tower and 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 COWs, COLTs, and SOWs are comprised of cellular base stations, sometimes with expandable antenna masts, and generators that may require connection 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 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 launched or recovered on 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 airport or harbor operations, temporary impacts on existing or new telecommunications sites, and more permanent impacts on utilities, if new infrastructure required tie-in to the electric grid. 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, and system redundancy. These impacts are expected to be less than significant. See Chapter 17, 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.

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 of 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 result as explained above, although these potential impacts would be expected to be minor and temporary.

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 also 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 also minimize disruptions and misinformation resulting from limited or disrupted service. See Chapter 17, 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.

9.2.1.5. Alternatives Impact Assessment

The following section assesses potential impacts to infrastructure associated with the Deployable Technologies Alternative and the No Action Alternative.[140]

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

[140] 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 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. Also, 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 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.

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 of established access roads or utility ROWs, or if additional maintenance-related construction activities occur within public road and utility ROWs, less than significant impacts could occur to transportation systems or utility services. See Chapter 17, 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.

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 from deployment and operation of the Proposed Action. Environmental conditions would therefore be the same as those described in Section 9.1.1, Infrastructure. The state also would not realize positive, beneficial impacts to infrastructure resources described above.

9.2.2. Soils

9.2.2.1. Introduction

This section describes potential impacts to soil resources in New Hampshire associated with deployment and operation of the Proposed Action and alternatives. See Chapter 17, 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.

9.2.2.2. Impact Assessment Methodology and Significance Criteria

The impacts of the Proposed Action on soil resources were evaluated using the significance criteria presented in Table 9.2.2-1. As described in Section 9.2, 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.

9.2.2.3. Description of Environmental Concerns

Soil Erosion

Soil erosion is an environmental concern of 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 New Hampshire and other states with similar geography and weather patterns is the erosion of construction site soils to natural waterways, where the sediment can impair water and habitat quality, and potentially affect aquatic plants and animals (NRCS, 2000). Areas exist in New Hampshire that have steep slopes (i.e., greater than 20 percent) or where the erosion potential is medium to high, including locations with Aquepts, Aquods, Cryods, Fluvents, Folists, Hemists, Orthents, Orthods, Psamments, and Udepts (see Section 9.1.2.3, Soil Suborders and Figure 9.1.2-2).

Based on the impact significance criteria presented in Table 9.2.2-1, 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 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 could implement BMPs and mitigation measures to avoid or minimize impacts, and minimize the periods when exposed soil is open to precipitation and wind (see Chapter 17).

Table 9.2.2-1: 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 county	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 county	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 county	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

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 9.2.2-1, 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 17), 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. Heavy equipment can cause perceptible compaction and rutting of susceptible soils, particularly if BMPs and mitigation measures are not implemented.

Soils with the highest potential for compaction or rutting were identified by using the STATSGO2 database (see Section 9.1.2.3, Soil Suborders). The most compaction susceptible soils in New Hampshire are hydric soils with poor drainage conditions, which include Aquepts, Aquults, and Hemists. These suborders constitute approximately 24 percent of New Hampshire's land area,[141] and are found across the state, particularly along coastal areas (see Figure 9.1.2-2). 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 9.2.1-1, the risk of soil compaction and rutting resulting from FirstNet deployment activities would be less than significant due to the extent of susceptible soils in the state.

9.2.2.4. 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, 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, 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.

[141] 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.

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
    - 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 nationwide public safety broadband network (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 are needed, they may require 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. See Chapter 17, 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.

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. If usage of heavy equipment as part of routine maintenance or inspections occurs off of 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. These impacts are expected to be less than significant. See Chapter 17, 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.

9.2.2.5. 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 if 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. See Chapter 17, 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.

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. If usage of heavy equipment as part of routine maintenance or inspections occurs off of 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 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. See Chapter 17, 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.

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 9.1.2, Soils.

9.2.3. Geology

9.2.3.1. Introduction

This section describes potential impacts to New Hampshire geology resources associated with deployment and operation of the Proposed Action and alternatives. See Chapter 17, 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.

9.2.3.2. Impact Assessment Methodology and Significance Criteria

The impacts of the Proposed Action on geology resources were evaluated using the significance criteria presented in Table 9.2.3-1. As described in Section 9.2, 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.

9.2.3.3. 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, mineral and fossil fuel resources, paleontological resources, surface geology, bedrock, topography, physiography, and geomorphology. These concerns and their impacts on geology are discussed below.

Table 9.2.3-1: Impact Significance Rating Criteria for Geology

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMPs 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
Volcanic Activity	Magnitude or Intensity	High likelihood that a project activity could be located near a volcano lava or mud flow area of influence	Effect that is potentially significant, but with mitigation is less than significant	Low likelihood that a project activity could be located near a volcanic ash area of influence	No likelihood of a project activity located within a volcano hazard zone
	Geographic Extent	Volcano lava flow areas of influence are highly prevalent within the state/territory		Volcano ash areas of influence occur within the state/territory, but may be avoidable	Volcano hazard zones 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

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	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
	Duration or Frequency	NA		NA	NA
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
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.

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	Less than Significant with BMPs and Mitigation Measures Incorporated	Less than Significant	No Impact
	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
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

Seismic Hazard

As discussed in Section 9.1.3.8, New Hampshire is not at risk to severe earthquake events. As shown in Figure 9.1.3-4, southeastern New Hampshire, including Concord, Manchester, and Portsmouth, are at greatest risk to earthquakes throughout the state, though no earthquake over magnitude 6.0 on the Richter scale has ever occurred in the state. Based on the impact significance criteria presented in Table 9.2.2-1, seismic impacts could be potentially significant if FirstNet's deployment locations were within high-risk earthquake hazard zones or active fault zones. Equipment that is exposed to earthquake activity is subject to misalignment, alteration, or, in extreme cases, destruction; all of these activities could result in connectivity loss. Given the potential for minor to moderate earthquakes in parts of New Hampshire, some amount of infrastructure could be subject to earthquake hazards, in which case BMPs and mitigation measures (see Chapter 17) could help avoid or minimize the potential impacts.

Volcanic Activity

Volcanoes were considered but not analyzed for New Hampshire, as they do not occur in New Hampshire; 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 9.1.3.8, portions of New Hampshire are at moderate to high risk of experiencing landslide events. The highest potential for landslides in New Hampshire occurs throughout the White Mountain section, and in the Seaboard Lowland section in areas underlain by clay soils. Based on the impact significance criteria presented in Table 9.2.3-1, 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. Where infrastructure is subject to landslide hazards, BMPs and mitigation measures, as discussed in Chapter 17, could help avoid or minimize the potential impacts.

Land Subsidence

As discussed in Section 9.1.3.8, land subsidence is minimal to nonexistent in New Hampshire. Therefore, based on the impact significance criteria presented in Table 9.2.3-1, subsidence impacts would be less than significant since FirstNet's deployment locations are unlikely to be within areas at high risk or inundation due to long-term land subsidence. BMPs and mitigation measures (see Chapter 17) could be implemented if deployment were to occur in a subsidence-prone area.

Mineral and Fossil Fuel Resource Impacts

As discussed in Section 9.1.3.7 and shown in Figure 9.1.3-4, portions of New Hampshire contain mineral and fossil fuel resources. Equipment deployment near mineral and fossil fuel resources are 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 9.2.3-1, impacts to mineral and fossil fuel resources are unlikely as the Proposed Action could only be potentially significant if FirstNet's deployment locations were to cause severe, widespread, observable impacts to mineral and/or fossil fuel resources.

Paleontological Resource Impacts

As discussed in Section 9.1.3.6, few fossils have been discovered throughout New Hampshire. Equipment installation and construction activities that require ground disturbance could damage existing paleontological resources, which are both fragile and irreplaceable. Based on the impact significance criteria presented in Table 9.2.3-1, impacts to paleontological resources could be potentially significant if FirstNet's buildout/deployment locations were to cause impacts to paleontological resources. 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 fossil resources should be considered on a site-by-site basis, and BMPs and mitigation measures (see Chapter 17) may be required help avoid or minimize the potential impacts.

Surface Geology, Bedrock, Topography, Physiography, and Geomorphology

Construction activities related to the Proposed Action and Alternatives are not likely to require removal of significant volumes of terrain to reach the threshold of significance. 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 9.2.3-1, impacts would likely be less than significant if FirstNet's deployment is unlikely 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 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 (see Chapter 17) could be implemented to help avoid or minimize the potential impacts.

9.2.3.4. 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

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, 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 geological resources, it is anticipated that this activity would have no impact on geological 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 resources and paleontological resources. The types of infrastructure 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 POP, 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 mineral resources or paleontological resources. Where equipment is installed in locations that are susceptible to earthquakes, landslides, 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 earthquakes, landslides, 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 earthquakes, landslides, 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 and inland bodies of water is not expected to impact geologic resources, including marine paleontological resources. However, where landings and/or facilities for submarine cable are installed at locations that are susceptible to earthquakes, landslides, 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 earthquakes, landslides, and other 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 perturbation of geologic resources. Where equipment is installed in locations that are susceptible to earthquakes, landslides, 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 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 earthquakes, landslides, 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. However, where equipment is permanently installed in locations that are susceptible to earthquakes, landslides, 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 geology associated with deployment could include minimal removal of bedrock or mineral resources, or adverse impacts to installed equipment resulting from geologic hazards (e.g., seismic hazards). 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. Therefore, these impacts are expected to be less than significant. See Chapter 17, 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 further avoid or minimize potential impacts.

Operation Impacts

As described in Section 2.1.2, Proposed Action, 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.

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. See Chapter 17, 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.

9.2.3.5. 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.

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. See Chapter 17, 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.

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.

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. See Chapter 17, 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.

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 9.1.3, Geology.

9.2.4. Water Resources

9.2.4.1. Introduction

This section describes potential impacts to water resources in New Hampshire associated with deployment and operation of the Proposed Action and alternatives. See Chapter 17, 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.

9.2.4.2. Impact Assessment Methodology and Significance Criteria

The impacts of the Proposed Action on water resources were evaluated using the significance criteria presented in Table 9.2.4-1. As described in Section 9.2, 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 9.2.4-1: 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, 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		The impact is temporary, lasting no more than six months.	NA
Floodplain degradation*	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.

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
	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		The impact is temporary, lasting no more than one season or water year, 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		The impact is temporary, lasting no more than six months.	NA
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
	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

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
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		Potential impact is temporary, not lasting more than six months.	NA

* - 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).

NA = not applicable

9.2.4.3. 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.

All of New Hampshire's rivers and streams, lakes, reservoirs, and ponds, and estuaries and bays are impaired (see Table 9.1.4-2, Figure 9.1.4-3). Generally, the water quality of New Hampshire's principal aquifers is suitable for drinking and daily water needs (Moody, Carr, Chase, & Paulson, 1986).

Deployment activities can contribute pollutants in a number of ways but the primary manner is increased sediment in surface waters. Vegetation removal on site exposes soils to rain and wind that can 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 can 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, a state or USEPA NPDES Construction General Permit (CGP) would be required. As part of the permit application for the CGP, a stormwater 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.

Construction 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, and Safe Drinking Water Act), 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 9.2.4-1, 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[142] 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 New Hampshire dewatering requirements. Any groundwater extracted during dewatering activities or as required by a dewatering permit would be treated prior to discharge or disposed of at a wastewater treatment facility.

Due to average thickness of most New Hampshire aquifers, there is little potential for groundwater contamination within a watershed or multiple watersheds. Thus, it is unlikely that the majority of FirstNet's deployment 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 9.2.4-1, 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, then site-specific analysis, BMPs, and mitigation measures could be implemented to further reduce 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 humans, 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.

Based on the impact significance criteria presented in Table 9.2.4-1, floodplain degradation impacts would be potentially less than significant since the majority of FirstNet's deployment, on the watershed or subwatershed level occur inside the 500-year floodplain, 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. Additionally, any effects would be temporary, lasting no more than one season or water year[143], or occur only during an emergency.

[142] 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).
[143] 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, 2014g)

Examples of activities that would have less than significant impacts 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.
- Limited clearing or grading activities.

Implementation of BMPs and mitigation measures would reduce any risk of additional impacts to floodplain degradation (see Chapter 17).

Drainage Pattern Alteration

Flooding and erosion from land disturbance can changes drainage patterns. Stormwater runoff causes erosion while construction activities and land clearing can change drainage patterns. Clearing or grading activities, or the creation of walls or berms, can alter water flow in an area or cause changes to drainage patterns. Drainage can be directed to stormwater drains, storage, and retention areas designed to slow water and allow sediments to settle out. Improperly handled drainage can cause increased erosion, changes in stormwater runoff, flooding, and damage to water quality. Existing drainage patterns can 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 9.2.4-1, 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.

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 off-site on other properties.
- Activities designed so that the amount of stormwater generated before construction is the same as afterwards.
- 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. BMPs, mitigation measures, and avoidance could be implemented to further reduce any 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 can 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 can 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 9.2.4-1. 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 a temporary (no more than six months) are likely to have less than significant impacts on flow alteration, on a watershed or subwatershed level. Examples of projects likely to have less than significant impacts 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 off site or into surface water bodies that have not received that volume of stormwater before.
- 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 to flow alteration. BMPs, mitigation measures, and avoidance could be implemented to further reduce any impacts.

Changes in Groundwater or Aquifer Characteristics

As described in Section 9.1.4.7, over one-half of New Hampshire’s population draws its drinking water from the state’s groundwater resources. Generally, the water quality of New Hampshire’s principal aquifers is suitable for drinking and daily water needs (Moody, Carr, Chase, & Paulson, 1986). Groundwater is an important natural resource used by industrial, commercial, agricultural, and residential uses for manufacturing, irrigation, and drinking water purposes. 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 any impacts to water quality. Activities that may cause changes is groundwater or aquifer characteristics include:

- Excavation or dredging during or after construction.
- Any liquid waste, including but not limited to wastewater generation.
- Storage of petroleum or chemical products.
- Use of pesticides, herbicides, or insecticides during or after construction of a commercial, industrial, or recreational use.
- Commercial generation, treatment, storage, or disposal of hazardous wastes.

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 since they would not substantially deplete supplies of potable groundwater, as any construction dewatering would be short-term. The siting of deployment activities should be considered to avoid areas that would extract groundwater from potable groundwater sources in the area. According to Table 9.2.4-1, 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.

9.2.4.4. 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, 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 (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, 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 limited nearshore and inland 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 fully assess potential impacts to lake or river coastal 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 and potential groundwater impacts from trenching. If a new roadway were built, any additional impervious surface could impact water resources by increasing 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 could reduce impact intensity. 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 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 water resources. However, if the onsite delivery of additional power units, structural hardening, and physical security measures required ground disturbance, impacts to water resources could occur, including increased suspended solids leading to impaired water quality and impacts to groundwater from excavation.

  - 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. See Chapter 17, 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.

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 due to the limited geographic scale of individual activities and would likely return to baseline conditions once revegetation of disturbed areas is complete. BMPs to help mitigate or reduce any potential impacts are described in Chapter 17.

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 exiting roads and utility rights-of way. Any major infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the abovementioned deployment impacts. Impacts to surface and groundwater quality from routine operations and maintenance, such as herbicide application to control vegetation, are not expected. See Chapter 17, 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.

9.2.4.5. 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, implementation of deployable technologies could result in less than significant impacts to water resources if the deployment occurs 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. 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 the BMPs and mitigation measures identified in Chapter 17, as feasible and practicable, could avoid or further reduce potential impacts. The activities could also result in indirect impacts on water quality if fuels leak into surface or groundwater; these impacts would not be expected to be significant due to the small amounts of fuels expected to be used.

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 less than significant 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 of 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, however, due to the limited and temporary nature of the deployable activities, 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, 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. See Chapter 17, 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.

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 9.1.4, Water Resources.

9.2.5. Wetlands

9.2.5.1. Introduction

This section describes potential impacts to wetlands in New Hampshire associated with construction/deployment and operation of the Proposed Action and alternatives. Chapter 17 identifies BMPs and mitigation measures that could be implemented, as appropriate, to avoid or minimize potential impacts

9.2.5.2. Impact Assessment Methodology and Significance Criteria

The impacts of the Proposed Action on wetlands were evaluated using the significance criteria presented in Table 9.2.5-1. As described in Section 9.2, 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 9.2.5-1: 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 (spills or sedimentation)	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**
	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] 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 US Army Corp of Engineers (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.

9.2.5.3. 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 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. Potential wetlands impacts can be further reduced by implementing BMPs and mitigation measures (see Chapter 17).

There are approximately 290,000 acres of wetlands throughout New Hampshire (USFWS, 2014). In New Hampshire, the two main types of wetlands are palustrine (freshwater) wetlands found on river and lake floodplains across the state, and estuarine/marine (tidal) wetlands along estuaries and the Atlantic coast, as shown in Section 9.1.5, Figure 9.1.5-1 (USFWS, 2007).

Based on the impact significance criteria presented in Table 9.2.5-1, and given the temporary nature of most proposed activities, the deployment activities would most likely have less than significant direct impacts on wetlands. Additionally, deployment activities would not violate applicable federal (e.g., CWA Section 404), state, and local regulations.

In New Hampshire, as discussed in Wetlands, Section 9.1.5.4, in addition to protections under the state's Fill and Dredge in Wetlands Act, Shoreland Water Quality Protection Act, and the national CWA, New Hampshire also allows municipalities to designate certain high quality ("prime") wetlands for further protections, under RSA 482-A:15 and Env-Wt 700. "Prime wetlands" can be either tidal or nontidal, and are usually highly valued based on their large size, unspoiled character, and ability to support rare or threatened plant and animal species populations. After evaluation for designation via both field and desktop analysis, residents of a municipality will vote on adoption of the prime wetland. Once the state formally accepts the designation, the prime wetland, along with a 100-foot buffer, are afforded further protections under New Hampshire wetlands law. These protections include a more stringent burden of proof on project proposals in the wetland or buffer zone, that the proposed project is the alternative with the least impact, and that the proposed project will not result in a net loss of any of the wetland's values. Maps of different municipal wetlands are available at http://des.nh.gov/organization/divisions/water/wetlands/prime_wetlands.htm. More than 30 towns in New Hampshire have designated prime wetlands. (NHDES, 2008d) (NHDES, 2014f)

Potential Other Direct Effects

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, 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 9.2.5-1, 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 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. Potential wetlands impacts can be further reduced by implementing BMPs and mitigation measures (see Chapter 17).

Examples of activities that could have other direct effects to wetlands in New Hampshire 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 can 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 Soil Changes: Changes in soil chemistry can lead to degradation of wetlands that have a specific pH range and/or other parameter, such as the acidic conditions of sphagnum bogs and alkaline conditions of calcareous 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) can reduce light penetration, dissolved oxygen, and overall wetland

productivity. Toxic materials in runoff can interfere with the biological processes of wetland plants, resulting in impaired growth, mortality, and changes in plant communities.

Indirect Effects:[144] Change in Function(s)[145] 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 could divert surface runoff and can 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 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. Potential wetlands impacts can be further reduced by implementing BMPs and mitigation measures (see Chapter 17).

Examples of functions related to wetlands in New Hampshire 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 can lower flood peaks by providing detention of storm flows.
- *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 can eventually threaten a wetland's existence. Where sediment inputs exceed rates of sediment export and soil consolidation, a wetland would gradually become filled.
- *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 can harm some wetland plant species, it promotes others. Shifts in plant communities because of hydrologic changes can 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.

[144] 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.

[145] 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.

According to the significance criteria defined in Table 9.2.5-1, 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 the 290,000 acres of wetlands throughout New Hampshire are not considered high quality, deployment activities could have less than significant indirect impacts on wetlands in the state. BMPs and mitigation measures could be implemented, as feasible and practicable, to reduce potential impacts to all wetlands.

In areas where there are prime wetlands that 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.

9.2.5.4. 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 to 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 launches 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 are needed, 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 (see Chapter 17) 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, weather 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 due to the small about 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. See Chapter 17, 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 further 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 due to the limited nature of deployment activities. It is also anticipated that routine maintenance activities would be conducted on existing roads and utility ROW. See Chapter 17, 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 further avoid or minimize potential impacts.

9.2.5.5. 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 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 wetlands. 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 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. See Chapter 17, 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 further 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 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 due to the limited nature of site maintenance activities, including mowing and application of herbicides. See Chapter 17, 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.

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 9.1.5, Wetlands.

9.2.6. Biological Resources

9.2.6.1. Introduction

This Chapter describes potential impacts to terrestrial vegetation, wildlife, fisheries and aquatic habitat, and threatened and endangered species in New Hampshire associated with deployment and operation of the Proposed Action and its alternatives. BMPs and mitigation measures that could be implemented, as appropriate, to avoid or minimize those potential impacts are identified in Chapter 17.

9.2.6.2. 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 9.2.6-1. As described in Section 9.2, *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 9.2.6.3, 9.2.6.4, and 9.6.2.5, respectively, are presented as a range of possible impacts.

Refer to Section 9.2.6.6 for impact assessment methodology and significance criterial associated with threatened and endangered species in New Hampshire.

Table 9.2.6-1: 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), MBTA, and Bald and Golden Eagle Protection Act (BGEPA).	Effect that is potentially significant, but with mitigation 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 New Hampshire for at least one species. Anthropogenic 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	Impact Level: Less than Significant with BMPs and Mitigation Measures Incorporated	Impact Level: Less than Significant	Impact Level: 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 mitigation 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 New Hampshire 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	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**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, including those from Radio Frequency (RF) emissions, 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 mitigation 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, including exposure to RF emissions, 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 New Hampshire 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

Type of Effect	Effect Characteristic	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
	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
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 mitigation 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 New Hampshire 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 mitigation 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 New Hampshire for at least one species. Anthropogenic disturbances that lead to exclusion from prey or habitat resources required for breeding/spawning, or anthropogenic disturbances, including exposure to RF emissions, that lead to 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

Type of Effect	Effect Characteristic	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
	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
Invasive Species Effects	Magnitude or Intensity	Extensive increase in invasive species populations over several seasons.	Effect that is potentially significant, but with mitigation 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 New Hampshire.		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

9.2.6.3. Terrestrial Vegetation

Impacts to terrestrial vegetation occurring in New Hampshire 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. Direct mortality/injury to plants could occur in construction zones by either land clearing, excavation activities, or vehicles; however, these events are expected to be relatively small in scale. Based on the impact significance criteria presented in Table 9.2.6-1, 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, these events are expected to be relatively small in scale. The implementation of BMPs and mitigation measures and avoidance measures could help to minimize or altogether avoid potential impacts to plant population survival.

Vegetation and Habitat Loss, Alteration, or Fragmentation

Habitat impacts are primarily physical perturbations that result in alterations in the amount or quality of a habitat. 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 loss or breaking down of continuous and connected habitat.

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. Further, some limited amount of infrastructure may be built in sensitive or rare regional vegetative communities, in which case BMPs and mitigation measures would be recommended to minimize or avoid 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 can include stress related to disturbance. The alteration of soils or hydrology within a localized area can 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. Increasing or decreasing hydrology in an area as an indirect effect, could lead to moisture stress and/or mortality of plant species that are adapted to specific hydrologic regimes. Indirect injury/mortality impacts vary depending on the species, time of year and duration of construction or deployment, though BMPs and mitigation measures could help to minimize or avoid the 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 can have a dramatic effect on natural resources and biodiversity.

When non-native species are introduced into an ecosystem in which they did not evolve, their populations sometimes increase rapidly. Natural or native community species evolve together into an ecosystem with many checks and balances that limit the population growth of any one species. These checks and balances include such things as predators, herbivores, diseases, parasites, and other organisms competing for the same resources and limiting environmental factors. However, when an organism is introduced into an ecosystem in which it did not evolve naturally, those limits may not exist and its numbers can sometimes dramatically increase. The unnaturally large population numbers can then have severe impacts to the environment, local economy, and human health. Invasive species can out-compete the native species for food and habitats and sometimes even cause their extinction. Even if natives are not completely eliminated, the ecosystem often becomes much less diverse.

The potential to introduce invasive plants within construction zones and during long-term site maintenance can 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 minimize or avoid the potential for introducing invasive plant 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 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, depending on the deployment scenario or site-specific conditions. The terrestrial vegetation that would be affected would depend on the ecoregion, the species' phenology, and the nature as well as the extent of the habitats affected.

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 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.
  - 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 biological resources, it is anticipated that this activity would have no impact on terrestrial vegetation.

Activities with the Potential to Have Impacts

Potential construction/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 if BMPs and mitigation measures are not implemented.
    - 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 individual species 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 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 and 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 shore to accept submarine cables could potentially occur as a result of land clearing, excavation activities, and heavy equipment use. 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 or indirect injury to plants, the vegetation loss, and invasive species effects.

- Wireless Projects
    - New Wireless Communication Towers or Backhaul Equipment: 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. 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 new power units, replacement towers, or structural hardening are 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, and 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 radio frequency emissions, refer to Section 2.4, Radio Frequency Emissions.
    - Deployment of drones, balloons, blimps, and 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 terrestrial vegetation associated with deployment of this infrastructure are anticipated to be less than significant 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. These potential impacts are expected to be less than significant due to the small-scale of expected deployment activities. Chapter 17 discusses BMPs and mitigation measures that could be implemented, as appropriate, 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 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. Site maintenance, including mowing or herbicides, may result in less than significant effects 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 due to the small-scale of expected activities. See Chapter 17, 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.

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.

Deployment Impacts

As described above, implementation of deployable technologies could result in less than significant impacts 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. However, impacts are expected to remain less than significant due to the relatively small-scale of FirstNet activities at individual locations. See Chapter 17, 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.

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 to terrestrial vegetation associated with routine operations and maintenance due to the relatively small-scale of likely FirstNet project sites. The impacts can vary greatly among species, vegetative community, and geographic region, but are expected to remain less than significant.

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 9.1.6.3, Terrestrial Vegetation.

9.2.6.4. Wildlife

Impacts to amphibians and reptiles, terrestrial mammals, marine mammals, birds, and terrestrial invertebrates occurring in New Hampshire and New Hampshire's near offshore environment (i.e., less than two miles from the edge of the coast) 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 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 9.2.6-1, less than significant impacts would be anticipated given the anticipated small size and nature of the majority of the proposed deployment activities. Although anthropogenic disturbances may be measurable but 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.

Terrestrial Mammals

Vehicle strikes are common sources of direct mortality or injury to both small and large mammals in New Hampshire. Mammals use roads to access mating or nesting sites, as preferred habitat in right-of-ways, source of vegetation along roadways, or as a means of travel (FHWA, 2011b). 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.

If 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 or minimize 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 man-made object discarded, disposed of, or abandoned that enters the marine environment. Entanglements from marine debris are not anticipated from FirstNet activities.

Birds

Mortalities from collisions or electrocutions with man-made cables and wires are environmental concerns for avian species and violate MBTA and BGEPA. Generally, collision events occur to “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 span (Gehring, Kerlinger, & Manville, 2011).

Avian mortalities or injuries can also result from vehicle strikes, although typically occur as isolated events.

Direct injury and mortality of birds can 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 if birds temporarily avoid IBAs within the state as these areas provide them with essential habitat that supports various life stages (Hill, 1997). Direct injury/mortality are not anticipated to be widespread or affect bird populations due to the small-scale of likely FirstNet actions.

Direct mortality and injury to birds of New Hampshire are not likely to be widespread or affect populations of species as a whole; individual species impacts may be realized depending on the nature of the deployment activity. If siting considerations and BMPs and mitigation measures are implemented (Chapter 17), potential impacts could be further minimized. Additionally, potential impacts under MBTA and BGEPA can be addressed through BMPs and mitigation measures developed in consultation with USFWS.

<u>Reptiles and Amphibians</u>

The majority of New Hampshire's amphibian and reptile species are widely distributed throughout the state. Direct mortality to amphibians or reptiles could occur in construction zones either by excavation activities or by vehicle strikes; however, these events are expected to be temporary and isolated, affecting only individual animals.

Three species of marine turtles – all listed as threatened or endangered under the ESA – occur in New Hampshire's offshore environment. Environmental consequences pertaining to these reptiles are discussed in Section 9.2.6.6, *Threatened and Endangered Species and Species of Conservation Concern*.

<u>Terrestrial Invertebrates</u>

The terrestrial invertebrate populations of New Hampshire 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

Habitat impacts are primarily physical perturbations that result in alterations in the amount or quality of a habitat. 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 loss or breaking down of continuous and connected habitat, and impeding access to resources and mates. There are areas of New Hampshire that have experienced extensive land use changes from urbanization and agriculture. However, there are also portions of the state that are largely forested and remain relatively unfragmented, particularly in northern New Hampshire.

Additionally, habitat loss can 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.

Potential effects of vegetation and habitat loss, alteration, or fragmentation are described for New Hampshire's wildlife species below.

Terrestrial Mammals

Mammals occupy a wide range of habitats throughout New Hampshire and may experience localized effects of habitat loss or fragmentation. Removal or loss of vegetation may impact large mammals 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 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.

Marine Mammals

A number of seal species may occur in the offshore areas of New Hampshire. Harbor seals tend to be non-migratory; they can be found in open waters and also using rocks, beaches or other coastal habitats as haulouts and pupping sites in New Hampshire. Seals could be temporarily excluded from a resource or abandon their haulout locations due to the presence of humans, noise, or vessel traffic during deployment activities. For example, the seals would need to find a new haulout, likely at a less favorable location. Effects on seals from exclusion from resources would be low magnitude and temporary in duration.

Further, whales may be temporarily excluded from a resource if they avoid it due to the increased presence of boats, humans, and associated noise. Depending on the duration of response activities, minke whales could be excluded from their environment temporarily or could abandon the habitat entirely.

The degree to which habitat exclusion affects minke whales depends on many factors. Minke whales are mobile and are found in open water habitat in both coastal inshore and offshore oceanic environments; therefore, it is expected that activities would have only a minor and temporary effect on the ability of minke whales to access important resources. Loss of habitat or exclusions from these areas could be avoided or minimized by BMPs and mitigation measures, as appropriate.

Loss of habitat or exclusions from these areas for seals and whales could be avoided or minimized by BMPs and mitigation measures (see Chapter 17). Environmental consequences pertaining to the endangered whales protected under the ESA are discussed in Section 9.2.6.6, Threatened and Endangered Species and Species of Conservation Concern.

Birds

The direct removal of most migratory bird nests are prohibited under the MBTA. The USFWS and the NHFG can provide regional guidance on the most critical time periods (e.g., breeding season) to avoid vegetation clearing. The removal and loss of vegetation can affect avian species directly by loss of nesting, foraging, stopover, and cover habitat

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[146] species from disturbance or displacement from construction activities is likely to be short-term with less than significant impacts from exclusion. Exclusion from resources concentrated in a small migratory stop area during peak migration can 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, could help to avoid or minimize the potential impacts to birds from exclusion of resources, as appropriate.

Reptiles and Amphibians

Important habitats for New Hampshire's amphibians and reptiles typically consist of wetlands and, in some cases the surrounding upland forest. Impacts are expected to be less than significant. If proposed project sites were unable to avoid sensitive areas, BMPs and mitigation measures (see Chapter 17) could be implemented, as appropriate, to avoid or minimize the potential impacts.

Filling or draining of wetland breeding habitat (see Section 9.2.4, Water Resources) and alterations to ground or surface water flow from development associated with the Proposed Action may also have effects to New Hampshire amphibian and reptile populations; site-specific analysis of potential wetland impacts would need to be conducted.

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 9.2.6.6, 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, though BMPs and mitigation measures could help to avoid or minimize the potential impacts.

[146]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.

<u>Terrestrial Mammals</u>

Stress from repeated disturbances during critical time periods (e.g., roosting and mating) can reduce the overall fitness and productivity of young and adult terrestrial mammals. Indirect effects could occur result 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, therefore repeated disturbances would not occur. Depending on the project type and location, individual species may be disturbed resulting in less than significant impacts.

<u>Marine Mammals</u>

Repeated disturbance (e.g., from vessel traffic), especially near haulouts, can cause stress to individuals resulting in lower fitness and productivity. Given that the majority of FirstNet deployment activities are not expected to be located onshore 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, can 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 (Hill, 1997). The majority of FirstNet deployment activities would be short-term in nature, therefore prolonged disturbances would not occur. Depending on the project type and location, individual species may be disturbed resulting in less than significant impacts.

<u>Reptiles and Amphibians</u>

Changes in water quality, especially during the breeding seasons, can cause stress resulting in lower productivity. The majority of FirstNet deployment activities would be short-term in nature, therefore repeated disturbances would not occur. Depending on the project type and location, individual species may be disturbed resulting in less than significant impacts.

<u>Terrestrial Invertebrates</u>

Terrestrial invertebrates can 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.

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. Potential effects to migration patterns of New Hampshire's amphibians and reptiles, terrestrial mammals, marine mammals, birds, and terrestrial invertebrates are described below.

Terrestrial Mammals

Large game animals (e.g., moose) have well-defined migratory routes. Route knowledge is passed on from one generation to the next and includes important feeding and calving areas. Small mammals (e.g., bats) also have migratory routes that include spring and fall roosting areas between their summer maternity roosts and hibernacula[147]. 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 can vary depending on the species, time of year of construction/operation, and duration, but are generally expected to be less than significant. 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 New Hampshire 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[148]. It is clear that behavioral responses are strongly affected by the context of exposure and by the animal's experience, motivation, and conditioning. Marine mammals have the capacity to divert from sound sources during migration, and impacts are expected to be less than significant. 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 vast distances often involving many different countries. For example, as a group shorebirds undertake some of the longest-distance migrations of all animals. New Hampshire is located within the Atlantic Flyway, which spans more than 3,000 miles from the Arctic tundra to the Caribbean. New Hampshire has 17 IBAs spread throughout the state that serve as important stopover areas for migratory birds (New Hampshire Audubon, 2016). Many migratory routes are passed from one generation to the next. Impacts can vary (e.g., mortality of individuals or abandonment of stopover sites by whole flocks) depending on the species, time of year of construction/operation, and duration, but are generally expected to be less than significant. BMPs and mitigation measures could help to further avoid or minimize effects to migratory pathways.

[147] A location chosen by an animal for hibernation.

[148] 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*).

Reptiles and Amphibians

Several species of salamanders and the wood frog are known to seasonally migrate in New Hampshire. These amphibians often travel by the hundreds on their migration pathway that often crosses roadways. Salamanders are typically found in burrows in the forest floor. 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). However, Berven and Grudzien (1990) found that a small percentage of juvenile wood frogs could migrate over 1.5 miles from natal ponds, suggesting juveniles may be capable of migrating relatively long distances. Mortality and barriers to movement could occur as result of the Proposed Action (Calhoun and Maynadier 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 generally be less than significant. 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-term or temporary in nature. No effects to migratory patterns of New Hampshire'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 can affect the overall population of individuals.

Terrestrial Mammals

Restricted access to important winter hibernacula or summer maternity roosts for bats and calving grounds for large mammals, such as the moose, has the potential to negatively affect body condition and reproductive success of mammals in New Hampshire.

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. Reproductive effects as a result of displacement and disturbance could be minimized through the use of BMPs and mitigation measures.

Marine Mammals

Restricted access to important calving grounds has the potential to negatively affect body condition and reproductive success of marine mammals in New Hampshire. For example, the displacement of female seals from preferred pupping habitats due to deployment or operation activities may reduce fitness and survival of pups potentially affecting overall productivity, though impacts are expected to be less than significant since activities are likely to be small-scale in nature. BMPs and mitigation measures could help to further avoid or minimize the potential impacts.

Disturbance to hauled out seals from activities associated with the Proposed Action could result in the abandonment, or death of offspring, though BMPs and mitigation measures could 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 in nature. BMPs and mitigation measures as defined through consultation with USFWS, if required, could help to avoid or minimize any potential impacts.

Reptiles and Amphibians

Reproductive effects to reptile nests may occur through direct loss or disturbance of nests. For example, the spotted turtle (*Clemmys guttata*) leaves its breeding pool in May and travels to its nesting site.

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, alter water quality through sediment infiltration, or obstruction of natural water flow to pools, though BMPs and mitigation measures 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; 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 can have a dramatic effect on natural resources.

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.

Potential invasive species effects to New Hampshire’s wildlife are described below.

Terrestrial Mammals

In New Hampshire, Eurasian boars (*Sus scrofa*) can adversely impact several native large and small mammals, including bear (*Ursus americanus*), turkey (*Meleagris gallopavo*), waterfowl and deer.

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. Invasive species effects to terrestrial mammals could be minimized following BMPs in Chapter 17 to reduce the introduction potential from heavy equipment or laborers.

Marine Mammals

Invasive species displace native fauna and flora communities and/or radically change the nature of the habitats they invade. They also compete for the same natural resources and life requirements (i.e., food, space, and shelter) as native species and degrade local ecologies by disrupting the food chain, thereby causing the extinction of native species. Proposed FirstNet deployment activities near water would likely occur onshore with limited activities in the water; therefore, the introduction of non-native marine mammal species would not occur.

Birds

Invasive plant and pest species directly alter the landscape or habitat to a condition that is more favorable for an invasive species, and less favorable for native species and their habitats. For example, in New Hampshire, mute swans (*Cygnus olor*) can impact native waterfowl and wetland birds causing nest abandonment or impacts to rearing young due to their aggressive behavior. Further, this invasive bird can lead to declines in water quality from increased fecal coliform loading in the water, and declines in submerged aquatic vegetation that support native fish and other wildlife (Swift et al. 2013). 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 bird species are not expected to be introduced at project sites as part of the deployment activities.

Reptiles and Amphibians

Non-native reptiles and amphibians) are regulated in New Hampshire NHAR Fis 800. Non-native reptiles and amphibians tend to be highly adaptable and can threaten native wildlife by competing with them for food sources and also spread disease. Proposed FirstNet deployment activities near water would likely occur onshore with limited activities in the water; therefore, the introduction of non-native species would be limited. Invasive terrestrial reptile or amphibian species are not expected to be introduced at project sites from machinery or laborers.

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 in particular pose a large threat to New Hampshire's forest and agricultural resources. Species such as the gypsy moth (*Lymantria dispar*), hemlock woolly adelgid (*Adelges tsugae*), Asian longhorn beetle (*Anoplophora glabripennis*), and emerald ash borer (*Agrilus planipennis*) are of particular concern in New Hampshire and are known to cause irreversible damage to native forests. The potential to introduce invasive invertebrates within construction zones and during long-term site maintenance can 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 would help to avoid or minimize the potential for introducing invasive plant 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.

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.

<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 Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting up of dark fiber would have no impacts to wildlife resources.
    - 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.

- 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 construction/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 if BMPs and mitigation measures are not implemented.
  - 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 individual species 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 and inland bodies of water and construction of landings and/or facilities on the shore to accept submarine cables could potentially impact wildlife, marine mammals in particular (see Section 9.2.4, 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 new power units, replacement towers, or structural hardening are 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, and 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 radio frequency emissions, refer to Section 2.4, Radio Frequency Emissions.

- Deployment of drones, balloons, blimps, and 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 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. 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. See Chapter 17, 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.

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 associated with routine inspections of the Preferred Alternative. Site maintenance would be infrequent, including mowing or limited application of herbicides, may result in less than significant effects to wildlife including direct injury/mortality to less mobile wildlife, or exposure to contaminants from accidental spills from maintenance equipment or release of pesticides.

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 individual wildlife species and unlikely to cause population-level impacts, and therefore would likely be less than significant. See Chapter 17, 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.

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 because deployment activities are expected to be temporary, likely affecting only a small number of wildlife. See Chapter 17, 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.

<u>Operational Impacts</u>

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 because deployable activities are expected to be temporary and likely affecting only a small number of wildlife. The impacts can vary greatly among species and geographic region. See Chapter 17, 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.

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 9.1.6.4, Terrestrial Wildlife.

9.2.6.5. Fisheries and Aquatic Habitats

Impacts to fisheries and aquatic habitats occurring in New Hampshire and New Hampshire's near offshore environment 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 entanglement, vessel strike, problems associated with accidental ingestion, and injuries incurred by sensitive animals from disturbance events (USEPA, 2012e).

Based on the impact significance criteria presented in Table 9.2.6-1, less than significant impacts would be anticipated given the size and nature of the majority of proposed deployment activities. Although anthropogenic disturbances may be measurable (although minimal) for some FirstNet projects, individual behavior of fish species would be short-term and 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

Habitat impacts are primarily physical perturbations that result in alterations in the amount or quality of a habitat. 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.

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 can include stress related to disturbance and disruption of life history patterns (such as migration and breeding) important for survival. A short-term stress response to an acute, temporary stressor, initiates a "fight or flight" response which diverts energy, otherwise used for reproduction and growth, to the immediate survival of the animal (Reeder and Kramer 2005). Most organisms are well adapted and recover quickly from these types of stressors.

Water quality impacts from exposure to contaminants from accidental spills from vehicles and equipment, and erosion or sedimentation from land clearing and excavation activities near or within riparian areas, floodplains, wetlands, streams, and other aquatic habitats could result in changes to habitat, food sources, or prey resulting in indirect mortality/ injury to fish and aquatic invertebrates. Indirect injury/mortality impacts vary depending on the species, time of year, and duration of deployment. These impacts are expected to be less than significant, and BMPs and mitigation measures to protect water resources (see Section 9.2.4, 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. Impacts are expected to be less than significant, and are anticipated to be localized and at a small-scale, and would vary depending on the species, time of year, and duration of deployment. BMPs and mitigation measures could help to further avoid or minimize the potential impacts.

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 can 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 expected to be less than significant, though BMPs and mitigation measures could help to further avoid or minimize the potential impacts.

Invasive Species Effects

The potential to introduce invasive plants within construction zones can occur from vehicles and equipment being transported from one region to another, or when conducting revegetation of a site after deployment activities are complete. 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, therefore impacts are expected to be less than significant. 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 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.

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 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 to fisheries and aquatic habitats
- 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 and if RF hazards are deemed insignificant.
  - 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 construction/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 if BMPs and mitigation measures are not implemented.

- 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, if conducted near water resources that support fish, could result in habitat loss, alteration and fragmentation; indirect injury/mortality; and invasive species effects.

- Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Although lighting up of dark fiber would have no impacts to fisheries and aquatic habitats as mentioned above, installation of new associated huts or equipment or construction for laterals/drops, if required, could result in direct injury/mortality; habitat loss and alternation; effects of migratory patterns; indirect injury or mortality; reproductive effects; 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 shore to 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 which would not result in impacts to fisheries and aquatic habitats. However, if new power units, replacement towers, or structural hardening are 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 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 due to the small-scale of deployment activities and the limited number of aquatic species expected to be impacted. Chapter 17 discusses BMPs and mitigation measures that could be implemented, as appropriate, 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 that there would be less than significant impacts to fisheries and aquatic habitats associated with routine inspections of the Preferred Alternative. Site maintenance, if conducted near water resources that support fish, including application of herbicides, may result in less than significant effects to fisheries and aquatic habitats including exposure to contaminants from accidental spills from maintenance equipment or release of pesticides.

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 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. See Chapter 17, 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.

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.

Deployment Impacts

As explained above, 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 due to the limited nature of expected deployment activities. Chapter 17 discusses BMPs and mitigation measures that could be implemented, as appropriate, to avoid or minimize potential impacts.

Operational Impacts

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 to fisheries and aquatic habitats associated with routine operations and maintenance due to the limited nature of expected deployment activities. The impacts can vary greatly among species and geographic region. Chapter 17 discusses BMPs and mitigation measures that could be implemented, as appropriate, 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 9.1.6.5, Fisheries and Aquatic Habitats.

9.2.6.6. Threatened and Endangered Species and Species of Conservation Concern

This section describes potential impacts to threatened and endangered species in New Hampshire 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 17, may be implemented as appropriate to further minimize 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 9.2.6-2. 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.

Table 9.2.6-2: 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 fully mitigate the effect. 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 fully mitigate the effect. 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 fully mitigate the effect. 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 to adversely affect 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.	

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.

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 9.2.6-2, any direct injury or mortality of a listed species at the individual-level could be potentially significant as well as any impact that has more than a negligible potential to result in unpermitted take of an individual species at any geographic extent, duration, or frequency. Direct injury/mortality environmental concerns pertaining to federally listed terrestrial mammals, birds, reptiles and amphibians, invertebrates, and plants with known occurrence in New Hampshire are described below. There are no listed marine mammals or fish in New Hampshire, therefore they will not be discussed below.

<u>Terrestrial Mammals</u>

Direct mortality or injury to the federally listed Northern long-eared bat (*Myotis septentrionalis*) could occur if tree clearing activities occurred during the roosting season (i.e., approximately April-November) and bats were present. While projects would not likely directly affect winter hibernacula (e.g., caves), human disturbance in and around hibernacula when bats are present could lead to adverse effects to this 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, 2015e).

Impacts would likely be isolated, individual events. 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 17, may be implemented as appropriate to further minimize potential impacts.

<u>Birds</u>

Three federally listed birds are known to occur within coastal areas of New Hampshire. Depending on the project types and location, direct mortality or injury to these birds could occur from collisions or electrocutions with man-made cables and wires, vehicle strikes, or by disturbance or destruction of nests during ground disturbing activities. If proposed project sites are 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 17, may be implemented as appropriate to further minimize potential impacts.

Reptiles and Amphibians

No federally listed amphibians would be affected by the Proposed Action in New Hampshire.

Three federally listed sea turtles are also known to occur in the coastal area and offshore environment of New Hampshire. None of these turtles nest in the New Hampshire area. Direct mortality or injury could occur from watercraft and vessels strikes are unlikely as the majority of the FirstNet deployment projects would not occur in an aquatic environment. 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 17, may be implemented as appropriate to further minimize potential impacts.

Invertebrates

One federally listed mollusk occurs in New Hampshire. Direct mortality or injury could occur to these species if land clearing or excavation activities associated with the Proposed Action occur in an area inhabited by one of these species. Distribution of this species is very limited throughout the state. 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 17, may be implemented as appropriate to further minimize potential impacts.

Plants

Direct mortality to the three 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. In general, distribution of these species is very limited throughout the state. 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 17, may be implemented as appropriate to further minimize 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 can affect the breeding success. Potential effects to federally listed terrestrial mammals, birds, terrestrial reptiles and marine reptiles, amphibians, invertebrates, and plants with known occurrence in New Hampshire are described below. There are no listed marine mammals or fish in New Hampshire; therefore, they will not be discussed below.

Terrestrial Mammals

Noise, light, and other human disturbances associated with the Proposed Action could adversely affect federally listed terrestrial mammals within or in the vicinity of project activities. Impacts would be directly related to the frequency, intensity, and duration of these activities. 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 17, may be implemented as appropriate to further minimize potential impacts.

Birds

The piping plover, roseate tern, and red knot are the only federally listed bird species that are known to occur in New Hampshire. Impacts to their habitat due to land clearing or excavation activities could directly affect nesting if deployment activities occur during the breeding/nesting season. In addition, habitat loss or degradation could lead to indirect affects to nesting due to birds having to find new nesting sites. Further, noise, light, or human disturbance within nesting areas could cause piping plovers or roseate terns to abandon their nests, relocate to less desirable locations, or cause stress to individuals reducing survival and reproduction. 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 17, may be implemented as appropriate to further minimize potential impacts.

Reptiles and Amphibians

New Hampshire does not have any federally listed terrestrial reptiles or amphibians.

The three federally listed sea turtles found in the offshore areas of New Hampshire are migrants. Consequently, similar to federally listed marine mammals, no long-term reproductive effects to federally listed sea turtles are expected as a result of the Proposed Action.

Invertebrates

Changes in water quality from ground disturbing activity can cause stress resulting in lower productivity for the federally listed mollusk known to occur in New Hampshire. istribution of this species is very limited throughout the state. 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 17, may be implemented as appropriate to further minimize potential impacts.

Plants

No reproductive effects to federally listed plants are expected as a result of the Proposed Action.

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, birds, reptiles and amphibians, invertebrates, and plants with known occurrence in New Hampshire are described below. There are no listed marine mammals or fish in New Hampshire, therefore they will not be discussed below.

Mammals

Direct mortality or injury to the federally listed Northern long-eared bat (*Myotis septentrionalis*) could occur if tree clearing activities occurred during the roosting season (i.e., approximately April-November) and bats were present. While projects would not likely directly affect winter hibernacula (e.g., caves), human disturbance in and around hibernacula when bats are present could lead to adverse effects to this 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, 2015e). It is clear that behavioral responses are strongly affected by the context of exposure and by the animal's experience, motivation, and conditioning. 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 17, may be implemented as appropriate to further minimize potential impacts.

Birds

Because many birds have extremely long migrations, protection efforts for critical sites along migratory routes must be coordinated over vast distances often involving many different countries. Disturbance in stopover, foraging, or breeding areas (visual or noise) or habitat loss/fragmentation can 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 adverse effects to federally listed birds. 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 17, may be implemented as appropriate to further minimize potential impacts.

Reptiles and Amphibians

Disturbances during deployment activities are not anticipated to stress federally listed sea turtles. 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 17, may be implemented as appropriate to further minimize potential impacts.

Invertebrates

Changes in water quality, habitat loss or alternation, and introduction of aquatic invasive species could impact food sources for the federally listed mollusk resulting in lower productivity. Impacts associated with deployment activities are expected to result in less than significant changes to water quality. 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 17, may be implemented as appropriate to further minimize 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 extent. FirstNet activities are generally expected to be small-scale in nature, therefore large-scale impacts are not expected, however it is possible that small-scale changes could lead to potentially significant adverse effects for certain species. For example, impacts to designated critical habitat for a listed species that is only known to occur in one specific location geographically. However, the threatened and endangered species that occur in New Hampshire do not have critical habitat in the state as described below.

<u>Terrestrial Mammals</u>

No designated critical habitat occurs for terrestrial mammals in New Hampshire. 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.

<u>Birds</u>

No critical habitat has been designated for the piping plover populations, roseate tern, or red knot that are known to occur in New Hampshire; therefore, no effect to these federally listed birds from the loss or degradation of designated critical habitat is expected as a result of the Proposed Action.

<u>Reptiles and Amphibians</u>

No designated critical habitat occurs for reptiles or amphibians in New Hampshire. 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.

<u>Invertebrates</u>

No designated critical habitat occurs for terrestrial or aquatic invertebrates in New Hampshire. 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.

<u>Plants</u>

No designated critical habitat occurs for plants in New Hampshire. 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 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 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 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.

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 to 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 not impact threatened and endangered if those activities would not require ground disturbance and if RF hazards are deemed insignificant.
    - 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 protected species, it is anticipated that this activity would have no impact on protected species.

Activities with the Potential to 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 impacts 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 – 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 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 if BMPs and mitigation measures are not implemented.
  - 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 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 shore to accept submarine cables could potentially impact threatened and endangered species and their habitat, particularly aquatic species (see Section 9.2.4, 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 replacement towers or structural hardening are required, impacts could be similar to new wireless construction. Hazards related 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. These impacts may affect, but are not likely adversely affect protected species; BMPs and mitigation measures identified in Chapter 17 and as defined through consultation with the appropriate resource agency, could help to mitigate or reduce 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 threatened and endangered species that would be affected would depend on the species' phenology and the nature and extent of the habitats affected.

It is anticipated that operational impacts 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 in compliance with BMPs and mitigation measures developed through consultation with the appropriate resource agency.

During operations, direct injury/mortality of threatened and endangered species could occur from collisions and/or entanglements with transmission lines, towers, and aerial platforms. 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. See Chapter 17, 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.

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. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. See Chapter 17, 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.

Alternatives Impact Assessment

The following section assesses potential impacts 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 impacts 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. 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 17, may be implemented as appropriate to further minimize 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. 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 17, may be implemented as appropriate to further 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 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 9.1.6.6, Threatened and Endangered Species and Species of Conservation Concern.

9.2.7. Land Use, Recreation, and Airspace

9.2.7.1. Introduction

This section describes potential impacts to land use, recreation, and airspace resources in New Hampshire associated with deployment and operation of the Proposed Action and alternatives. See Chapter 17, 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.

9.2.7.2. 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 9.2.7-1. As described in Section 9.2, 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 9.2.7-1: 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

9.2.7.3. 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 above-ground 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 rights-of-way 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 9.2.7-1, less than significant impacts would be anticipated 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 above-ground 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 right-of-way, 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 9.2.7-1, less than significant impacts would be anticipated as any new land use would be small-scale and consistent with the surrounding land uses in the area; only short-term impacts during the construction phase would be expected.

Loss of Access to Public or Private Recreation Land or Activities

Access to public or private recreation land or activities could be influenced by the deployment, operation, and maintenance of facilities and the acquisition of rights-of-way or easement. 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 9.2.7-1, less than significant impacts would be anticipated 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. Enjoyment of recreation land could be temporarily impacted by crews accessing the site during the deployment and maintenance of structures, towers, roads, and other permanent features. 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 9.2.7-1, less than significant impacts would be anticipated 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. 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 9.2.7-1, 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 of time, FirstNet would likely not impact airspace resources.

9.2.7.4. 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, 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, 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 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 Likely to Have Impacts* below.
    - Recreation: See *Activities Likely 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 9.10.5.3, Obstructions to Airspace Considerations) and Chapter 422-B of the New Hampshire Statues Title XXXIX: Aeronautics (See Section 9.10.5.4).
  - 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 Likely 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 9.10.5.3, Obstructions to Airspace Considerations) and Chapter 422-B of the New Hampshire Statues Title XXXIX: Aeronautics (See Section 9.10.5.4).

- 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 Likely to Have Impacts* below.
  - Recreation: See *Activities Likely 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 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 Likely to Have Impacts* below.

- Recreation: See *Activities Likely to Have Impacts* below.

- Airspace: The installation of cables in limited nearshore and inland 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 9.10.5.3, Obstructions to Airspace Considerations) and Chapter 422-B of the New Hampshire Statues Title XXXIX: Aeronautics (See Section 9.10.5.4).

- 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 Likely to Have Impacts* below.

  - Recreation: See *Activities Likely 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 9.10.5.3 Obstructions to Airspace Considerations) and Chapter 422-B of the New Hampshire Statues Title XXXIX: Aeronautics (See Section 9.10.5.4).

- 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 Likely to Have Impacts* below.

    - Airspace: See *Activities Likely 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 impacts.

    - 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 Above Ground Level (AGL) or do not trigger any of the other FAA obstruction to airspace criteria listed in Section 9.10.5.3 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, it is anticipated that this activity would have no impact on land use.

Activities with the Potential to Have Impacts

Potential construction/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 development scenarios 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.
    - <u>Land Use:</u> Construction activities could temporarily restrict existing and surrounding land uses at isolated locations.
    - <u>Recreation:</u> 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.
    - <u>Airspace:</u> 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) rights-of-way or easements and the potential construction of access roads.
    - <u>Land Use:</u> 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 rights-of-way 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.
    - <u>Recreation:</u> 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.
    - <u>Airspace:</u> No impacts are anticipated – see previous section.
  - New Build – Submarine Fiber Optic Plant: Installing cables in limited nearshore and inland bodies of water and constructing landings and/or facilities on shore to accept submarine cable.
    - <u>Land Use:</u> 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 limited nearshore and inland 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 the other criteria listed in Section 9.10.5.3 Obstructions to Airspace Considerations. 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 New Hampshire'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 New Hampshire airports (See obstruction criteria in Section 9.10.5.3 Obstructions to Airspace Considerations). 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 are expected to be less than significant 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 17 discusses BMPs and mitigation measures that could be implemented, as appropriate, 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. 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. The degree of change in the visual environment (see Section 9.2.8, 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. 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. See Chapter 17, 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.

9.2.7.5. 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.[149]

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. 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. 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 due to the temporary nature of likely deployment activities. If deployment triggers any obstruction criterion or result in changes to flight patterns and airspace restrictions, FirstNet (or its partners) would consult with the FAA to determine how to proceed. Chapter 17 discusses BMPs and mitigation measures that could be implemented, as appropriate, 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

[149] As mentioned above and in Section 2.1.3, Proposed Action Infrastructure, the Preferred Alternative includes implementation of deployable technologies.

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 due to the temporary nature of deployment activities. See Chapter 17, 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.

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 9.1.7, Land Use, Recreation, and Airspace.

9.2.8. Visual Resources

9.2.8.1. Introduction

This section describes potential impacts to visual resources in New Hampshire associated with deployment and operation of the Proposed Action and alternatives. See Chapter 17, 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.

9.2.8.2. Impact Assessment Methodology and Significance Criteria

The impacts of the Proposed Action on visual resources were evaluated using the significance criteria presented in Table 9.2.8-1. As described in Section 9.2, 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 9.2.8-1: 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

NA = not applicable

9.2.8.3. 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 New Hampshire, residents and visitors travel to many national sites and state parks, such as Greensfield State Park to view its picturesque forest and lake views. 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. New Hampshire's Preservation Easements policy was established for "maintaining the historic rural character of the state's landscape, sustaining agricultural traditions, and providing an attractive scenic environment for work and recreation of the state's citizens and visitors" (State of New Hampshire, 2015). 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.

Based on the impact significance criteria presented in Table 9.2.8-1, 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.

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.

Based on the impact significance criteria presented in Table 9.2.8-1, lighting that illuminates the night sky on a regional basis, diminishes night sky viewing over long distances, and persists over the long-term would 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.

9.2.8.4. 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, 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, 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 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 minimal 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 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 construction/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 located 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 shore to 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 highly 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 are needed, 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 due to the temporary and small-scale nature of deployment activities.

Depending on specific design, Construction of New Wireless Communication Towers or Installation of Optical Transmission or Centralized Transmission Equipment options could introduce new artificial lighting, due to FAA regulations or other security concerns. New lighting associated with FirstNet structures could contribute incrementally to sky glow. As a result of the temporary nature of deployment, these effects would be less than significant. See Chapter 17, 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.

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 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. See Chapter 17, 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.

9.2.8.5. Alternatives Impact Assessment

The following section assesses potential impacts to visual resources associated with the Deployable Technologies Alternative and the No Action Alternative.[150]

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 as generally they would be limited to the deployment location and could often be screened or otherwise blocked from view. See Chapter 17, 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.

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

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[150] As mentioned above and in Section 2.1.2, Proposed Action Infrastructure, the Preferred Alternative includes implementation of deployable technologies.

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. These potential impacts would be similar to the potential impacts described for the Deployable Technologies option of the Preferred Alternative, above, only likely with greater numbers of deployable units. See Chapter 17, 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.

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 9.1.8, Visual Resources.

9.2.9. Socioeconomics

9.2.9.1. Introduction

This section describes potential impacts to socioeconomics in New Hampshire associated with deployment and operation of the Proposed Action and alternatives. See Chapter 17, 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 impact.

9.2.9.2. Impact Assessment Methodology and Significance Criteria

The impacts of the Proposed Action on socioeconomics were evaluated using the significance criteria presented in Table 9.2.9-1. As described in Section 9.2, 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 9.2.9-1: 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 tax revenues, wages, major industries, or direct spending
	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

9.2.9.3. 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
- 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 property values below typical market 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 Existing Environment, property values vary considerably across New Hampshire. Median values of owner-occupied housing units in the 2009–2013 period ranged from about $330,000 in the Portsmouth area, to about $95,000 in the Berlin area. 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 pending, Income, Industries, and Public Revenues

Developing the NPSBN may increase economic activity as governments and contractors 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 users 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. 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, 2006b). 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 is a 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 impacts would be considered positive and less than significant. However, even small employment games 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 New Hampshire. The average unemployment rate in 2014 was 4.3 percent, considerably lower than the national rate. County-level unemployment rates were lower than the national rate in all counties. They were lowest in the counties in the western and central portions of the state, and highest in New Hampshire's northernmost county.

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 9.2.9-1, 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.

9.2.9.4. 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 9.2.9-1.

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 indicates which of 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
- 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.
        - Impacts to Employment – Similarly, 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.

    - Impacts to Employment – Similarly, 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.

    - Impacts to Employment – Similarly, 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.

    - Impacts to Employment – Similarly, 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.

    - Impacts to Employment – Similarly, 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.
  - Impacts to Employment – Similarly, 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.
  - Impacts to Employment – Similarly, 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.
    - 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.

    - Impacts to Employment – Similarly, 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.

    - Impacts to Employment – Similarly, 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.

    - 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.

    - Impacts to Employment – Similarly, 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.

        - Impacts to Employment – Similarly, 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. To the extent that certain activities could have adverse impacts to property values, those impacts are also expected to be less than significant, as described above. See Chapter 17, 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.

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.

Operation Impacts

Activities with the Potential to Have 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.

- 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.

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 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. See Chapter 17, 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.

9.2.9.5. 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.

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 as described above. See Chapter 17, 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.

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.

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 as they would be limited to a relatively small number of sites within the region and state. See Chapter 17, 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.

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 9.1.9, Socioeconomics.

9.2.10. Environmental Justice

9.2.10.1. Introduction

This section describes potential impacts to environmental justice in New Hampshire associated with deployment and operation of the Proposed Action and alternatives. See Chapter 17, 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.

9.2.10.2. Impact Assessment Methodology and Significance Criteria

The impacts of the Proposed Action on environmental justice were evaluated using the significance criteria presented in Table 9.2.10-1. As described in Section 9.2, 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 9.2.10-1: 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 counties at the Census Block Group level		Effects realized within counties at the Census Block Group level	Effects realized within 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

9.2.10.3. 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, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (USEPA, 2016a), 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.” (Council on Environmental Quality, 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. Indian tribes are considered environmental justice populations (Council on Environmental Quality, 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 (Council on Environmental Quality, 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.

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. As discussed in Existing Environment (Section 9.1.9), New Hampshire’s population has lower percentages of minorities than the region or the nation, and lower rates of poverty than the region or the nation.

New Hampshire has several areas with high potential for environmental justice populations, mainly in the more densely populated parts of the state. By land area, the majority of the state is categorized as moderate potential for environmental justice populations; these moderate potential areas are more evenly distributed across the state than the high potential areas. Further analysis using the data developed for the screening analysis in Section 9.1.9 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, 2015e; USEPA, 2016b).

A site-specific analysis would also evaluate whether an actual environmental justice impact on those populations would be likely to occur. Analysts can 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.

9.2.10.4. 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, 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, 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 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 onshore to 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. If collocation requires construction for additional power units, structural hardening, and physical security measures, 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, but are 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. See Chapter 17, 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.

Operation Impacts

Activities to Have No 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. See Chapter 17, 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.

9.2.10.5. 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 because they would be temporary in nature. See Chapter 17, 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.

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 as operations are expected to be temporary in nature. See Chapter 17, 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.

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 9.1.10, Environmental Justice.

9.2.11. Cultural Resources

9.2.11.1. Introduction

This section describes potential impacts to cultural resources in New Hampshire associated with deployment and operation of the Proposed Action and alternatives. See Chapter 17, 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.

9.2.11.2. 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 9.2.11-1. As described in Section 9.2, 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.

9.2.11.3. 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 9.2.11-1, 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 that archaeological sites and historic properties are present throughout New Hampshire, some deployment activities may be in these same areas, in which case BMPs (see Chapter 17) 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.

Table 9.2.11-1: 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[2]	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 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

[1] 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 SHPO/THPO and other consulting parties, including Indian Tribes and Native Hawaiian Organizations, to develop appropriate mitigation.

* 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 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.

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 can be avoided or minimized through BMPs (see Chapter 17).

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 Native Americans. It is anticipated that FirstNet would identify potential impacts to such areas by conducting research on particular areas and through the NHPA consultation process, and would minimize deployment activities that would cause such loss of access.

9.2.11.4. 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, 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 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 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 because there would be no ground disturbance and no perceptible visual changes.

- 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 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 or inland bodies of water could impact cultural resources, as well as sites associated with the state’s maritime history since European colonization, such as shipwrecks. Impacts to maritime-related cultural resources could also potentially occur as a result of the construction of landings and/or facilities on shore to accept submarine cable, which could result in the disturbance of archaeological and historical sites, such as wharves and seawalls in Portsmouth (archaeological deposits tend to be located in association with bodies of water), and the associated network 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 impacts to archaeological sites, and the deployment of collocated equipment could result in visual impacts or physical damage to historic properties, especially in urbanized areas such of New Hampshire that have larger numbers of historic 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 sites. 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. Additional BMPs, as defined in Chapter 17, may be applied as appropriate to help further mitigate or reduce these 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. See Chapter 17, 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.

9.2.11.5. 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. See Chapter 17, 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.

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. See Chapter 17, 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.

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 9.1.11, Cultural Resources.

9.2.12. Air Quality

9.2.12.1. Introduction

This section describes potential impacts to New Hampshire's air quality from deployment and operation of the Proposed Action and alternatives. See Chapter 17, 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.

9.2.12.2. Impact Assessment Methodology and Significance Criteria

The impacts of the Proposed Action on New Hampshire's air quality were evaluated using the significance criteria presented in Table 9.2.12-1. As described in Section 9.2, 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 New Hampshire's air quality addressed in this section are presented as a range of possible impacts.

9.2.12.3. 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 unknown timeframes (if power is lost to a site, for example). Impacts are likely to be less than significant 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 New Hampshire that are in maintenance or nonattainment for one or more criteria pollutants, particularly, ozone is a state-wide issue (see Section 9.1.12, Air Quality).

Table 9.2.12-1: Impact Significance Rating Criteria for New Hampshire

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

Based on the significance criteria presented in Table 9.2.12-1, would likely be less than significant 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. Less than significant emissions could occur for any of the criteria pollutants within attainment areas in New Hampshire; however, NAAQS exceedances are not anticipated. Given that nonattainment areas are present throughout New Hampshire (Figure 9.1.12-1), 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.

9.2.12.4. 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 depending on the deployment scenario or site-specific conditions.

Activities Likely to Have No Impacts

Of the types of facilities or infrastructure development scenarios described in Section 2.1.2, Proposed Action, 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 minimal 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 the Potential to Impact Air Quality

Construction, deployment, and operation activities related to the Preferred Alternative could impact air quality by generating various quantities of criteria air pollutant emissions. It is expected that such impacts would be less than significant due to the shorter duration and localized nature of the activities. The types of infrastructure development 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 POP, 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 shore to 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. If additional power units are needed, 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 due to the limited nature of the deployment. See Chapter 17, 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.

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 significant 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 as they would still be limited in nature. See Chapter 17, 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.

9.2.12.5. 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

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 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 concentrations and associated impacts would be dictated by the products of combustion from ground support vehicles, as well as the duration of ground support operations and travel between storage and deployment locations. Additionally, routine maintenance and inspections of the deployable technologies are anticipated to be less than significant, given that these activities are of low-intensity and short duration. See Chapter 17, 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.

No Action Alternative

Under the No Action Alternative, FirstNet would not deploy the NPSBN and there would be no impact on 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.

9.2.13. Noise

9.2.13.1. Introduction

This section describes potential noise impacts from construction, deployment, and operation of the Proposed Action and alternatives in New Hampshire. See Chapter 17, 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.

9.2.13.2. Impact Assessment Methodology and Significance Criteria

The noise impacts of the Proposed Action were evaluated using the significance criteria presented in Table 9.2.13-1. As described in Section 9.2, 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 New Hampshire addressed in this section are presented as a range of possible impacts.

Table 9.2.13-1: 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	County or local		County or local	County or local
	Duration or Frequency	Permanent or long-term		Short term	Temporary

9.2.13.3. 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.

Based on the significance criteria presented in Table 9.2.13-1, noise impacts would likely be less than significant 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 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 would be followed to limit impacts on nearby noise-sensitive receptors. However, given that much of the concentration and setup of equipment would often occur in populated areas, FirstNet operations would not be able to completely avoid noise impacts due to construction and operations at various receptors.

9.2.13.4. 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.

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 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 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 deployment 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 POP, 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.

- 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 shore to 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. Any major infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the construction impacts. These impacts are expected to be less than significant 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). See Chapter 17, 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.

Operation Impacts

Operation activities associated with the Preferred Alternative would be less than significant 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. See Chapter 17, 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.

9.2.13.5. 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 Noise 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, given that these activities are of low-intensity and short duration. See Chapter 17, 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.

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 would 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. 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. See Chapter 17, 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.

No Action Alternative

Under the No Action Alternative, FirstNet would not deploy the NPSBN and there would be no impact on 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.

9.2.14. Climate Change

9.2.14.1. Introduction

This section describes potential impacts to climate and climate change-vulnerable FirstNet installations and infrastructure in New Hampshire associated with deployment and operation of the Proposed Action and alternatives. See Chapter 17, 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.

9.2.14.2. 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 9.2.14-1. As described in Section 9.2, 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 in 2013 (USEPA, 2015i), 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 located 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 can provide useful information to the project planning to ensure these projects are resilient to the impacts of climate change.

Table 9.2.14-1: Impact Significance Rating Criteria for Climate Change

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with 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 greenhouse gas 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

9.2.14.3. Projected Future Climate

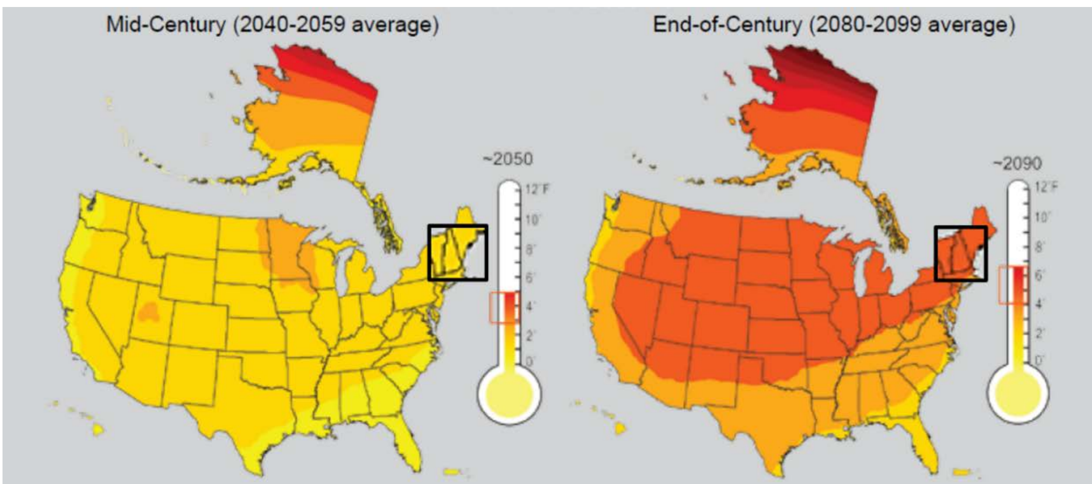
Climate model forecasts of future temperatures are highly dependent on emissions scenarios (low versus high), particularly in projections beyond 2050. By mid-century, the total number of days above 90 ºF is projected to increase in the majority of the Northeastern states especially the southern portion of the region. Under both low and high GHG emissions scenarios, the frequency, intensity, and duration of heat waves (sequential days with temperatures over 90 ºF) is also expected to increase, with the most intense heat waves occurring under higher emissions scenarios. Increases in temperature would also impact precipitation events, sea level rise, and ocean water acidity (USDA, 2012).

Air Temperature

Figure 9.2.14-1 and Figure 9.2.14-2 illustrate the anticipated temperature changes for low and high GHG emission scenarios for New Hampshire from a 1969 to 1971 baseline.

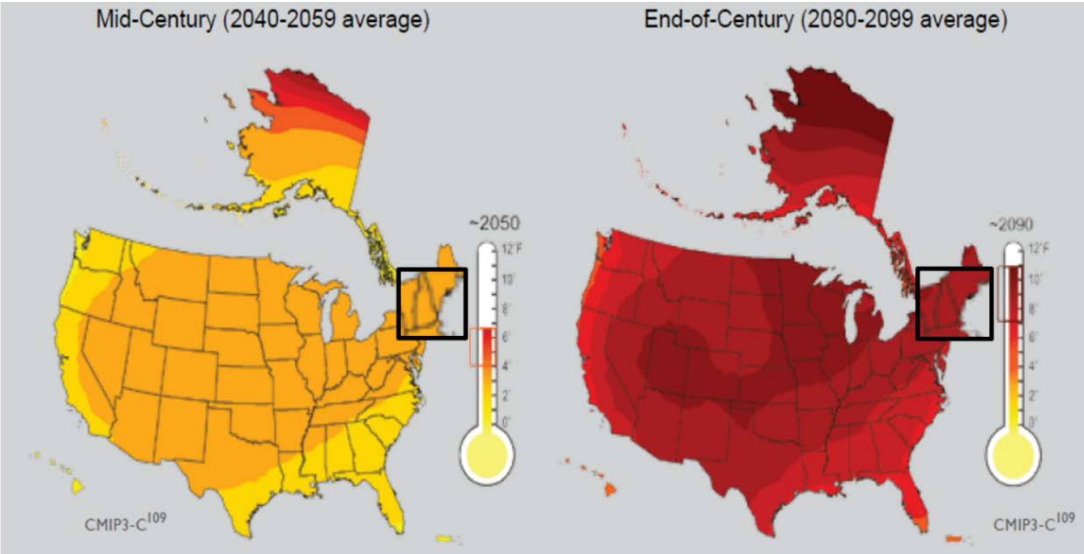
Dfb – Figure 9.2.14-1 shows that by mid-century (2040 to 2059), temperatures in the entire state of New Hampshire under a low emissions scenario will increase by approximately 4 °F, and by the end of the century (2080 to 2099) under a low emissions scenario temperatures in the entire state of New Hampshire will increase by approximately 6° F.

Figure 9.2.14-2 shows that under a high emissions scenario for the period (2040 to 2059), temperatures will increase by approximately 5 °F. Under a high emissions scenario for the period (2080 to 2099) in the entire state of New Hampshire, temperatures will increase by approximately 9° F (USGCRP, 2009).



Source: (USGCRP, 2009)

Figure 9.2.14-1: New Hampshire Low Emission Scenario Projected Temperature Change



Source: (USGCRP, 2009)

Figure 9.2.14-2: New Hampshire High Emission Scenario Projected Temperature Change

Precipitation

By late in the century under a high emissions scenario, winters in the Northeast are projected to be much shorter with fewer cold days and more precipitation. Winter and spring precipitation is projected to increase, and the frequency of heavy downpours is projected to continue to increase as the century progresses. Seasonal drought risk is also projected to increase in summer and fall as higher temperatures lead to greater evaporation and earlier winter and spring snowmelt (USGCRP, 2014a).

Figure 9.2.14-3 and Figure 9.2.14-4 show predicted seasonal precipitation change for an approximate thirty year period of 2071 to 2099 compared to a 1970 to 1999 approximate thirty year baseline. Figure 9.2.14-3 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, 2014a).

Figure 9.2.14-4 shows a high emissions scenario, which assumes continued increases in emissions, with associated large increases in warming and major precipitation changes. Continued increases in emissions would lead to large reductions in spring precipitation in the Northeast. (Note: white areas in the figures indicate that the changes are not projected to be larger than could be expected from natural variability (USGCRP, 2014a).

Dfb – Figure 9.2.14-3 shows that in a low emissions scenario in the 30-year period for 2071 to 2099, precipitation will increase by 10 percent in winter, spring and summer for the entire state of New Hampshire. However, there are no expected increases in precipitation in fall other than fluctuations due to natural variability (USGCRP, 2014a).

Figure 9.2.14-4 shows that if emissions continue to increase, winter precipitation could increase as much as 30 percent over the period 2071 to 2099 in the northern portion of the state while precipitation in the southern portion of the state could increase up to 20 percent. In spring, precipitation in this scenario could increase as much as 20 percent. In summer, precipitation could increase up to 10 percent. No significant change to fall rainfall is anticipated over the same period in the majority of the state. However, in the western portion of the state precipitation could increase up to 10 percent (USGCRP, 2014a).

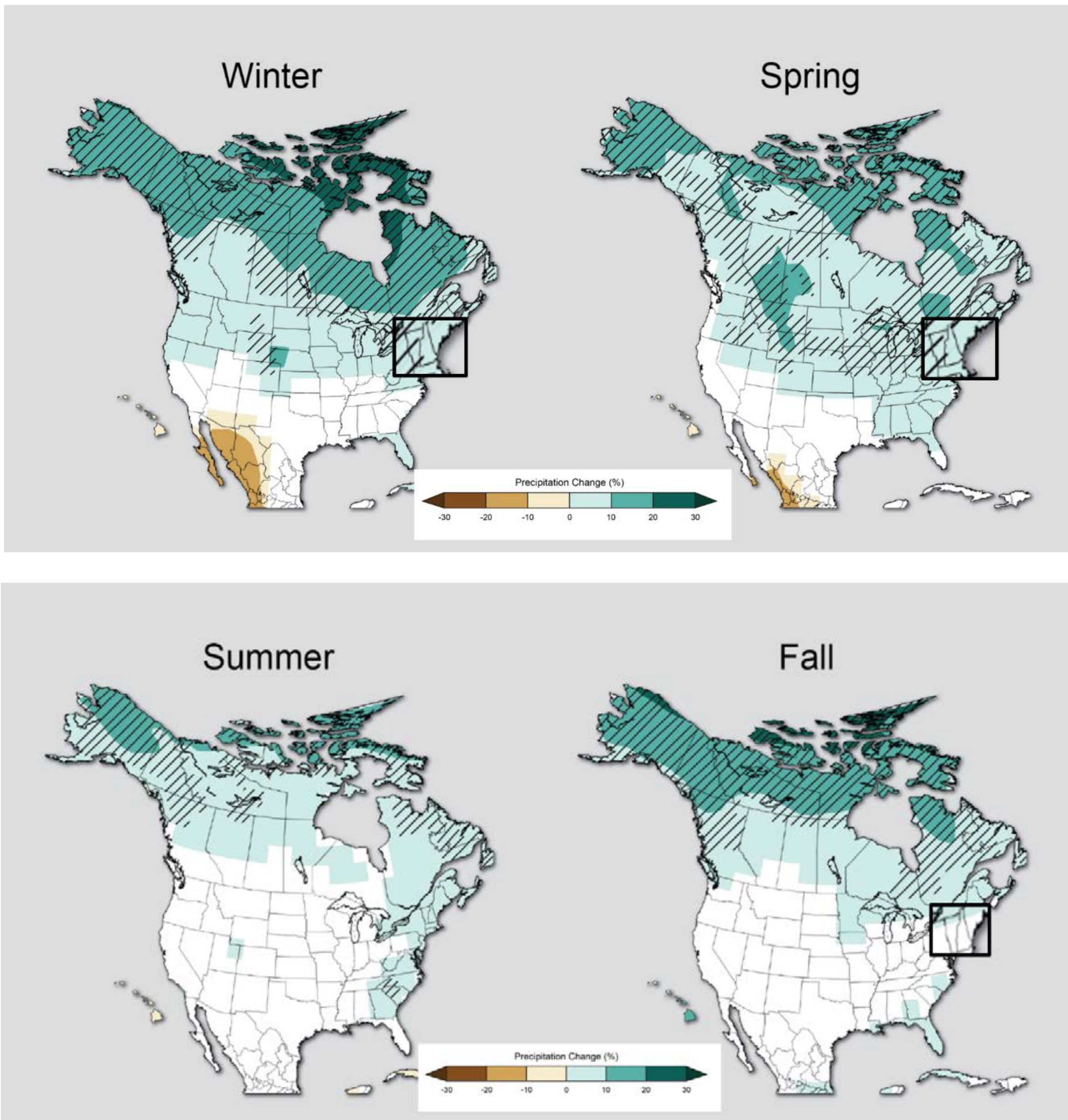


Figure 9.2.14-3: Predicted Seasonal Precipitation Change for 2071 to 2099 Compared to 1970 to 1999 Baseline in a Low Emissions Scenario

Source: (USGCRP, 2014a)

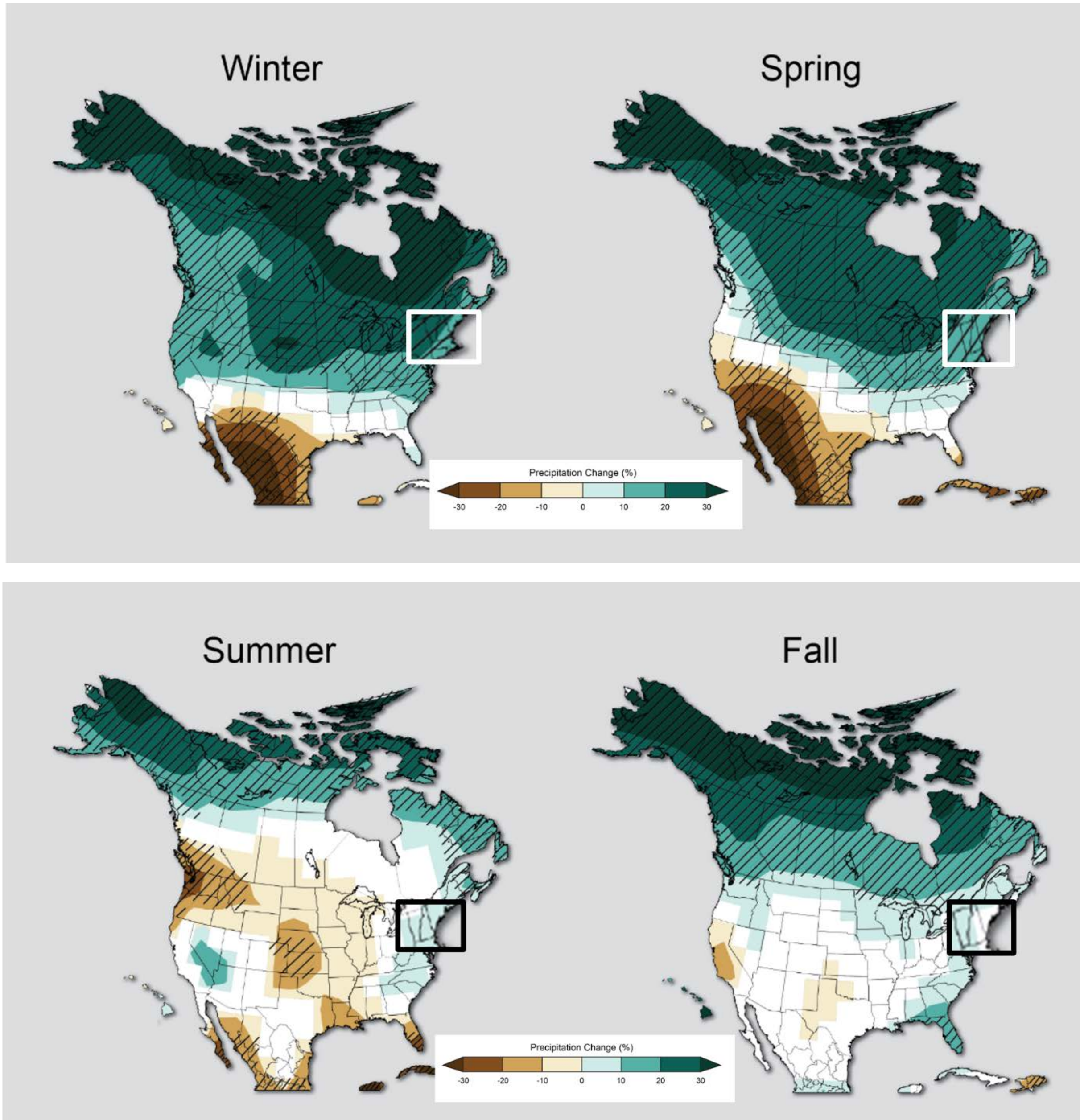


Figure 9.2.14-4: Predicted Seasonal Precipitation Change for 2071 to 2099 Compared to 1970 to 1999 Baseline in a High Emissions Scenario

Source: (USGCRP, 2014a)

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" (USFWS, 2004). 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." (USFWS, 2004). Sea level and currents can be influenced by the amount of heat stored in the ocean (USFWS, 2004).

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 level 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 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). Figure 9.2.14-5 and Figure 9.2.14-6 show feet of sea level above 1992 levels at different tide gauge stations. Figure 9.2.14-5 shows an 8 inch global sea level rise above 1992 levels by 2050 and Figure 9.2.14-6 shows a 1.24 foot global sea level rise above 1992 levels by 2050 (USGCRP, 2014b).

Dfb–Figure 9.2.14-5 presents an 8 inch global average sea level rise above 1992 levels, resulting in a 0.7 to 1 foot sea level rise in 2050 along the coast of New Hampshire, which is only a small southeastern portion of the state. Figure 9.2.14-6 indicates that a 1.24 foot sea level rise above 1992 level would result in a 1.3 to 1.7 foot sea level rise in 2050 along the coast of New Hampshire (USGCRP, 2014b).

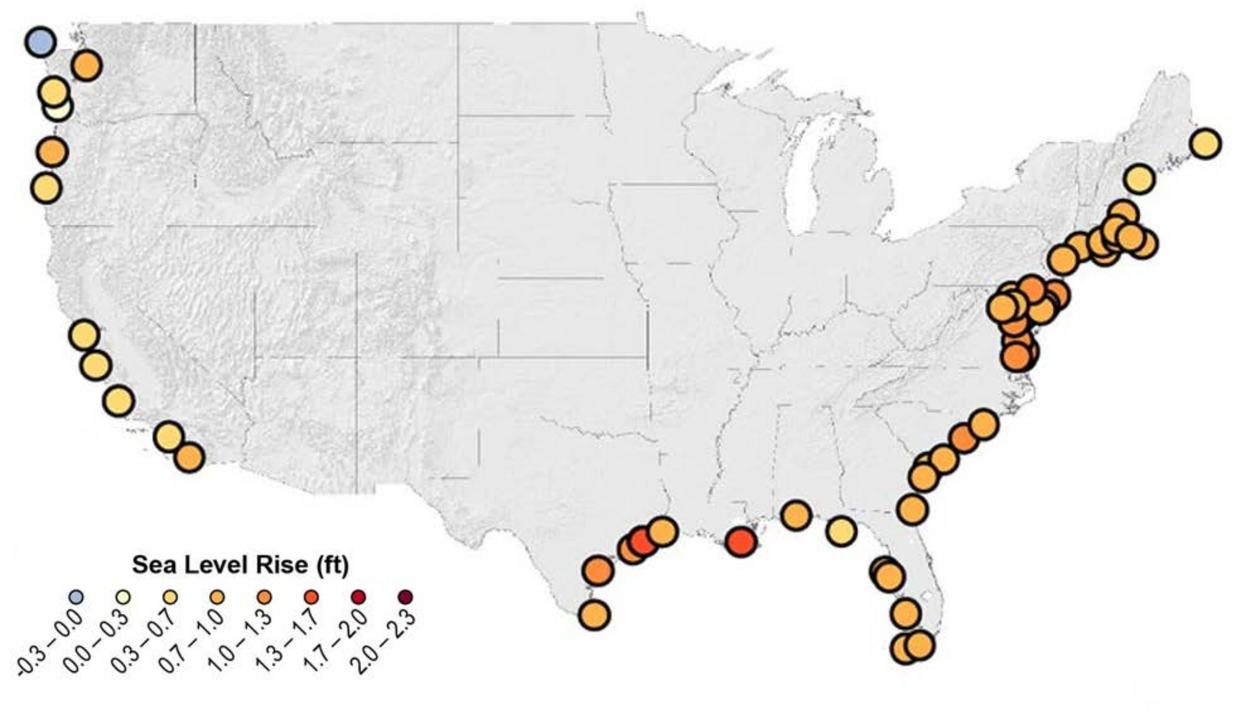


Figure 9.2.14-5: 8-inch Sea Level Rise Above 1992 Levels by 2050

Source: (USGCRP, 2014b)

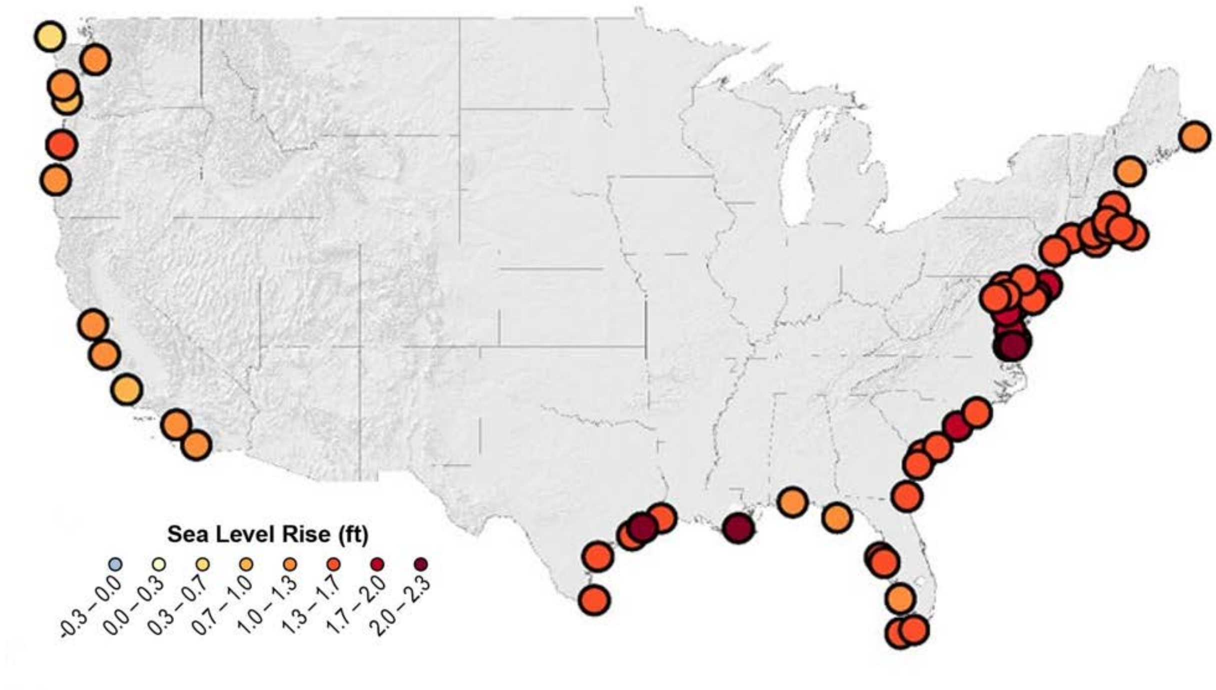


Figure 9.2.14-6: 1.24-foot Sea Level Rise Above 1992 Levels by 2050

Source: (USGCRP, 2014b)

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, 2014c).

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, 2014c). 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, changes 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).

9.2.14.4. 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 9.2.14-1 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 on-site 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 (Multiquip, 2015). Diesel fuel combustion emits 22.38 lbs of CO_2 per gallon (EIA, 2015c). 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 is less carbon-intensive, and would generate approximately 240 MT of CO_2 per year for the same equipment, depending on the region of the U.S. where the electricity was generated (USEPA, 2014d). 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 (Willem Vereecken, 2011), and would not impact GHG emissions in such a way as to require a quantitative analysis.

Impact of Climate Change on Project-Related Resource Effects

Climate change may impact project-related effects 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.

New Hampshire's infrastructure is at risk from the impacts of climate change. Sea level rise is already affecting New Hampshire's coastline, and forecasts indicate that sea level could rise between 2.2 (low emissions scenario) and 6.6 (high emissions scenario) by 2100 (State of New Hampshire, 2009). More frequent and severe torrential downpours will have consequences for both natural and built environments, and the State of New Hampshire Climate Action Plan indicates that, in particular, New Hampshire's stormwater and wastewater infrastructure will not have the capacity to treat expected water volumes (State of New Hampshire, 2009). For natural ecosystems, it would result in increased nutrient and sediment inputs to already stressed receiving waters, and negative impacts on both aquatic flora and fauna (USGCRP, 2014d).

Warming temperatures are also anticipated to negatively affect skiing and other tourism, and have an uncertain impact on New Hampshire's agriculture and forestry industries (State of New Hampshire, 2009). Thermal stress is also anticipated to negatively impact public health, with the number of days of temperatures over 95 ^{o}F in Concord, New Hampshire increasing to more than 65 per year by the end of the century, and poor air quality days increasing four-fold (State of New Hampshire, 2009).

Impact 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.

With New Hampshire at increasing risk of flooding under warming scenarios, the growing frequency and severity of torrential downpours, with increased incidences of flash flooding particularly in areas with inadequate stormwater infrastructure (State of New Hampshire, 2009) (USGCRP, 2014e) may impact FirstNet Installations and Infrastructure. Rising summer temperatures and the increased intensity and duration of heat waves may raise electricity demand for air conditioning and may strain electrical grid operations (DOE, 2015) while sustained high temperatures may overwhelm the capacity on-site equipment needed to keep microwave and other transmitters cool.

9.2.14.5. 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 New Hampshire, 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, 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, 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-term emissions. Long-term impacts are not likely, as optical networks are relatively energy efficient, the resulting GHG emissions will not be significant, and are likely to have no impacts.
- Satellites and Other Technologies
  - 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:

- Wireless 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 work boats 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.
  - 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 back-up), 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 construction would not take place. 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 back-up), and would depend on their size, number, and the frequency and duration of their use.

- Deployable Technologies
  - COWs, COLTs, or 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 due to the limited and localized nature of deployment activities. See Chapter 17, 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.

Climate Change Impacts on FirstNet Infrastructure or Operations

Climate change effects on the Preferred Alternative could be potentially significant to less than significant with BMPs and mitigation measures incorporated because climate change may potentially impact FirstNet installations or infrastructure during periods of extreme heat, severe storms, and other weather events. Mitigation measures could minimize or reduce the severity or magnitude of a potential impact resulting to the project, including adaptation, which refers to anticipating adverse effects of climate change and taking appropriate action to prevent and minimize the damage climate change effects could cause.

Climate change's anticipated impact on extreme weather events such as hurricanes or heat waves may increase the severity of the emergencies to which first responders are responding in vulnerable areas, and thus the extent and duration of their dependence on FirstNet resources. FirstNet would likely prepare to sustain these operations in areas experiencing climate and weather extremes through the design and planning process for individual locations and operations.

9.2.14.6. 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.

Potential 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 based on the defined significance criteria, since activities would be temporary and short-term.

Potential 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. 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 deployment and 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 due the limited duration of deployment activities.

Additionally, routine maintenance and inspections of the deployable technologies are anticipated to be less than significant, given that these activities are of low-intensity and short duration.

Climate Change Impacts on FirstNet Deployable Infrastructure or Operations

As explained above, operation activities would consist of implementation/running of the deployable technology and routine maintenance and inspections. These projects may also consist of deploying aerial vehicles including, but not limited to, drones, balloons, blimps, and piloted aircraft, which could involve fossil fuel combustion. 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.

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 9.1.14.

9.2.15. Human Health and Safety

9.2.15.1. Introduction

This section describes potential impacts to human health and safety in New Hampshire associated with deployment of the Proposed Action and alternatives. See Chapter 17, 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.

9.2.15.2. 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 9.2.15-1. 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 9.2.15-1: 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, 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 county or county-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 general 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 county or county-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 Man-Made Disasters	Magnitude or Intensity	Exposure to concentrations of chemicals above regulatory limits, or USEPA chemical screening levels protective of the general 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 county or county-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

9.2.15.3. 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 proposed 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 9.2.15-1, occupational injury impacts could be potentially significant if the proposed 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. For example, if fuel is spilled from an onsite fuel tank, the spilled fuel could migrate down gradient and infiltrate underground drinking water sources. The general public may then be exposed to hazardous chemicals in their drinking water if they utilize the same groundwater aquifer.

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 (FHA, 2015a).

- Engineering controls;
- Work practice controls;
- Administrative controls; and then
- 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, 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 employer specific workplace rules and operational practices (FHA, 2015a). 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 proposed 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 (SOP) 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 (FHA, 2015a). 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.

The New Hampshire Department of Labor (NHDOL) is not authorized by OSHA to administer a state program for public or private sector employers. Therefore, NHDOL defers all regulatory authority and enforcement for occupational safety relating to FirstNet site work to the leadership and interpretation of OSHA.

Hazardous Materials, Hazardous Waste, and Mine Lands

The presence of environmental contamination at FirstNet deployment sites has the potential to negatively impact health and safety of workers and the general public. 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 as a result of underground shaft collapses or seismic shifting. Based on the impact significance criteria presented in Table 9.2.15-1, 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 NHDES, or through an equivalent commercial resource, such as Environmental Data Resources, Incorporated.

By screening sites for environmental contamination, 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, the more favorable the site will be for FirstNet deployment projects. If sites containing known environmental contamination are selected for 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 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. 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 New Hampshire state laws in order to protect workers and the general 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 NHDES 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

FirstNet is intended to improve connectivity among public safety entities during disasters, thereby improving their ability to respond more safely and effectively during such events. The addition of towers, structures, facilities, equipment, and other deployment activities is expected to allow for expedited responses during 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 9.2.15-1, human health impacts could be significant if FirstNet deployment sites are located in areas that are directly impacted by natural 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, as new infrastructure could be deployed with additional structural hardening, and existing infrastructure may also 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. Therefore, FirstNet partner(s) would develop disaster response plans that outline specific steps employees should take in the event of a natural or manmade disaster.

9.2.15.4. 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, 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.

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 construction/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 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.

- 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 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.

- 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 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. 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 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. 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), management of hazardous materials and hazardous waste, and weather exposure. Potential impacts to human health and safety associated with deployment of the Proposed Action 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 due to the small-scale of likely FirstNet activities that would be temporary and of short duration. See Chapter 17, BMPs and Mitigation Measures, for 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 less than significant impacts to human health and safety associated with routine inspections of the Preferred Alternative, assuming that the inspections do not require climbing towers or confined space entry. In those instances, PPE or other mitigation measures could be necessary to adequately protect workers. 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 due to the small-scale of likely FirstNet activities that would be temporary and of short duration. See Chapter 17, BMPs and Mitigation Measures, for 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.

9.2.15.5. 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. 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 is an electrical generator, then there would also likely be a need to manage hazardous materials (fuel) onsite. These activities could result in less than significant impacts to human health and safety. 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 due to the small-scale of likely FirstNet activities that would be temporary and of short duration. See Chapter 17, BMPs and Mitigation Measures, for 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, assuming that the inspections do not require climbing towers or confined space entry. In those instances, PPE or other mitigation measures may be necessary to adequately protect workers. 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 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. See Chapter 17, 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.

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 9.1.15, Human Health and Safety.

NH APPENDIX A – WATER RESOURCES

Table A-1. Characteristics of New Hampshire's Watersheds, as Defined by NHDES

Watershed/Size Land Area within NH (square miles)	Major Surface Waterbodies	Major Water Quality Concerns
Connecticut River (3,063)	Connecticut River	Sedimentation and Turbidity (upper reaches)
Merrimack River (3,834)	Merrimack River	Mercury Bacteria Heavy Metals Low Dissolved Oxygen
Androscoggin River (716)	Androscoggin River	Acid deposition Mercury seepage from contaminated groundwater Non-point source pollution
Piscataqua River (Coastal) (792)	Piscataqua River Gulf of Maine Great Bay	Mercury Acid deposition Road salt runoff Phosphorus
Saco River (876)	Saco River	Mercury Acid deposition Road salt runoff Phosphorus

Sources: (NHDES, 2008a) (NHDES, 2008b) (NHFG, 2015a)

Table A-2. New Hampshire Designated Rivers

River Name
Ammonoosuc
Ammonoosuc Upper Reach
Ashuelot
Cocheco
Cold
Connecticut Connecticut Headwaters Connecticut Riverbend Connecticut Upper Valley Connecticut Mount Ascutney Connecticut Wantastiquet
Contoocook and North Branch
Exeter (upper)
Exeter and Squamscott
Isinglass
Lamprey
Lamprey Watershed
Mascoma
Merrimack (lower)
Merrimack (upper)
Oyster
Pemigewasset
Piscataquog
Saco
Souhegan
Swift

NH APPENDIX B – COMMUNITIES OF CONCERN

Table B-1: NHNHB S1 Ranked Terrestrial Communities of Concern in New Hampshire

Vegetative Community Type	USEPA Ecoregion(s)	Description	Distribution
Alpine herbaceous[151] snowbank/rill	Northeastern Highlands	Herbaceous community occurring under late melting snowbanks. Can also be found above tree line along gullies, ravines, seeps, springs, and streams	Restricted to the Presidential Range[152]
Moist alpine herb - heath meadow	Northeastern Highlands	Alpine tundra community with vegetation consisting of a variety of forbs[153], sedges[154] and shrubs	Only occurs in Alpine Garden on Mount Washington, in the Presidential Range
Bigelow's sedge meadow	Northeastern Highlands	A high elevation sedge meadow dominated almost exclusively by Bigelow's sedge (*Carex bigelowii*)	Occurs at high elevations in the Presidential Range
Sedge - rush - heath meadow	Northeastern Highlands	An alpine meadow community dominated by a mix of sedges, rushes, and highland shrubs	Occurs above 4,800 ft. amsl in the Presidential Range
Diapensia shrubland	Northeastern Highlands	A dwarf shrub community occurring in exposed alpine environments with high winds.	Occurs at high elevation in the Presidential Range
Alpine/subalpine bog	Northeastern Highlands	A peat moss dominated bog community that occurs above 3,500 f. in elevation. Common in poorly drained depressions where snow melts later in the year	Occurs in mountain ranges above 3,500 ft. amsl
Subalpine sloping fen[155]	Northeastern Highlands	A peatland community that occurs adjacent to cliffs on steep slopes	Occurs on steep slopes of the Presidential Range
Hudsonia inland beach strand	Northeastern Highlands	A shrub community, dominated by Hairy hudsonia (*Hudsonia tomentosa*), that is found on the beaches of inland freshwater lakes	Only occurs on the beaches of Ossipee Lake
Montane black spruce - red spruce forest	Northeastern Highlands	A black and red spruce dominated forest community that occurs between 2,000 and 3,000 ft. amsl	Limited to areas of the White Mountains[156]

[151] Herbaceous: "Plants without woody stems." (USEPA, 2015l)
[152] The Presidential Range is 19 mile mountain range with 13 peaks named after presidents. The range is predominantly in Coos County, New Hampshire.
[153] Forb: "Any herbaceous plant that is not a grass." (USEPA, 2015l)
[154] Sedge: "Plants of the family Cyperacae that resemble grasses, but have solid stems." (USFWS 2015b)
[155] Fen: "A type of wet meadow with highly alkaline soil. Vegetation is primarily composed of herbaceous species, encircled by zones of plants of increasing height and woodiness." (USEPA, 2015l)
[156] The White Mountains consists of a mountain range covering the northern portion of New Hampshire. The White Mountains include the Presidential Range, Franconia Range, Sandwich Range, Carter-Moriah Range, Kinsman Range, and Mahoosuc Range.

Vegetative Community Type	USEPA Ecoregion(s)	Description	Distribution
Subalpine cold-air talus shrubland	Northeastern Highlands	A community of stunted or dwarf trees and shrubs that that are usually found at higher elevations but have adapted to the cold air created by these micro climates	Limited to rocky debris piles at the base of slopes in the White Mountains
Jack pine rocky ridge	Northeastern Highlands	A jack pine (*Pinus banksiana*) dominated woodland community occurring on rocky ridges between 1,800 and 3,900 ft. amsl	Limited to a few rocky ridges in the White Mountains
Circumneutral rocky ridge	Northeastern Highlands	A forb dominated community, typically absent of trees, found on rock outcrops and cliff edges	Limited to calcareous bedrock outcrops at the brows of cliffs, Holts Ledge in the Town of Lyme
Northern white cedar forest/woodland	Northeastern Highlands	An upland forested community dominated by northern white cedar (*Thuja occidentalis*)	Limited to Coos County New Hampshire
Pitch pine - Appalachian oak - heath forest	Northeastern Highlands	A mixed forested community dominated by oak species and pitch pine. The community is fire adapted and typically occurs on outwash[157] plains	Limited to the Lower Merrimack River Valley
Pitch pine rocky ridge	Northeastern Highlands	A fire adapted pine community dominated by pitch pine that is typically found on rocky ridges with a history of drought and fire	Limited to rocky ridges in southern and east-central New Hampshire
Sugar maple - ironwood - short husk floodplain forest	Northeastern Highlands	A flood plain forest community typically found on the upstream reaches of rivers. Sugar maple typically dominates the canopy layer with ironwood (*Ostrya virginiana*)	Found in floodplains and terraces of rivers in northern New Hampshire
Acidic northern white cedar swamp	Northeastern Highlands	A forested swamp community occurring on sites with acidic soils	Limited to northeastern New Hampshire
Hudsonia - silverling river channel	Northeastern Highlands	A sparsely vegetated community dominated by forbs. Primarily occurs on shelves between the river and forest edge	Limited to northeastern New Hampshire
Circumneutral riverbank outcrop	Northeastern Highlands	Grass and forb dominated community occurring in scoured bedrock along medium to large sized rivers	Restricted to the Connecticut River Valley
Acidic riverside seep	Northeastern Highlands	Fen-like community occurring where groundwater emerges through cracks in bedrock. Small shrubs and forbs are typically dominant	Occurring along larger rivers in northern New Hampshire

[157] 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." (USEPA, 2015l)

Vegetative Community Type	USEPA Ecoregion(s)	Description	Distribution
Calcareous[158] riverside seep	Northeastern Highlands	Similar to acidic riverside seep community, but with decidedly more calcareous bedrock influence	Limited occurrences along the Connecticut River
Riverwash plain and dunes	Northeastern Highlands	A sparsely vegetated community occurring on broad sandy peninsulas of river systems	Only known to occur along terraces of the Upper Merrimack River
Twig-rush sandy turf pond shore	Northeastern Highlands	A shrub and forb community occurring on sandy or gravel shores of freshwater lakes	Occurs on sandy lake shores in central New Hampshire
Montane sandy pond shore	Northeastern Highlands	A shrub and forb community occurring on sand or gravel shores of freshwater lakes in mountainous regions	Limited to the mountains of northern New Hampshire
Montane sandy basin marsh	Northeastern Highlands	A wetland[159] community of ferns and rushes that occurs in basins at the base of slopes. At times, this community displays vernal pool[160] characteristics	Limited to the White Mountains in northern New Hampshire
Circumneutral - calcareous flark	Northeastern Highlands	A fen with saturated hollow areas and peat ridges that are oriented perpendicular to groundwater flow. Characterized by sparse vegetation cover of typical bog species	Limited to a single occurrence in northern New Hampshire near Ubagog Lake
Northern white cedar circumneutral string	Northeastern Highlands	Very similar to circumneutral – calcareous lark communities, but vegetation is largely dominated by stunted northern white cedar	Limited to northern New Hampshire near Ubagog Lake
Montane alder - heath shrub thicket	Northeastern Highlands	Dense thickets dominated by tall shrubs, typically occurring on flat ridges and slopes	Limited to the White Mountains of northern New Hampshire
Maritime sandy beach	Northeastern Coastal Zone	A sparsely vegetated community occurring along beaches at the extra-high tide line. Vegetation is predominantly salt tolerant species	Occur on the seaward side of coastal sand dunes in New Hampshire
Beach grass grassland	Northeastern Coastal Zone	Narrow strands of vegetation along sand dunes and the upper portions of some beaches	Limited to sand dunes and beaches

[158] Calcareous: "Of or containing calcium carbonate, calcium, or limestone." (USEPA, 2015l)
[159] Wetlands: "Areas that are inundated or saturated by surface or ground water 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." (USEPA, 2015l)
[160] Vernal pools: "Seasonal depressional wetlands." (USEPA, 2015l)

Vegetative Community Type	USEPA Ecoregion(s)	Description	Distribution
Bayberry - beach plum maritime shrubland	Northeastern Coastal Zone	Shrub thickets found in the back dune areas of sand dunes	Limited to Seabrook Beach
Hudsonia maritime shrubland	Northeastern Coastal Zone	A shrubland community, dominated by Hairy hudsonia that typically occurs in the interdunal areas of sand dunes	Only known to occur oat Seabrook Beach
Maritime wooded dune	Northeastern Coastal Zone	Wooded thickets typically occurring on the protected backsides of sand dune areas. Black cherry is usually the dominant species attaining heights of 20 ft or less	Limited to Seabrook Beach
Coastal rocky headland	Northeastern Coastal Zone	A stunted woodland community that is heavily influenced by strong winds and salt spray	Limited to windswept coastline and peninsulas of the Great Bay[161]
Swamp white oak floodplain forest	Northeastern Coastal Zone	A floodplain forest dominated by swamp white oak (*Quercus bicolor*) that is typically found on fertile, silty soils	Restricted to drainages of the Great Bay watershed[162] within 30 mi. of the coast
Sycamore floodplain forest	Northeastern Coastal Zone	A floodplain forest dominated by American sycamore (*Platanus occidentalis*)	Limited to the southern New Hampshire minor river floodplains
Inland Atlantic white cedar swamp	Northeastern Coastal Zone	A forest community dominated by Atlantic white cedar (*Chamaecyparis thyoides*). Typically found between 500 and 1,000 ft. amsl and characterized by pit and mound micro topography	Occurs in southern New Hampshire greater than 30 mi. from the coast
Atlantic white cedar - leatherleaf swamp	Northeastern Coastal Zone	A fen community dominated by Atlantic white cedar and leatherleaf (*Chamaedaphne calyculat*) usually occurring on poorly decomposed peat soils	Occurs within 30 mi. of the coast
Atlantic white cedar - giant rhododendron swamp	Northeastern Coastal Zone	Similar characteristics to other swamp communities with slightly different vegetation. Atlantic white cedar is the dominant species in the canopy layer and giant rhododendron (*Rhododendron maximum*) is the dominant species in the understory	Limited to one location near Manchester
Swamp white oak basin swamp	Northeastern Coastal Zone	Similar to swamp white oak floodplain forests, but differs by a lack of riverine flooding. Characterized by standing water in the spring that usually disappears by mid to late summer	Limited to the lower Merrimack River Valley
Meadow beauty sand plain marsh	Northeastern Coastal Zone	Very similar to twig-rush sandy turf pond shore community, but vegetation is mostly composed of coastal species.	Limited to south central New Hampshire

[161] The Great Bay is a large tidal estuary in southeast New Hampshire.
[162] Watershed: “The land area that catches rain or snow and drains it into a local water body (such as a river, stream, lake, marsh, or aquifer) and affects its flow, and the local water level.” (USEPA, 2015l)

Vegetative Community Type	USEPA Ecoregion(s)	Description	Distribution
Spike-rush - floating-leaved aquatic mudflat marsh	Northeastern Coastal Zone	A mudflat community characterized by submerged and floating aquatic vegetation.	Limited to south central New Hampshire
Sharp-flowered mannagrass shallow peat marsh	Northeastern Coastal Zone	A wetland community dominated by floating-stemmed sharp-flowered mannagrass.	Limited to south central New Hampshire
Coastal interdunal marsh/swale[163]	Northeastern Coastal Zone	A freshwater wetland community dominated by shrubs and grasses. Usually found in shallow depressions between sand dunes.	Limited to Seabrook Beach in southeastern New Hampshire
Marsh elder shrubland	Northeastern Coastal Zone	A salt marsh shrub community dominated by marsh elder (*Iva frutescens*)	Limited to a few occurrences around the Great Bay
Coastal salt pond marsh	Northeastern Coastal Zone	A salt marsh separated from the coastal shoreline. Vegetation is composed of both freshwater and brackish water species.	Limited to one known occurrence Odiorne Point State Park in southeast New Hampshire
Maritime cobble beach	Northeastern Coastal Zone	A cobble beach characterized by sparse cover of grasses and forbs.	Limited to the coastline of southeast New Hampshire
Maritime meadow	Northeastern Coastal Zone	An upland meadow of grasses and forbs occurring on landward sides of islands.	Limited to Isle of the Shoals State Park
Maritime shrub thicket	Northeastern Coastal Zone	A maritime shrub community occurring on thin sandy soils.	Limited to only a few locations along New Hampshire's maritime coastline

amsl = above mean sea level, ft. = feet, mi. = miles

Sources: (MFWP and MNHP 2015; USEPA 2015)

[163] Swale: "A swale, sometimes called a biofilter, is a grass-lined channel that is designed to convey stormwater in shallow flow. Pollutant removal is accomplished through filtration through the vegetation and swales are frequently designed to allow for infiltration of stormwater." (USEPA, 2015l)

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
APCO	Association of Public Safety Communications Officials
APE	Area of Potential Effect
AQCR	Air Quality Control Region
ARPA	Archaeological Resources Protection Act
ASL	Above Sea Level
ASPM	Aviation System Performance Metrics
ATC	Air Traffic Control
ATO	Air Traffic Organization
BGEPA	Bald and Golden Eagle Protection Act
BLM	Bureau of Land Management
BLS	Bureau of Labor Statistics
BTOP	Broadband Technologies Opportunity Program
BYA	Billion Years Ago
CAA	Clean Air Act
CCD	Common Core of Data
CCMP	Comprehensive Conservation and Management Plan
CCR	Consumer Confidence Report
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFOI	Census of Fatal Occupational Injuries
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 Trucks
COMLINK	Commonwealth Link to Interoperable Communications
COW	Cell On Wheels
CRS	Community Rating System
CWA	Clean Water Act
CWS	Community Water Systems
CZM	Coastal Zone Management
DACA	Deployable Aerial Communications Architecture
DES	Department of Environmental Services
DOC	Department of Commerce
DOD	Department of Defense
DOE	Department of Energy
DOT	Department of Transportation
DPH	Division of Ports and Harbors
DRED	Department of Resources and Economic Development
DVRS	Digital Vehicular Repeater System

Acronym	**Definition**
EDACS	Enhanced Digital Access System
EFH	Essential Fish Habitat
EIA	Energy Information Agency
EMS	Emergency Medical Services
EO	Executive Order
EPCRA	Emergency Planning and Community Right to Know Act
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulations
FCC	Federal Communication Commission
FDMA	Frequency Division Multiplexing
FEMA	Federal Emergency Management Agency
FGDC	Federal Geographic Data Committee
FHWA	Federal Highway Administration
FLM	Federal Land Manager
FLPMA	Federal Land Policy and Management Act of 1976
FM	Frequency Modulation
FR	Federal Register
FRA	Federal Railroad Administration
FTA	Federal Transit Authority
FSDO	Flight Standards District Offices
FSS	Flight Service Station
GAO	Government Accountability Office
GHG	Greenhouse Gas
GNIS	Geographic Names Information System
H_2S	Hydrogen Sulfide
HAP	Hazardous Air Pollutant
HASP	Health and Safety Plans
HHRA	Human Health Risk Assessment
IBA	International Birding Area
IFR	Instrument Flight Rules
IP	Internet Protocol
IPCC	Intergovernmental Panel On Climate Change
ISMP	Invasive Species Management Plan
ISWG	Invasive Species Working Group
IV&D	Integrated Voice and Data
LBS	Locations-Based Services
LCCS	Land Cover Classification System
LEB	Lebanon Municipal Airport
LID	Low Impact Development
LMR	Land Mobile Radio
LRR	Land Resource Regions
LTE	Long Term Evolution
LYH	Lynchburg Regional/Preston Glen Field
MBTA	Migratory Bird Treaty Act
MDI	Methylene Diphenyl Diisocyanate
MHI	Median Household Income
MHT	Manchester International Airport
MLRA	Major Land Resource Areas
MOA	Memorandum of Agreement
MMPA	Marine Mammal Protection Act
MMT	Million Metric Tons

Acronym	Definition
MSFCMA	Magnuson-Stevens Fisheries Conservation Management Act
MSHA	Mine Safety and Health Administration
MSL	Mean Sea Level
MSW	Municipal Solid Waste
MT	Million Tons
MTN	Microwave Transmission Network
MYA	Million Years Ago
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
NEPA	National Environmental Policy Act
NERR	National Estuarine Research Reserve
NESCA	Nongame and Endangered Species Conservation Act
NFIP	National Flood Insurance Program
NH	New Hampshire
NH/MA	Nashua
NH/ME	Dover/Rochester
NH/VT	Lebanon/Hanover
NHA	National Heritage Areas
NHDAMF	New Hampshire Department of Agriculture Markets and Food
NHDES	New Hampshire Department of Environmental Services
NHDHHS	New Hampshire Department of Health and Human Services
NHDOL	New Hampshire Department of Labor
NHDOT	New Hampshire Department of Transportation
NHEC	New Hampshire Electric Cooperative Inc.
NHFG	New Hampshire Fish and Game
NHL	National Historic Landmarks
NHNHB	New Hampshire Natural Heritage Bureau
NHPA	National Historic Preservation Act
NHPUC	New Hampshire Public Utilities Commission
NIH	National Institute of Health
NIST	National Institute of Standards and Technology
NM	Nautical Miles
NNL	National Natural Landmarks
NOAA	National Oceanic and Atmospheric Administration
NOTAM	Notices To Airmen
NO_X	Oxides of Nitrogen
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
NSR	New Source Review
NTIA	National Telecommunications and Information Administration

Acronym	Definition
NTFI	National Task Force On Interoperability
NTNC	Non-Transient Non-Community
NWI	National Wetlands Inventory
NWR	National Wildlife Refuges
NWS	National Weather Service
OC	Optical Carrier
OCIO	Office of the CIO
OE/AAA	Obstruction Evaluation and Airport Airspace Analysis
OHRV	Off-Highway Recreational Vehicle
OSHA	Occupational Safety and Health Administration
OTR	Ozone Transport Region
PAB	Palustrine Aquatic Bed
PEIS	Programmatic Environmental Impact Statement
PEM	Palustrine Emergent Wetland
PFO	Palustrine Forested Wetland
PGA	Peak Ground Acceleration
PM	Particulate Matter
POP	Points of Presence
PPE	Personal Protective Equipment
PSAP	Public Safety Answering Point
PSCR	Public Safety Communications Research
PSD	Prevention of Significant Deterioration
PSM	Portsmouth International At Pease
PSS	Palustrine Scrub-Shrub Wetland
PUB	Palustrine Unconsolidated Bottom
R&D	Research and Development
RACOM	Radio Communications
RCRA	Resource Conservation and Recovery Act
RF	Radio Frequency
RGGI	Regional Greenhouse Gas Initiative
RMPP	Rivers Management and Protection Program
ROW	Right-of-Way
RSA	Revised Statues Annotated
SAA	Sense and Avoid
SAIPE	Small Area Income and Poverty Estimates
SASP	State Aviation System Plan
SCEC	State Climate Extremes Committee
SCC	State Corporation Commission
SDS	Safety Data Sheets
SDWA	Safe Drinking Water Act
SF_6	Sulfur Hexafluoride
SGCN	Species of Greatest Conservation Need
SHPO	State Historic Preservation Office
SIP	State Implementation Plan
SIRS	Statewide Interdepartmental Radio System
SO_2	Sulfur Dioxide
SO_3	Sulfur Trioxide
SOC	Standard Occupational Classification
SONET	Synchronous Optical Network
SOP	Standard Operating Procedures
SOW	System On Wheels
SO_X	Oxides of Sulfur

Acronym	Definition
SPHQ	State Police Headquarters
SPL	Sound Pressure Level
SRS	Statewide Radio System
STARS	Statewide Agencies Radio System
SUA	Special Use Airspace
SWAP	State Wildlife Action Plan
SWPPP	Storm Water Pollution Prevention Plan
SWQPA	Shoreland Water Quality Protection Act
THPO	Tribal Historic Preservation Office
TMDL	Total Maximum Daily Load
TPY	Tons Per Year
TRI	Toxics Release Inventory
TSCA	Toxic Substances Control Act
TWA	Time Weighted Average
UA	Unmanned Aircraft
UAS	Unmanned Aircraft Systems
UES	Unitil Energy Systems, Inc.
UHF	Ultra High Frequency
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USDOI	U.S. Department of Interior
USDOT	U.S. Department of Transportation
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGCRP	U.S. Global Change Research Program
USGS	U.S. Geological Survey
VFR	Visual Flight Rules
VHF	Very High Frequency
VOC	Volatile Organic Compounds
VPP	Voluntary Protection Program
WCS	Wetlands Classification Standard
WMA	Wildlife Management Areas
WWI	World War I
WWII	World War II

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