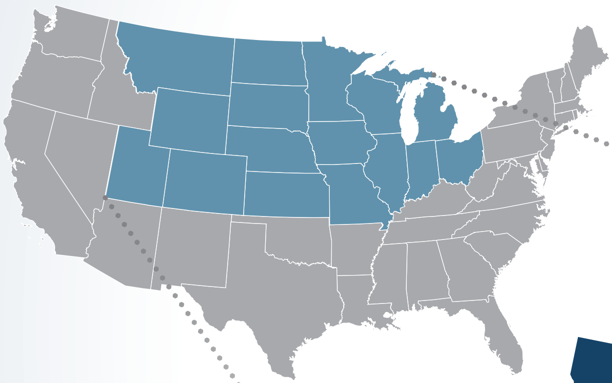
Nationwide Public Safety Broadband Network

Final Programmatic Environmental Impact Statement for the Central United States

VOLUME 9 - CHAPTER 11



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First Responder Network Authority

Nationwide Public Safety Broadband Network
Final Programmatic Environmental Impact Statement for the Central United States

VOLUME 9 - CHAPTER 11

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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 Commerce—National Telecommunications and Information Administration
U.S. Department of Defense—Department of the Air Force
U.S. Department of Energy
U.S. Department of Homeland Security

June 2017

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11. MONTANA

Montana was populated for centuries by American Indian tribes with a rich cultural history. During their exploration of the Louisiana Purchase and the western wilderness, the Lewis and Clark Expedition crossed Montana in the hopes of finding a passage linking the Columbia and Missouri rivers (National Archives, 2016). Although American Indians were the first inhabitants of the state, fur trappers, missionaries, and traders additionally inhabited the area until the Gold Rush of the 1860s (State of Montana, 2016a). Montana became a territory in 1864 and a state in 1889 (State of Montana, 2016a). Located in the western region of the United States, Montana is bordered by Canada to the north, Idaho to the west, North and South Dakota to the east, and Idaho and Wyoming to the south. This chapter provides details about the existing environment of Montana as it relates to the Proposed Action.

General facts about Montana are provided below:

- **State Nickname:** The Treasure State
- **Land Area:** 145,546 square miles; **U.S. Rank**: 4 (U.S. Census Bureau, 2015a)
- **Capital:** Helena
- **Counties:** 56 (U.S. Census Bureau, 2015b)
- **Estimated Population:** Over 1.032 million people, 2014 estimate; **U.S. Rank:** 44 (U.S. Census Bureau, 2015a)
- **Most Populated Cites:** Billings, Missoula, Great Falls, and Bozeman (U.S. Census Bureau, 2015b)
- **Main Rivers:** Kootenai, Flathead, Clark Fork, Milk, Missouri, Yellowstone, Powder, Tongue, and Bighorn
- **Bordering Waterbodies:** None
- **Mountain Ranges:** Bitterroot Mountains, Lewis Range, Absaroka Range, Big Belt Mountains, Bighorn Mountains, and Cabinet Mountains
- **Highest Point:** Granite Peak (12,799 ft) (USGS, 2016a)

11.1. AFFECTED ENVIRONMENT

11.1.1. Infrastructure

11.1.1.1. Definition of the Resource

This section provides information on key Montana 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 11.1.1.3 provides an overview of the traffic and transportation infrastructure in Montana, including road and rail networks and airport facilities. Montana public safety infrastructure could include any infrastructure utilized by a public safety entity[1] as defined in Title VI of the Middle Class Tax Relief and Job Creation Act of 2012 (Public Law [Pub. L.] No. 112-96, Title VI Stat. 156 (codified at 47 United States Code [U.S.C.] 1401 et seq.) (the Act), including infrastructure associated with police, fire, and emergency medical services (EMS). However, other organizations can qualify as public safety services as defined by the Act. Public safety services in Montana are presented in more detail in Section 11.1.1.3. Section 11.1.1.4 describes specific public safety communications infrastructure and commercial telecommunications infrastructure in Montana. An overview of utilities in Montana, such as power, water, and sewer, are presented in Section 11.1.1.5.

11.1.1.2. Specific Regulatory Considerations

Multiple Montana laws and regulations pertain to the state's public utility and transportation infrastructure and its public safety community. Table 11.1.1-1 identifies the relevant laws and regulations, the affected agencies, and their jurisdiction as derived from the state's applicable statutes and administrative rules referenced in column one. Appendix C, Environmental Laws and Regulations, identifies applicable federal laws and regulations.

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

Table 11.1.1-1: Relevant Montana Infrastructure Laws and Regulations

State Law / Regulation	Regulatory Agency	Applicability
Montana Code Annotated: Title 69 Public Utilities and Carriers	Department of Public Service Regulation	Plans for electricity supply resource needs; ensures location, construction, and operation of electric transmission facilities are in compliance with state law by requiring a certificate of compliance.
Montana Code Annotated: Title 10 Military Affairs and Disaster and Emergency Services	Department of Military Affairs	Provides for emergency and disaster management system; directs emergency and disaster preparation and response programs; coordinates means for efficient communication in time of emergency or disaster; considers desirability of supplementing or integrating communications resources with comprehensive state of state-federal telecommunications network.
Montana Code Annotated: Title 69 Public Utilities and Carriers	Public Service Commission	Defines "public utility" as any corporation, company, individual, or association of individuals, that own, operate, or control any plant or equipment, any part of a plant or equipment, or any water right within the state for the production, delivery, or furnishing of heat, street-railway service, light, power, water, or regulated telecommunications service.
Montana Code Annotated: Title 60 Highways and Transportation	Montana Department of Transportation	Plans, alters, constructs, and maintains highways; compiles statistics regarding public highways; designates roads to be part of the scenic-historic byways program.

Source: (Montana Secretary of State, 2015) (Montana Legislature, 2014)

11.1.1.3. Transportation

This section describes the traffic and transportation infrastructure in Montana, including specific information related to the road networks, airport facilities, and rail networks. The movement of vehicles is commonly referred to as traffic, as well as the circulation along roads. Roadways in the state can range from multilane road networks with asphalt surfaces, to unpaved gravel or private roads. The information regarding existing transportation systems in Montana are based on a review of maps, aerial photography, and federal and state data sources.

The Montana Department of Transportation (MDT) has jurisdiction over freeways and major roads, airports, railroads, and mass transit in the state; local counties have jurisdiction for smaller streets and roads. The mission of the MDT is to "to serve the public by providing a transportation system and services that emphasize quality, safety, cost effectiveness, economic vitality and sensitivity to the environment" (MDT, 2015a). Montana has an extensive and complex transportation system across the entire state. The state's transportation network consists of:

- 74,933 miles of public roads (FHWA, 2014) and 5,251 bridges (FHWA, 2015a);
- approximately 3,125 miles of rail network that includes passenger rail and freight (MDT, 2014);
- 270 aviation facilities, including public use airports and private airstrips and heliports (FAA, 2015a); and
- No major harbors or ports (U.S. Harbors, 2015).

Road Networks

As identified in Figure 11.1.1-1, the major urban centers of the state are Missoula in the west, Great Falls and Bozeman in the middle, and Billings in the south-central section of the state (U.S. Census Bureau, 2013a). Montana has three major interstates connecting its major metropolitan areas to one another, as well as to other states. Travel outside the major metropolitan areas is conducted on interstates, state, and county roads. Table 11.1.1-2 lists the interstates and their start/end points in Montana. Per the national standard, even numbered interstates run from west to east with the lowest numbers beginning in the south; odd numbered interstates run from north to south with the lowest numbers beginning in the west (FHWA, 2015b).

Table 11.1.1-2: Montana Interstates

Interstate	Southern or Western Terminus in MT	Northern or Eastern Terminus in MT
I-15	ID line near Lima	Canada line at Sweet Grass
I-90	ID line near Taft	WY line near Wyola
I-94	I-90 in Billings	ND line near Wibaux

Source: (USDOT Bureau of Transportation Statistics, 2014)

In addition to the Interstate System, Montana has one National Scenic Byway and legislation enabling State Scenic Byways, although no State Scenic Byways have been designated at this time (MDT, 2016). National Scenic Byways are roads that are recognized for one or more archaeological, cultural, historic, natural, recreational, and scenic qualities (FHWA, 2013). National Scenic Byways are roads with nationwide interest; the U.S. Department of Transportation's Federal Highway Administration designates and manages byways. Montana has one National Scenic Byway, the Beartooth Highway running through the Beartooth Mountain Range in Montana and Wyoming (FHWA, 2015c). Some national scenic trails, such as the Lewis and Clark National Historic Trail have components of them that are roadways. Four of the National Forest Service Scenic Byways in Montana are on MDT owned and maintained highways (MDT, 2016). Figure 11.1.1-1 illustrates the major roadways in Montana. Section 11.1.8, Visual Resources, describes the National Scenic Byway found in Montana from an aesthetic perspective.

Airports

Air service to the state is provided by a number of medium-sized airports (FAA, 2014a). The two largest airports in the state are the Billings Logan International Airport in the east and Bozeman Yellowstone International Airport in the southwest.

- Billings Logan International Airport (BIL) is owned and operated by the City of Billings (BIL, 2015a). In 2014, the airport facilitated 428,578 enplanements, or passenger boarding of planes, and 428,713 deplanements, or passengers disembarking planes, as well as

21,855,152 pounds of freight loaded onto airplanes and 39,172,069 pounds of freight offloaded from airplanes (BIL, 2015b).

- Bozeman Yellowstone International Airport (BZN) serves as a year-round gateway to Yellowstone National Park, as well as the City of Bozeman and the surrounding recreation areas. The airport is owned and operated by the Gallatin Airport Authority (BZN, 2015a). In 2014, the airport facilitated 483,132 enplanements and 483,832 deplanements (BZN, 2015b). In 2013, the airport handled approximately 8 million pounds of cargo annually (BZN, 2016).

Figure 11.1.1-1 illustrates the location of these airports in the state. Section 11.1.7, Airspace, provides detail on airports and airspace in Montana.

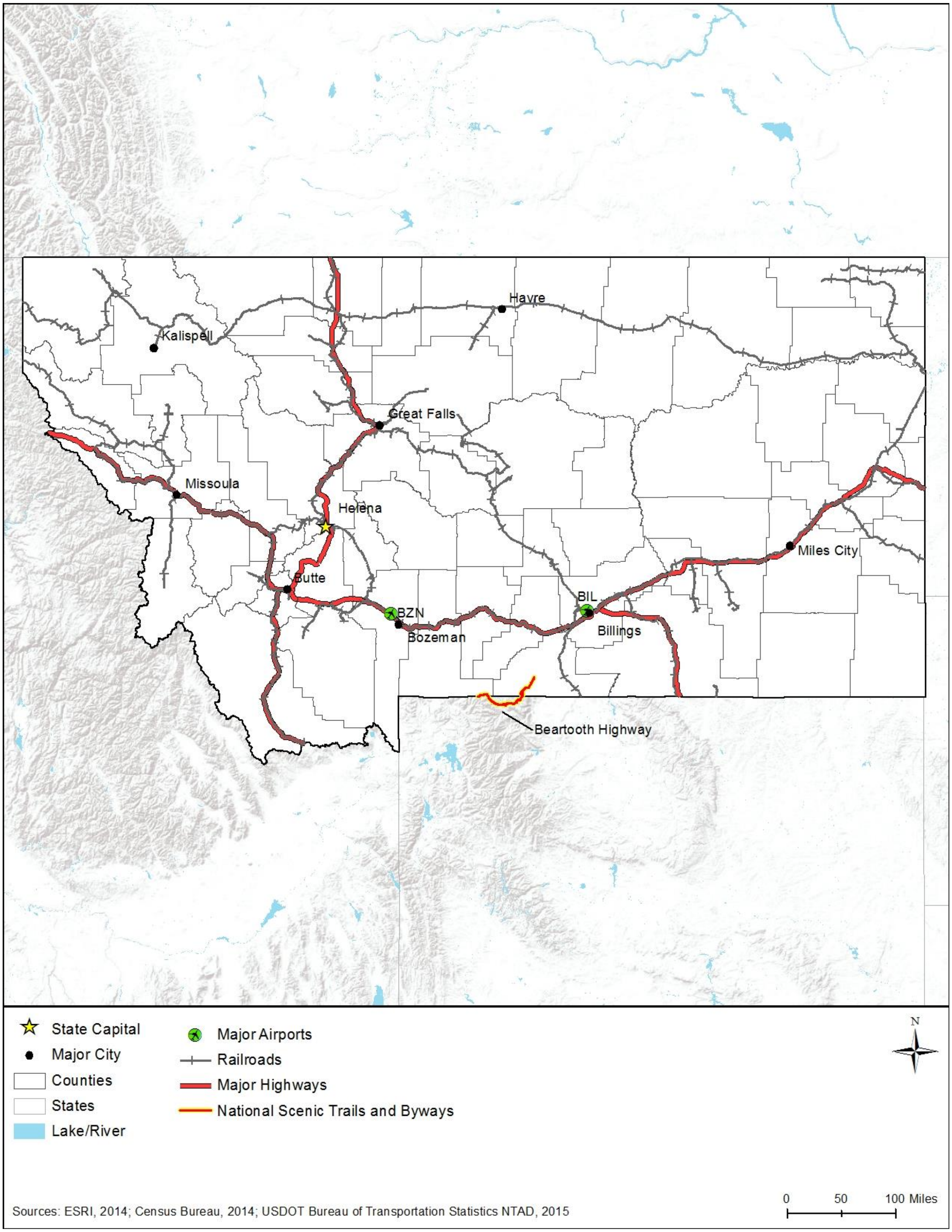


Figure 11.1.1-1: Montana Transportation Networks

Rail Networks

Montana is connected to a network of passenger rail (Amtrak) and freight rail. Figure 11.1.1-1 illustrates the major transportation networks, including rail lines, in Montana.

Amtrak runs one line through Montana. The Empire Builder line runs once per day between Chicago and Seattle, with stops at 12 stations in Montana. In 2013, 145,736 people got on or off the Empire Builder Line in Montana, with 45 percent of those riders using the Whitefish station (MDT, 2014). Table 11.1.1-3 provides information on the Amtrak route that runs through Montana.

Table 11.1.1-3: Amtrak Train Routes Serving Montana

Route	Starting Point	Ending Point	Length of Trip	Cities Served in Montana
Empire Builder	Chicago, IL	Seattle, WA	46 hours	Wolf Point, Glasgow, Malta, Havre, Shelby, Cut Bank, Browning, East Glacier Park, Essex, West Glacier, Whitefish, Libby

Source: (Amtrak, 2015)

The Federal Railroad Administration (FRA) classifies railroads as Class I, Class II, or Class III based on corporate revenue thresholds (FRA, 2015a). Two Class I freight railroad companies operate in Montana: the Burlington Northern & Santa Fe (BNSF), and the Union Pacific; the former is the largest freight rail operator in the state. BNSF operates on 1,939 miles of track in Montana and, in 2013, facilitated the movement of almost 1.8 million carloads of freight. Two regional, or Class II railroads and three short-line, or Class III, railroads also operate in the state. The majority of freight rail in Montana passes through the state, and does not originate or terminate there (MDT, 2014).

Harbors and Ports

Montana is a landlocked state and has relatively few large bodies of water. The one large moving body of water is the more than 2,300-mile long Missouri River, which begins in southwest Montana at Missouri Headwaters State Park and flows across the state to the northeast into North Dakota (Montana State Parks, 2015a). There are no ports or harbors of significant size on the Missouri River, or elsewhere in the state.

11.1.1.4. Public Safety Services

Montana public safety services generally consist of public safety infrastructure and first responder personnel aligned with the demographics of the state. Table 11.1.1-4 presents Montana's key demographics including estimated population; land area; population density; and number of counties, cities/towns, and municipal governments. More information about these demographics is presented in Section 11.1.9, Socioeconomics; however, these demographics are key to understanding the breadth of public safety services throughout the state.

Table 11.1.1-4: Key Montana Indicators

Montana Indicators	
Estimated Population (2014 estimated)	1,023,579
Land Area (square miles) (2010)	145,545.80
Population Density (persons per sq. mile) (2010)	6.8
Municipal Governments (2013)	129

Sources: (U.S. Census Bureau, 2015a) (U.S. Census Bureau, 2013b)

Table 11.1.1-5 presents Montana's public safety infrastructure, including fire and police stations. Table 11.1.1-6 identifies first responder personnel including dispatch, fire and rescue, law enforcement, and emergency medical personnel in the state.

Table 11.1.1-5: Public Safety Infrastructure in Montana by Type

Infrastructure Type	Number
Fire and Rescue Stations [a]	416
Law Enforcement Agencies [b]	119
Fire Departments [c]	279

Sources: (U.S. Fire Administration, 2015) (U.S. Bureau of Justice Statistics, 2011)

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

Table 11.1.1-6: First Responder Personnel in Montana by Type

First Responder Personnel	Number
Police, Fire and Ambulance Dispatchers [a]	460
Fire and Rescue Personnel [b]	5,992
Law Enforcement Personnel [c]	3,229
Emergency Medical Technicians and Paramedics [d e]	600

Sources: (U.S. Fire Administration, 2015) (U.S. Bureau of Justice Statistics, 2011) (BLS, 2015a)

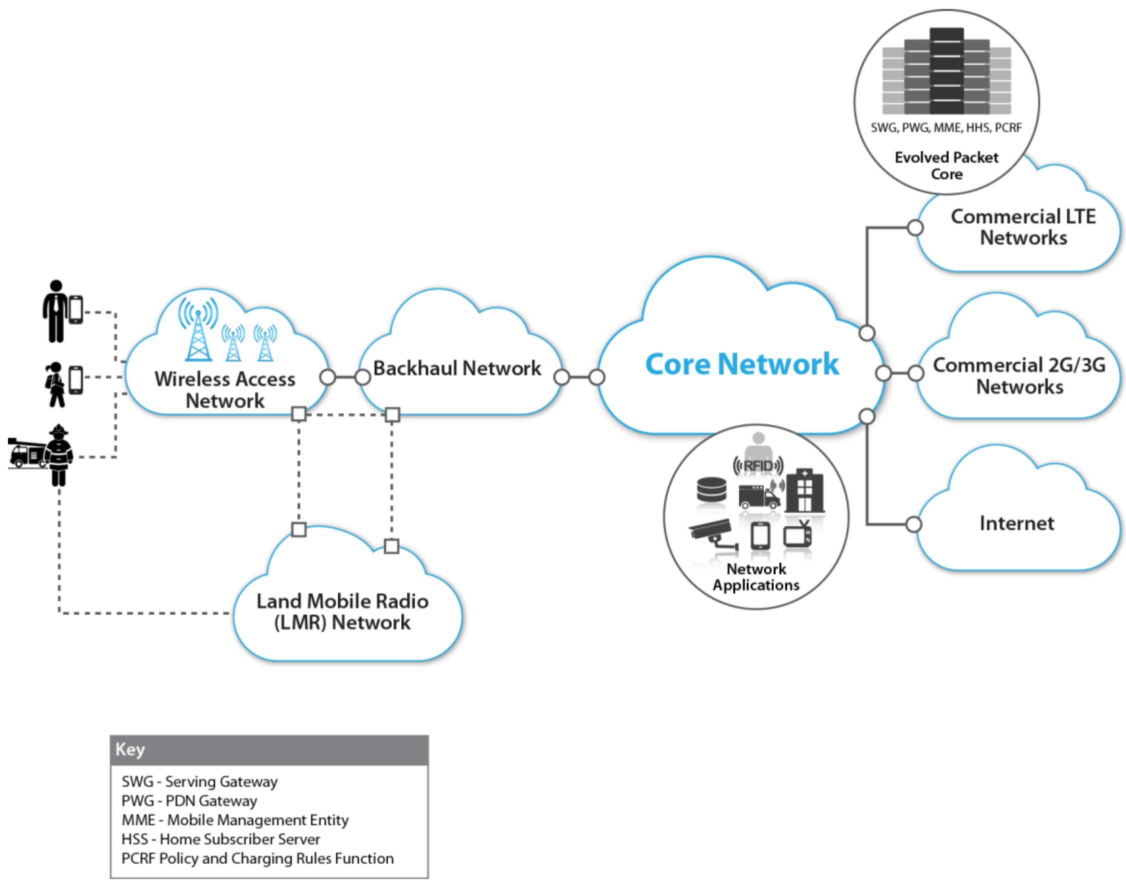
[a] BLS Occupation Code: 43-5031
[b] BLS Occupation Codes: 33-2011 (Firefighters), 33-2021 (Fire Inspectors and Investigators), 33-1021 (First-Line Supervisors of Fire Fighting and Prevention Workers), and 53-3011 (Ambulance Drivers and Attendants, Except Emergency Medical Technicians). Volunteer firefighters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

11.1.1.5. Telecommunications Resources

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

Communications throughout the state are based on a variety of publicly- and commercially-owned technologies.

Figure 11.1.1-2 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.



Prepared by Booz Allen Hamilton

Figure 11.1.1-2: 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. 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.

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 dissimilar Land Mobile Radio (LMR) networks with a nationwide public safety LTE broadband network, the U.S. Department of Commerce 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 to better inform investment decisions (PSCR, 2015).

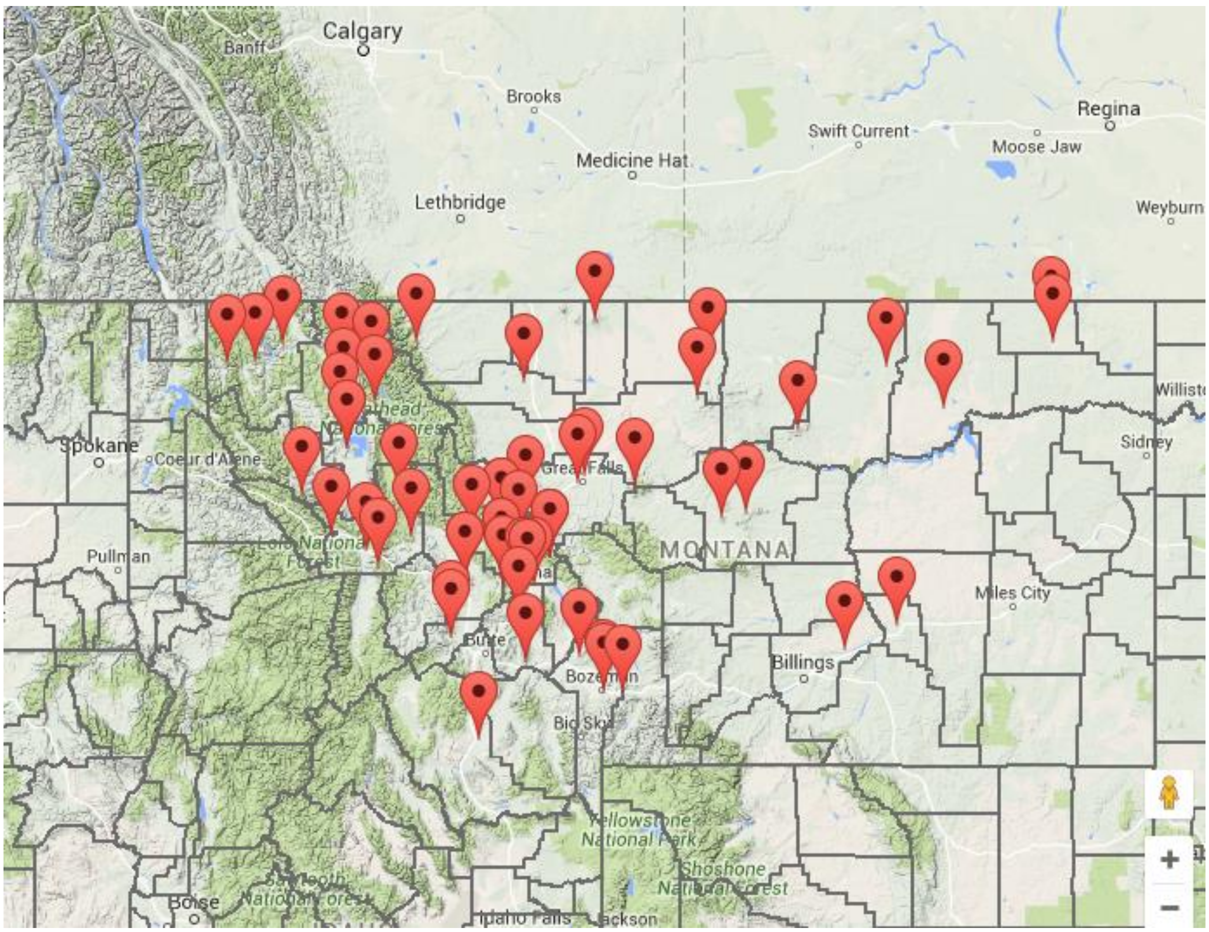
Montana's statewide system, the Montana State Interoperability Public Safety Radio System, is a Very High Frequency (VHF)[2] network providing coverage across Montana and supports public safety communications and diverse talk groups for multiple public safety agencies and users across the state including: the Montana State Patrol, Fire Dispatch, County Sheriffs, and a number of city police units. However, the majority of county and local public safety agencies operate today on VHF geographically segmented networks (RadioReference.com, 2015a).

Like most states, Montana's public safety LMR network environment is in transition and reflects the challenges of the need for greater system capabilities, broader coverage, and technology modernization to broadband and fuller data capability delivery. The state recognized these challenges and created a Statewide Interoperability Governing Board (SIGB) to address both near-term LMR improvements, network governance, and funding; Montana's SIGB has recommended both improved centralization of LMR network management as well as adoption of a funding for a phased LMR backbone and LBS roadmap (Statewide Interoperability Governing Board (SIGB)-Montana, 2015).

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

In March 2014, Montana commented in its Annual Snapshot to the state's 2013 Statewide Communication Interoperability Plan (SCIP) that, "In the next two years, Montana will primarily encounter challenges relating to governance, maintaining legacy communications systems, deployment of new communications technologies and networks and dedicated funding" (State of Montana, 2014).

In 2014, after consultation with the Federal Communication Commission (FCC), Montana cancelled its 96 licenses in the 700 MHz band realizing it would not meet the FCC narrow banding timeline and requirements; therefore, the responsibility for 700MHz licenses now falls under the Regional Planning Committee (RPC) versus the state (Urgent Communications, 2014).



Source: (RadioReference.com, 2015b).

Figure 11.1.1-3: Montana Statewide P25 Tower Locations

Statewide/Multi-County Public Safety Networks

The Montana statewide VHF Project 25 (P25)[3] tower site locations are depicted in Figure 11.1.1-3 (RadioReference.com, 2015b).

State Mutual Aid/Common frequencies in Montana are on VHF with Law Enforcement, Fire, EMS, and Search and Rescue all availing themselves of VHF common frequencies for tactical communications during mutual aid and cross-agency response situations (RadioReference.com, 2015c).

City and County Public Safety Networks

As of mid-2015, with the exception of Montana's VHF Statewide P25 network, the only other Public Safety P25 network operating in the state is the 800 MHz Billings Public Services System (BPSS) also a P25 system (Project 25.org, 2015). The city of Billings, the largest city in Montana (located in Yellowstone County) uses the digital P25 network for Police and Fire dispatch and tactical communications as well as to support a variety of city municipal services such as sanitation and parking enforcement (RadioReference.com, 2015d). Yellowstone County, as well as the cities of Broadview, Custer, Laurel, Shepard, and Worden within the county, are dominated by VHF systems with selective use of Ultra High Frequency (UHF)[4] such as that by the Yellowstone Sheriff organization for data. This frequency use contrasts with the city of Billings' use of an 800 MHz. network (RadioReference.com, 2015e).

The situation in Missoula County (and City) is very similar to Yellowstone County with the County and city frequency use dominated by VHF with selective use of UHF (e.g. County services) (RadioReference.com, 2015f). In Cascade County, where the city of Great Falls is located, the County's Public Safety network is VHF with the exception of one UHF channel (Sheriff Jail Security); in the City of Great Falls, Police and Emergency Services use VHF channels exclusively (RadioReference.com, 2015g).

In general, the situation regarding dependency on legacy analog VHF networks in other Montana counties and cities is similar to that found in Missoula and Cascade County (RadioReference.com, 2015a). Highly limited local deployment and funding of digital P25 technology has occurred in Montana to date; this is largely due to increased operations and maintenance costs for legacy LMR networks and budgetary constraints impacting LMR capital spending (State of Montana, 2013).

Public Safety Answering Points (PSAPs)

According to the FCC's Master PSAP registry, there are 64 PSAPs in Montana serving Montana's 56 counties (FCC, 2015a), which is an average of just above one PSAP per county in the state.

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[3] Project-25 (P25) 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.
[4] UHF band covers frequencies ranging from 300 MHz to 3000 MHz (NTIA, 2005)

Commercial Telecommunications Infrastructure

Montana'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 Montana's commercial telecommunications infrastructure, including information on the number of carriers and technologies deployed; geographic coverage; voice, Internet access, and wireless subscribers; and the quantity and location of telecommunications towers, fiber optic plant, and data centers.

Carriers, Coverage, and Subscribers

Montana'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 11.1.1-7 presents the number of providers of switched access[5] lines, Internet access[6], and mobile wireless services including coverage.

Table 11.1.1-7: Telecommunications Access Providers and Coverage 2013

Commercial Telecommunications Access Providers	Number of Service Providers	Coverage of Households
Switched access line [a]	91	97% of households
Internet access [b]	49	46% of households
Mobile wireless [c]	8	88% of population

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

[a] Switched access lines are a service connection between an end user and the local telephone company's switch (the basis of older telephone services); this number of service providers was reported by the FCC as of December 31, 2013 in Table 17 in "Local Telephone Competition: Status as of December 31, 2013" as the total of ILEC and non-ILEC providers (FCC, 2014b).
[b] Internet access providers are presented in Table 21 in "Internet Access Services: Status as of December 31, 2013" by technology provided; number of service providers is calculated by subtracting the reported Mobile Wireless number from the total reported number of providers (FCC, 2014a).
[c] Mobile wireless provider data is provided by the FCC in the sources identified. However, NTIA's National Broadband Map provides newer data, so FirstNet is using NTIA's GIS-based data from the National Broadband Map instead of the data reported by the FCC. The process for retrieving the National Broadband Map data is explained in detail in a subsequent footnote in Section 11.1.1.5, Last Mile Fiber Assets.

Table 11.1.1-8 shows the wireless providers in Montana along with their geographic coverage. The following three maps, Figure 11.1.1-4, Figure 11.1.1-5, and Figure 11.1.1-6, show: the combined coverage for the top two providers (each of which covers the entire state); Mid-Rivers

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

Telephone Cooperative, Inc. and Triangle Communications' coverage; and the coverage of all other providers with less than 5 percent coverage area, respectively.[7]

Table 11.1.1-8: Wireless Telecommunications Coverage by Providers in Montana

Wireless Telecommunications Providers	Coverage
Verizon Wireless	46.56%
AT&T Mobility	45.19%
Mid-Rivers Telephone Cooperative, Inc.	18.00%
Triangle Communications	8.19%
Other [a]	12.94%

Source: (NTIA, 2014)

[a] Other: Provider with less than 5% coverage area. Providers include: Nemont Telephone Cooperative, Inc.; Montaa Internet Corporation; Global Net, Inc.; WistWest.net; TCT West, Inc.; Rocky Mountain Internet; Landmark Electronics; SpeedConnect LLC; Oki Communications LLC; KDS Networks; USA Companies, L.P.; Cybernet1, Inc.; LAT Inc.; Western Montana ComunityTel; Hot Springs Telephone Company; Stellar Computing; Traceworks, LLC; Grizzly Internet, Inc.

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

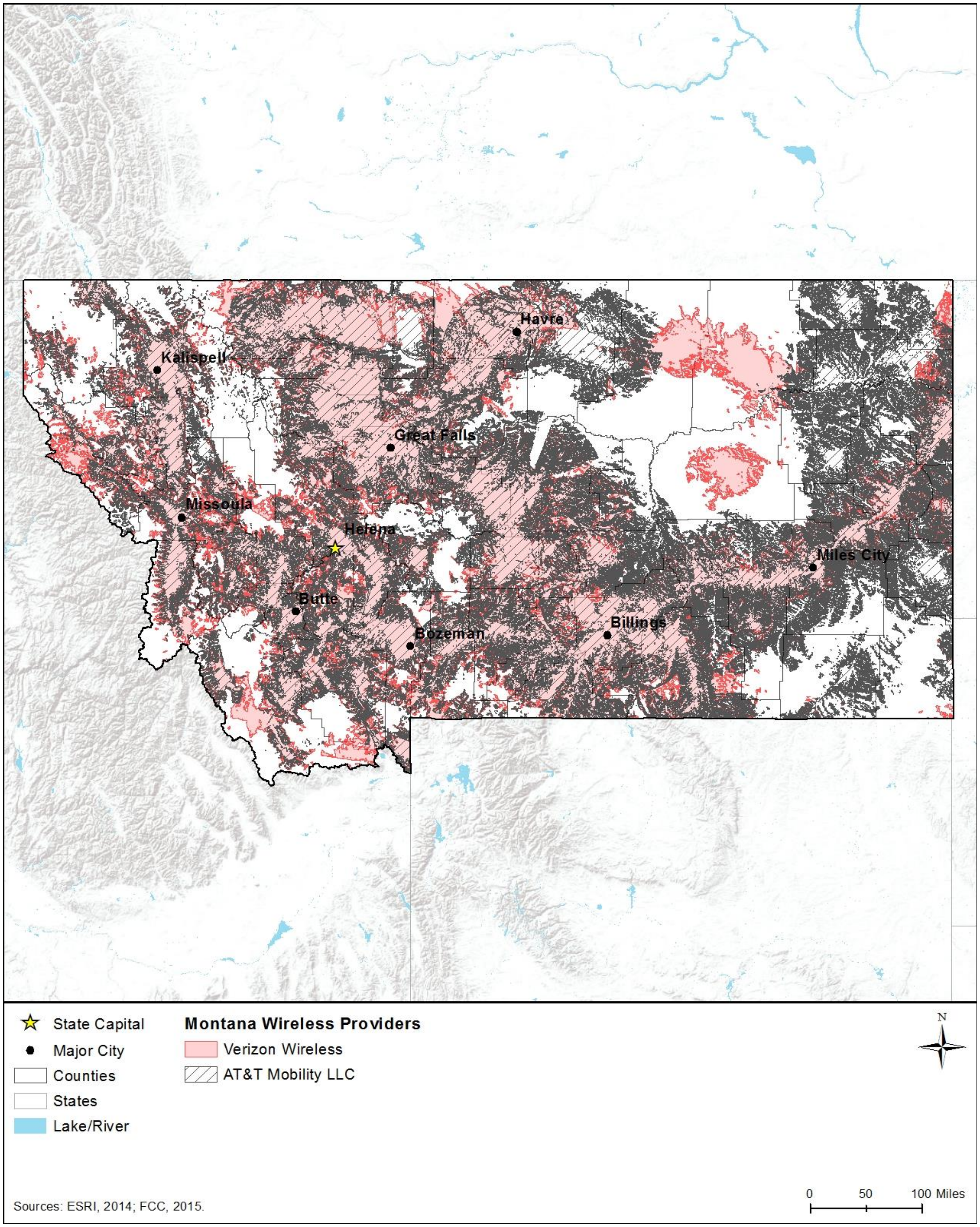


Figure 11.1.1-4: Top Wireless Providers Availability in Montana

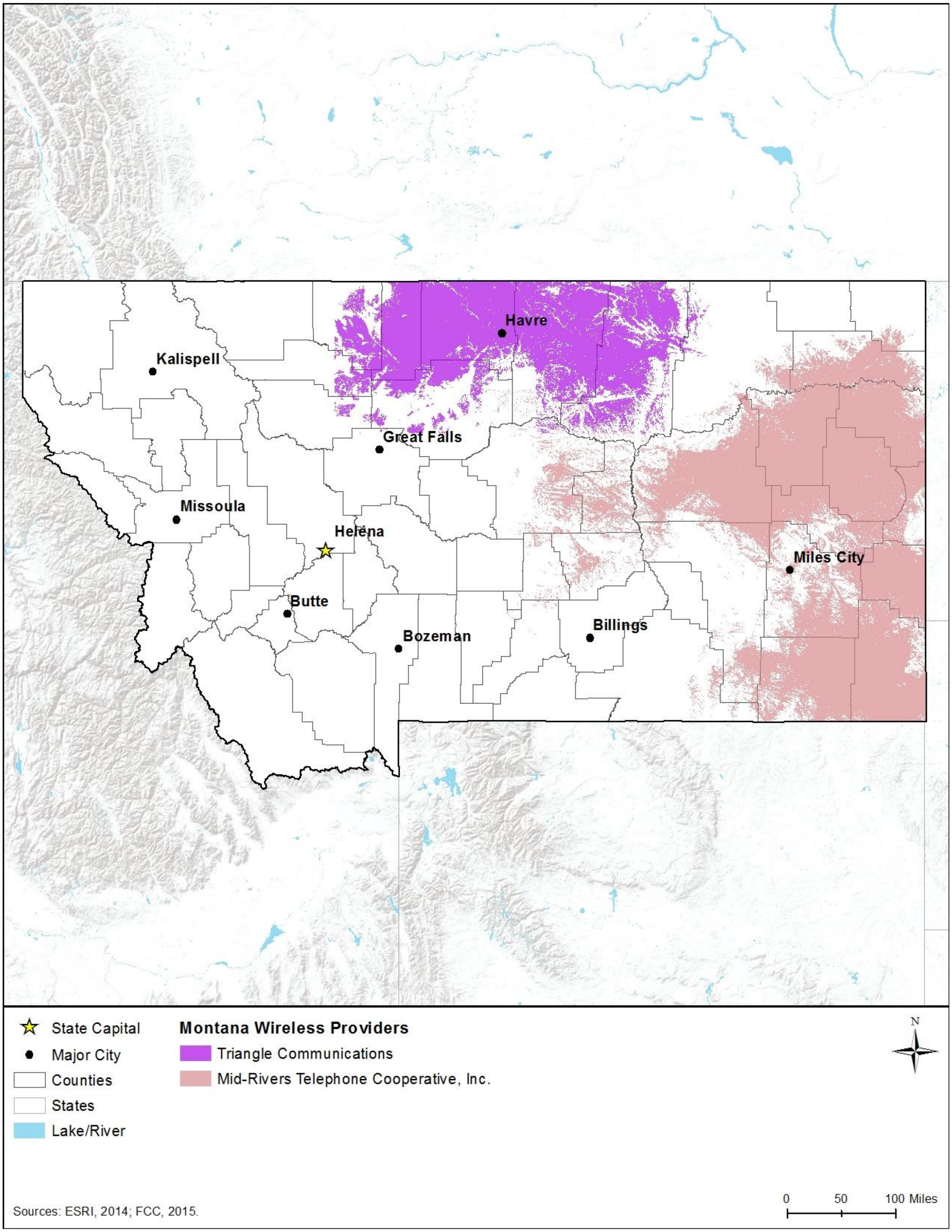


Figure 11.1.1-5: Triangle Communications and Mid-Rivers Telephone Cooperative, Inc. Wireless Availability in Montana

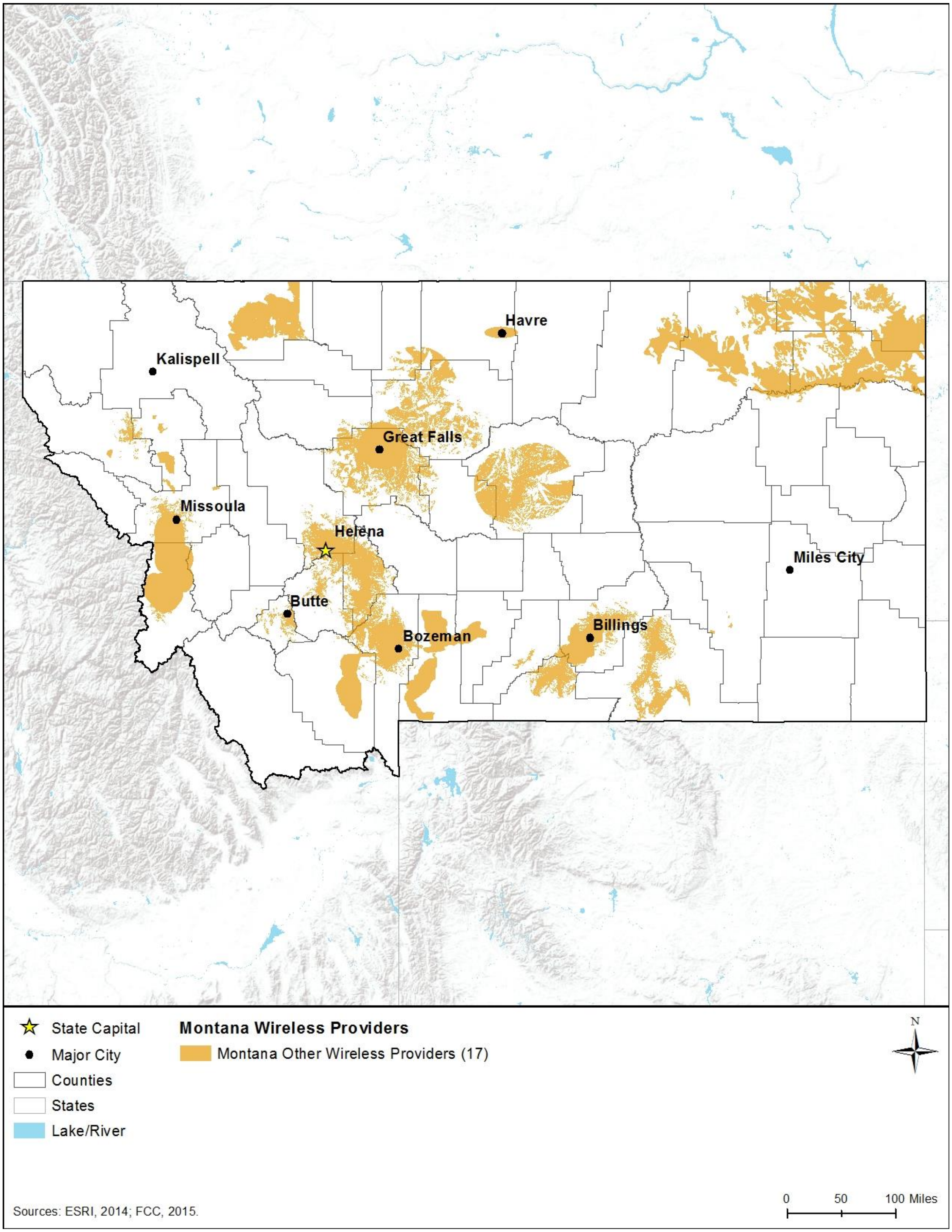


Figure 11.1.1-6: Other Wireless Providers in Montana

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 11.1.1-7 presents representative examples of each of these categories or types of towers.

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

Lattice
200 – 400 feet
Source: Personal Picture

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

Figure 11.1.1-7: Types of Towers

Telecommunications tower infrastructure proliferates throughout Montana, although tower infrastructure is concentrated in the higher and more densely populated areas of Great Falls, Kalispell, Missoula, Butte, Helena, Billings, and Bozeman. Owners of towers and some types of antennas are required to register those infrastructure assets with the FCC (FCC, 2016).[8] Table 11.1.1-9 presents the number of towers (including broadcast towers) registered with the FCC in Montana by tower type, and Figure 11.1.1-8 presents the location of those structures, as of June 2016.

[8] 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, 2016).

Table 11.1.1-9: Number of Commercial Towers in Montana by Type

Constructed [a] Towers [b]		**Constructed Monopole Towers**	
100ft and over	52	100ft and over	0
75ft – 100ft	91	75ft – 100ft	0
50ft – 75ft	108	50ft – 75ft	4
25ft – 50ft	148	25ft – 50ft	15
25ft and below	114	25ft and below	14
Subtotal	**513**	**Subtotal**	33
Constructed Guyed Towers		**Buildings with Constructed Towers**	
100ft and over	13	100ft and over	0
75ft – 100ft	14	75ft – 100ft	1
50ft – 75ft	6	50ft – 75ft	0
25ft – 50ft	12	25ft – 50ft	2
25ft and below	3	25ft and below	2
Subtotal	48	**Subtotal**	5
Constructed Lattice Towers		**Multiple Constructed Structures [c]**	
100ft and over	0	100ft and over	0
75ft – 100ft	8	75ft – 100ft	0
50ft – 75ft	36	50ft – 75ft	1
25ft – 50ft	30	25ft – 50ft	0
25ft and below	13	25ft and below	1
Subtotal	**87**	**Subtotal**	2
Constructed Tanks [d]			
Tanks	1		
Subtotal	**1**		
Total All Tower Structures		**689**	

Source: (FCC, 2015b)

[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).

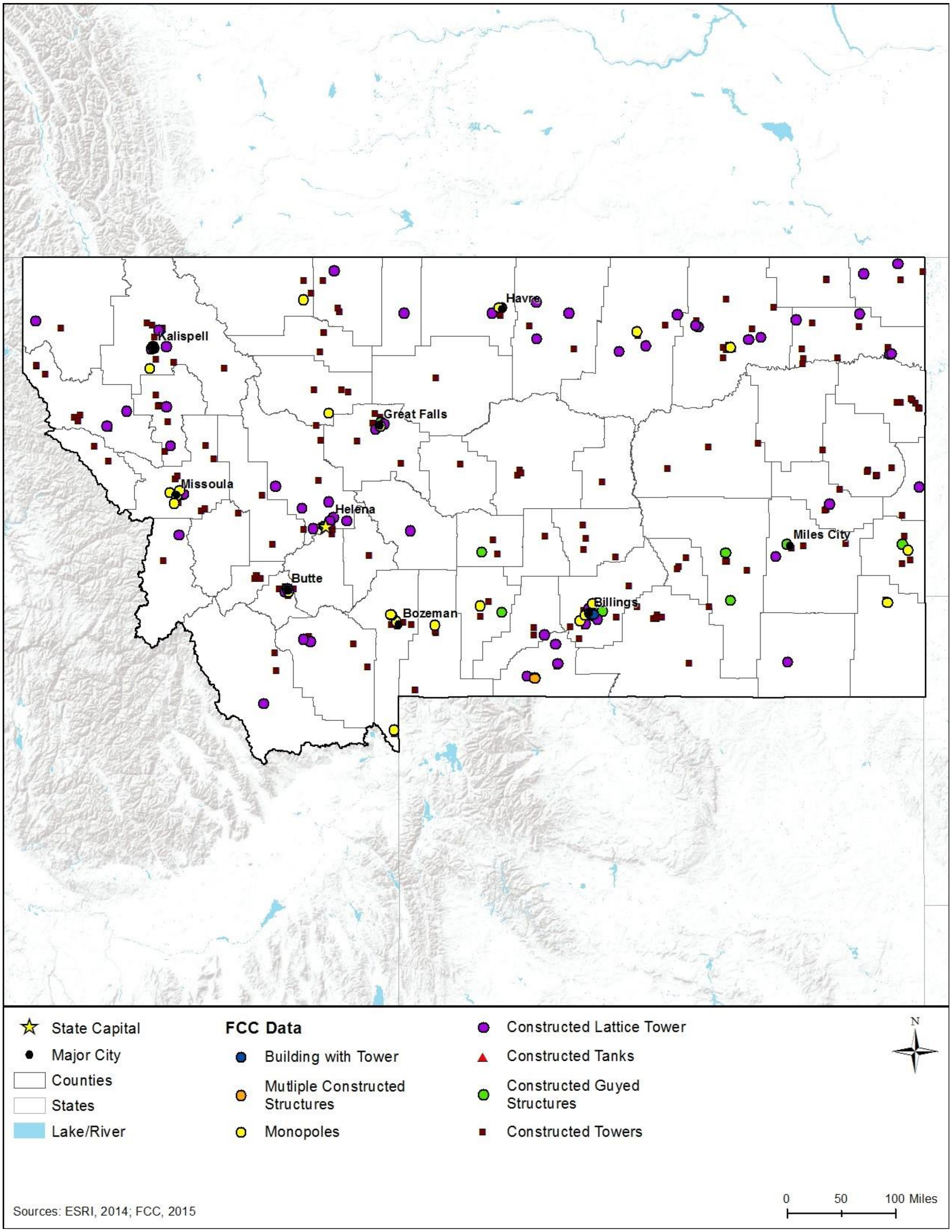
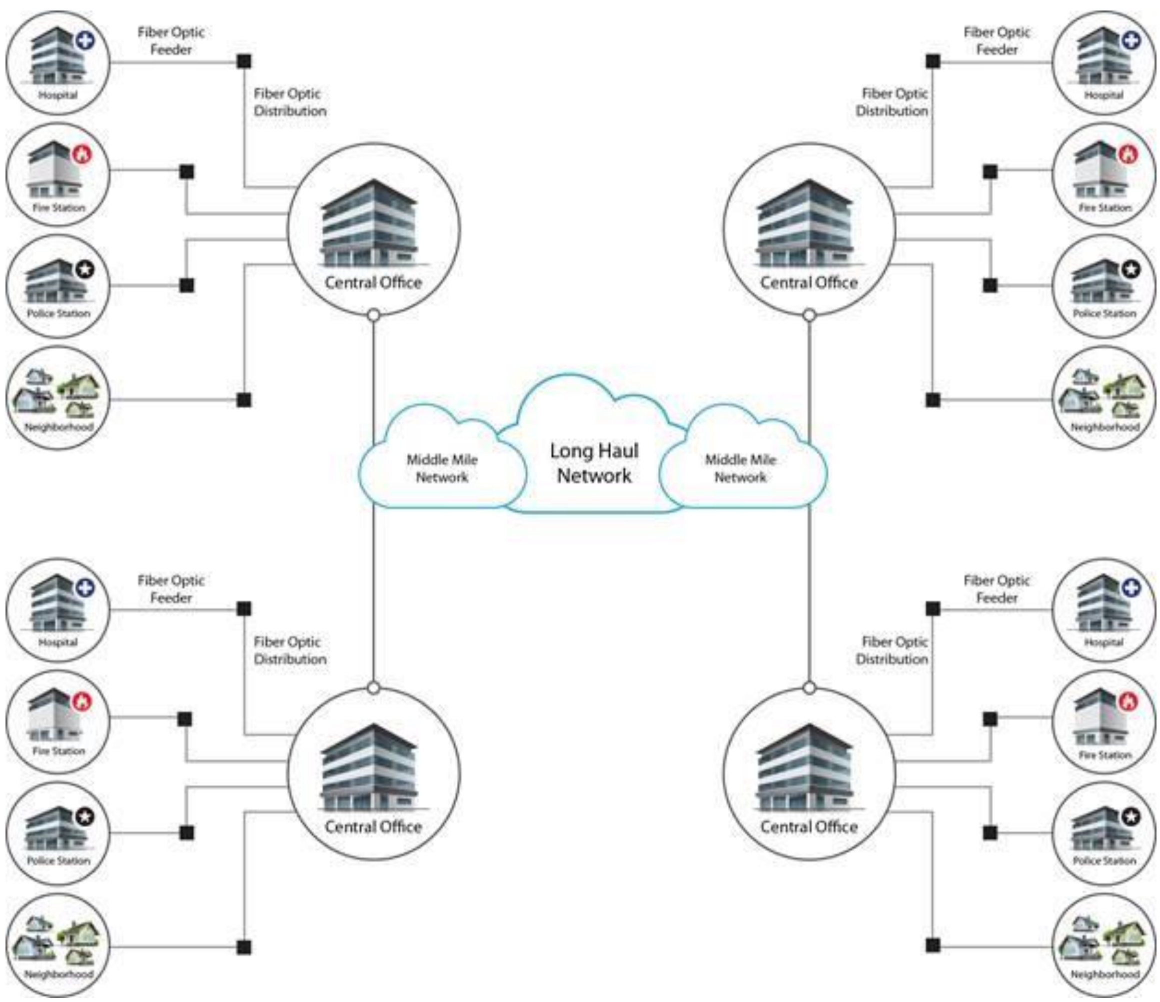


Figure 11.1.1-8: FCC Tower Structure Locations in Montana

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 11.1.1-8.

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).



Source: (ITU-T, 2012)

Prepared by: Booz Allen Hamilton

Figure 11.1.1-9: Typical Fiber Optic Network in Montana

Last Mile Fiber Assets

In Montana, fiber access networks are concentrated in the highest population centers as shown in the figures below. In Montana, there are 23 fiber providers that offer service in the state, as listed in Table 11.1.1-10.

Figure 11.1.1-9 shows coverage for CenturyLink and 3 Rivers Telephone Cooperative, Inc. with Triangle Communications/Range Telephone Cooperative's and all other fiber providers with a coverage area less than 5 percent depicted in Figure 11.1.1-10 and Figure 11.1.1-12, respectively.

Table 11.1.1-10: Fiber Provider Coverage in Montana

Fiber Provider	Coverage
Mid-Rivers Telephone Cooperative, Inc.	2.00%
Triangle Communications	1.96%
Range Telephone Cooperative, Inc.	1.26%
3 Rivers Telephone Cooperative, Inc.	1.26%
Others [a]	3.24%

Source: (NTIA, 2014)

[a] Other: Provider with less than 5 percent coverage area. Providers include: CenturyLink, Nemont Telephone Cooperative, Inc.; Bresnan Communications; Blackfoot Telephone Cooperative, Inc.; Northern Telephone Cooperative, Inc.; Frontier Communications of Montana; Interbel Telephone Cooperative, Inc.; Southern Montana Telephone Company; Ronan Telephone Company; West River Cooperative Telephone Company; Hot Springs Telephone Company; Montana Sky Networks; Lincoln Telephone Company, Inc.; Reservation Telephone Cooperative; USA Companies, L.P.; Montana Sky West; Level 3 Communications, LLC; Western Montana CommunityTel; Northwest Communications.

Data Centers

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

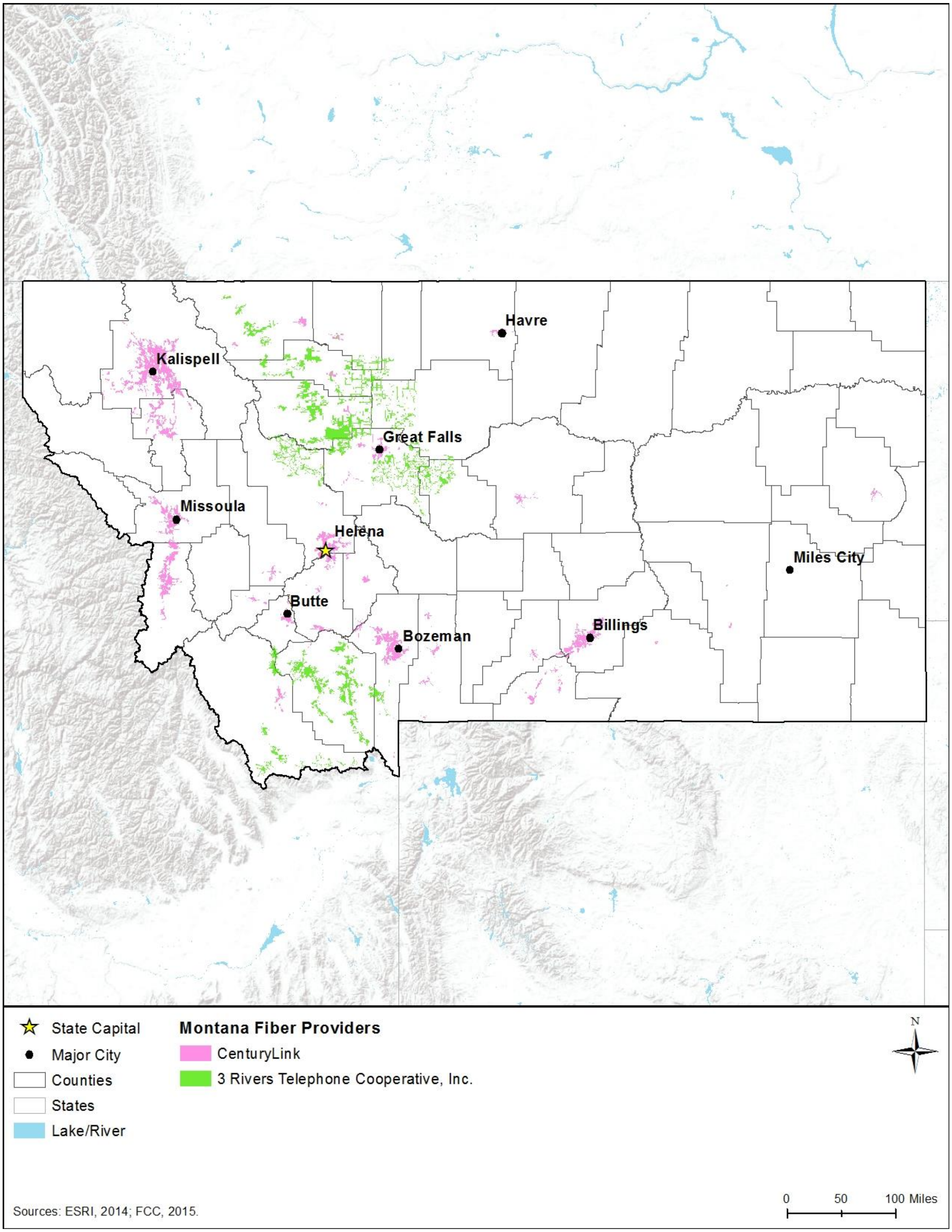


Figure 11.1.1-10: Fiber Availability in Montana for CenturyLink and 3 Rivers Telephone Cooperative, Inc.

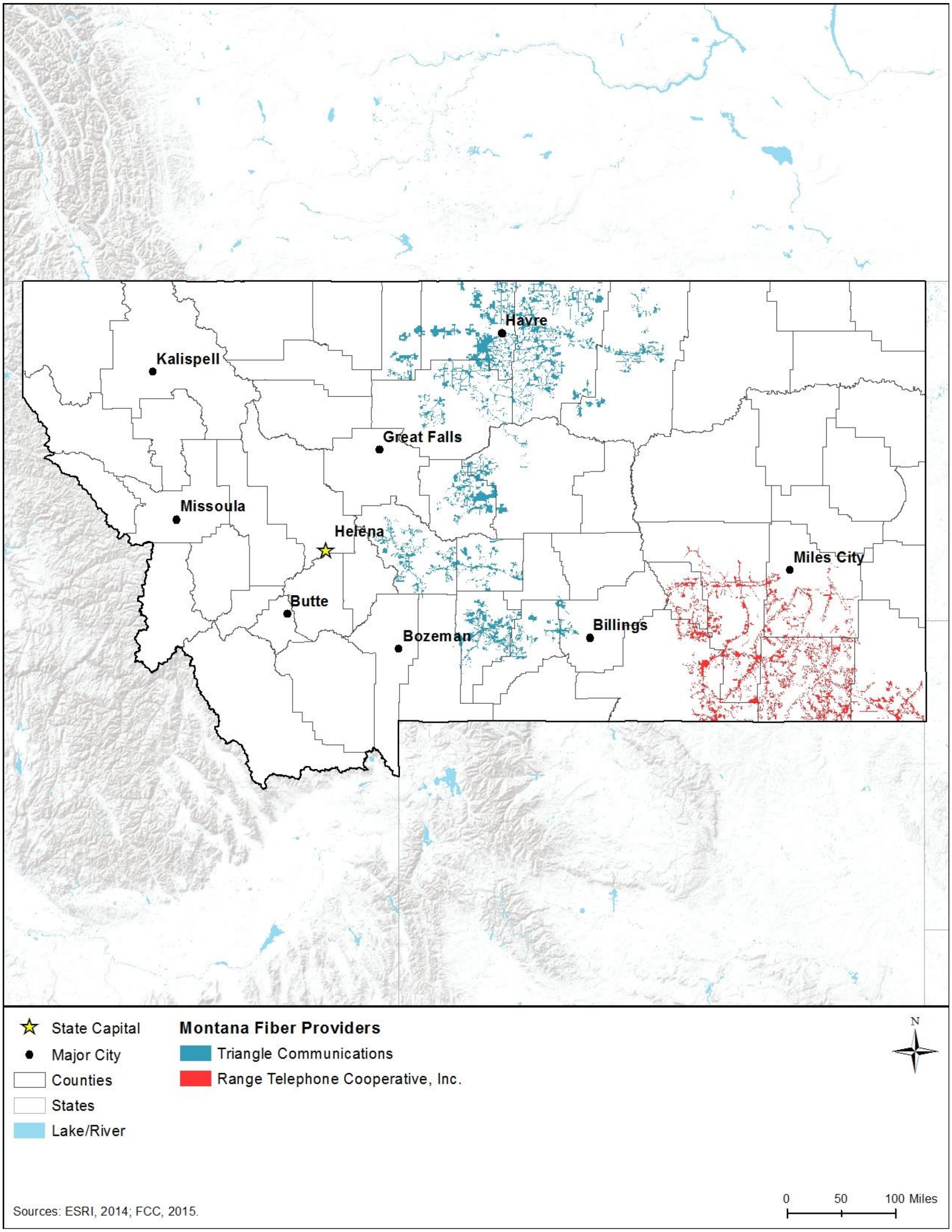


Figure 11.1.1-11: Triangle Communications and Range Telephone Cooperative, Inc. Fiber Availability in Montana

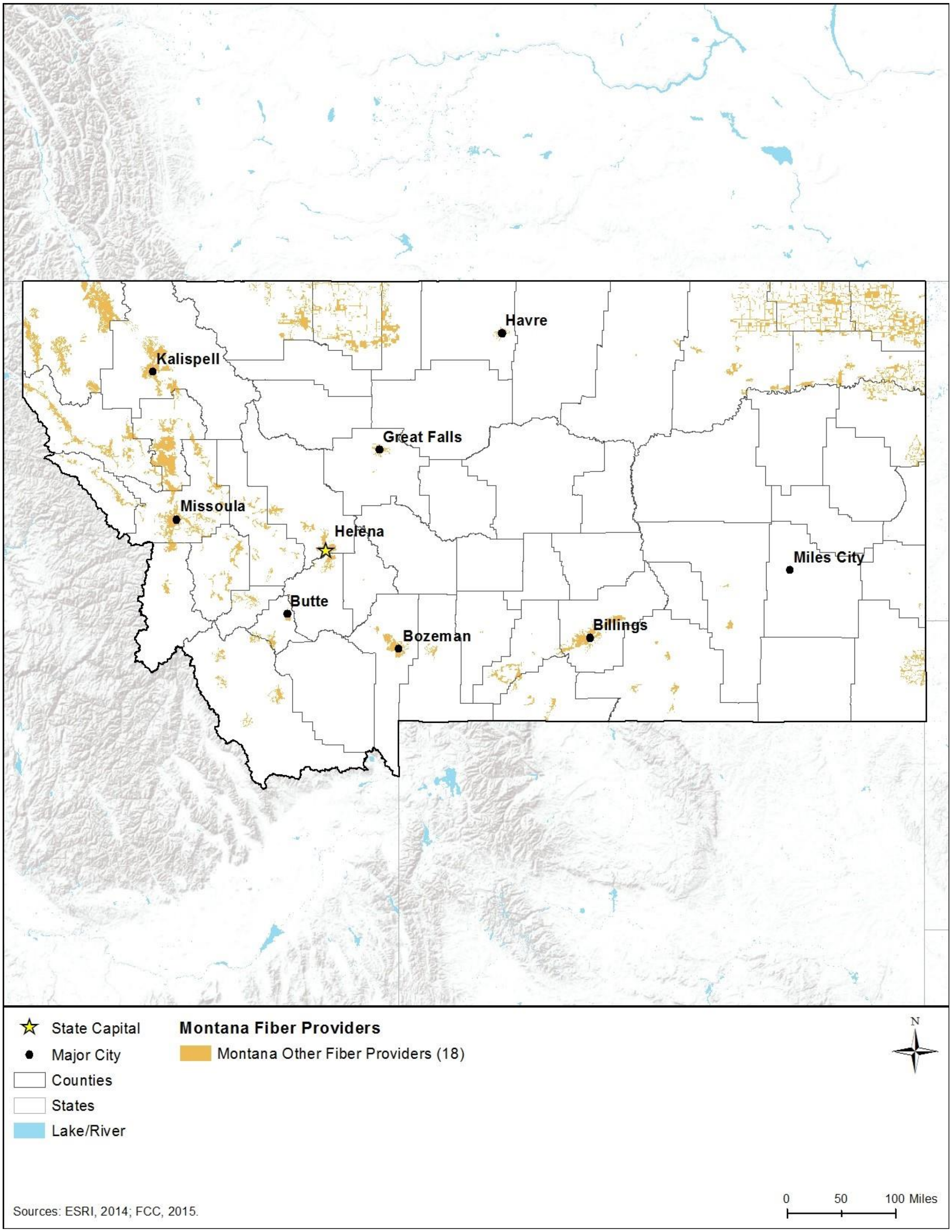


Figure 11.1.1-12: Other Fiber Providers in Montana

11.1.1.6. Utilities

Utilities are the essential systems that support daily operations in a community and cover a broad array of public services, such as electricity, water, wastewater, and solid waste. Section 11.1.4, Water Resources, describes the potable water sources in the state.

Electricity

The Montana Public Service Commission (PSC) regulates Montana's private investor-owned electric utilities. PSC regulates the rates that utilities charge their customers, while balancing this task with ensuring that investors still profit. Rural electric companies and cooperatives are not governed by the PSC (PSC, 2015a). There are four electric companies who have their rates dictated by the PSC: Avista Corporation, Black Hills Power Inc., Montana-Dakota Utilities Co. and North Western Energy (PSC, 2014). Annual reports submitted by these companies detail contact information, company structure, expenses and income, among other financial data (Avista Corporation, 2014).

According to the U.S. Energy Information Administration (EIA), Montana has historically procured its electricity from coal and hydroelectric dams (EIA, 2015b) and since 2006; wind power has been on the rise. In 2014, the state produced 30,257,616 megawatt hours[9] of electricity. Of this, 15,579,415 megawatt hours (52 percent) came from coal, 11,483,751 megawatt hours (38 percent) from hydroelectric, and 1,974,794 megawatt-hours (6.5 percent) from wind power with small percentages of power generated by natural gas, petroleum coke, and biomass. When modern-day wind power was first introduced to Montana in 2006, it accounted for just 0.15 percent of the state's power generation (EIA, 2015b). During 2014, the state experienced a growth in wind electric power generation with 6.5 percent of the state's electricity. Montana's Renewable Energy Resource Standard mandates that 15 percent of electricity sold by public utilities and private electricity companies be generated using renewable sources. Montana is also an important source of coal for the U.S. In 2013, Montana produced the seventh largest amount of coal of all U.S. states (4.3 percent) (EIA, 2015c).

Water

The Montana PSC regulates privately-owned water utilities to ensure the fairness of their rates. Utilities that are privately-owned do not fall under the PSC's jurisdiction, nor do cooperatives that only serve their members (PSC, 2015b). The Montana PSC regulates the rates of 18 private water utilities (PSC, 2015c). The PSC requires regulated utilities to submit an annual report that details financial data and number of customers, as well as more technical information on the company's infrastructure (PSC, 2015d).

Public water systems (defined as those that have "at least 15 service connections or that regularly serve at least 25 persons daily for any 60 or more days in a calendar year") are regulated by the Montana Department of Environmental Quality (MDEQ) (Montana Admin Rules, 2016). Water

[9] One megawatt hour is defined as one thousand kilowatt-hours or 1 million watt-hours; where one watthour is "the electrical energy unit of measure equal to one watt of power supplied to, or taken from, an electric circuit steadily for one hour." (EIA, 2015a)

systems that fall below these requirements are overseen by the Montana Department of Public Health and Human Services (MTDPHHS) (MDEQ, 2015a). The MDEQ requires all public water systems to submit a Consumer Confidence Report (CCR) each year. These reports include information about the source of the systems water, as well as any contaminants found in the water supply. These reports are then distributed to the system's customers (MDEQ, 2015b). In Montana, source waters are considered to be any stream, lake, aquifer, or other body of water used as a source for public drinking water. The Montana Source Water Protection (SWP) Program involves the identification of potential contamination sources in waters, as well as management and emergency plans for dealing with threats to public waters (MDEQ, 2015c).

Wastewater

The Montana PSC regulates the rates of the five privately owned sewer companies in the state (PSC, 2015b) (PSC, 2015e). The PSC requires these utilities to complete an annual report that details sewer infrastructure and financial data about the organization (PSC, 2015d). While the PSC oversees the rates of private systems, some aspects of public systems are overseen by MDEQ. Part of this authority includes the fact that "a public sewer system serving 15 or more families or 25 or more persons daily for any 60 or more days in a calendar year" require approval from the MDEQ to make changes to their infrastructure (MDEQ, 2015d). Additionally, the operators that work at wastewater treatment facilities must be certified through the MDEQ (MDEQ, 2015d).

Montana has 35 treatment plants that operate under a major discharge Montana Pollutant Discharge Elimination System (MPDES) permit and 121 facilities that operate under a minor discharge MPDES permit. All of these facilities discharge their treated wastewater into surface waters, such as rivers or streams. Major permits are issued to treatment facilities that have treat more than one million gallons of wastewater each day. They are also issued to facilities with U.S. Environmental Protection Agency (USEPA) approved programs for industrial pretreatment (MDEQ, 2015e). Minor discharge permits are issued to those facilities that do not meet these requirements, meaning they treat less than one million gallons of wastewater/day and do not have industrial pretreatment programs (MDEQ, 2015e). In addition to these, there are 90 facilities that have been issued a Montana Ground Water Pollution Control System (MGWPCS) permits. These permits allow the operators of "tailings ponds, waste treatment and storage ponds, spill clean-up systems, soil treatment cells," and others facilities to discharge their wastes into state groundwater. The permits function as a means of monitoring the amount of pollutants in Montana's groundwater at a given time, as well as controlling the locations of waste discharge (MDEQ, 2015f).

Solid Waste Management

Montana's solid waste is managed and regulated by the MDEQ. The MDEQ uses "technical reviews, licensing, certifications, compliance monitoring, training and technical assistance" to oversee a number of waste management methods (MDEQ, 2015g). Among these are landfills for municipal or construction waste, recycling of municipal waste and motor vehicles, and the application of on-site waste facilities such as septic tanks. A mixture of landfills, transfer stations, recycling facilities, burn sites, and composed operators make up the 140 waste facilities currently licensed by the MDEQ. Constituting the largest portion of these facilities are Montana's 63 landfills, 19 recycling facilities, and 20 compost operators. The state also has 14 burn facilities and 10 transfer stations. The remaining facilities are a mixture of landfarms, electronic waste facilities, and tire monofills (storage for scrap tires). Montana also has one facility for the treatment of infectious waste (MDEQ, 2014a). In 2014, the state generated 2,043,674 tons of municipal solid waste. Of this, 1,590,542 tons, or 78 percent, was sent to a landfill. The remaining 453,131 tons or 22 percent was sent to a recycling facility or was otherwise diverted. This met the goal set by the Montana Integrated Waste Management Act to divert or recycle 22 percent of the Montana's municipal waste by 2015 (MDEQ, 2014b).

11.1.2. Soils

11.1.2.1. 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.

11.1.2.2. 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, Overview of Relevant Federal Laws and Executive Orders. A list of applicable state laws and regulations is included in Table 11.1.2-1 below.

Table 11.1.2-1: Relevant Montana Soil Laws and Regulations

State Law / Regulation	Regulatory Agency	Applicability
Administrative Rules of Montana 17.30.1101-1117	MDEQ	Sediment and erosion controls must be included in Storm water Pollution Prevention Plan (SWPPP) for permitted construction activities.

Source: (MDEQ, 2015a)

11.1.2.3. Environmental Setting

Montana is composed of four Land Resource Region (LRR),[10] as defined by the National Resources Conservation Service (NRCS) (NRCS, 2006):

- Northern Great Plains Spring Wheat Region
- Rocky Mountain Range and Forest Region
- Western Great Plains Range and Irrigated Region
- Western Range and Irrigated Region

Within and among Montana's four LRRs are 14 Major Land Resource Areas (MLRA),[11] which are characterized by patterns of soils, climate, water resources, land uses, and type of farming. The locations and characteristics of Montana's MLRAs are presented in Figure 11.1.2-1 and Table 11.1.2-2.

Soil characteristics are an important consideration for FirstNet insomuch as soil properties could influence the suitability of sites for network deployment. Soil characteristics can differ over relatively short distances, reflecting differences in parent material; elevation and position on the landscape; biota[12] such as bacteria, fungi, biological crusts, vegetation, and animals; and climatic variables such as precipitation and temperature. For example, expansive soils[13] 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[14] (discussed further in the subsections below).

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

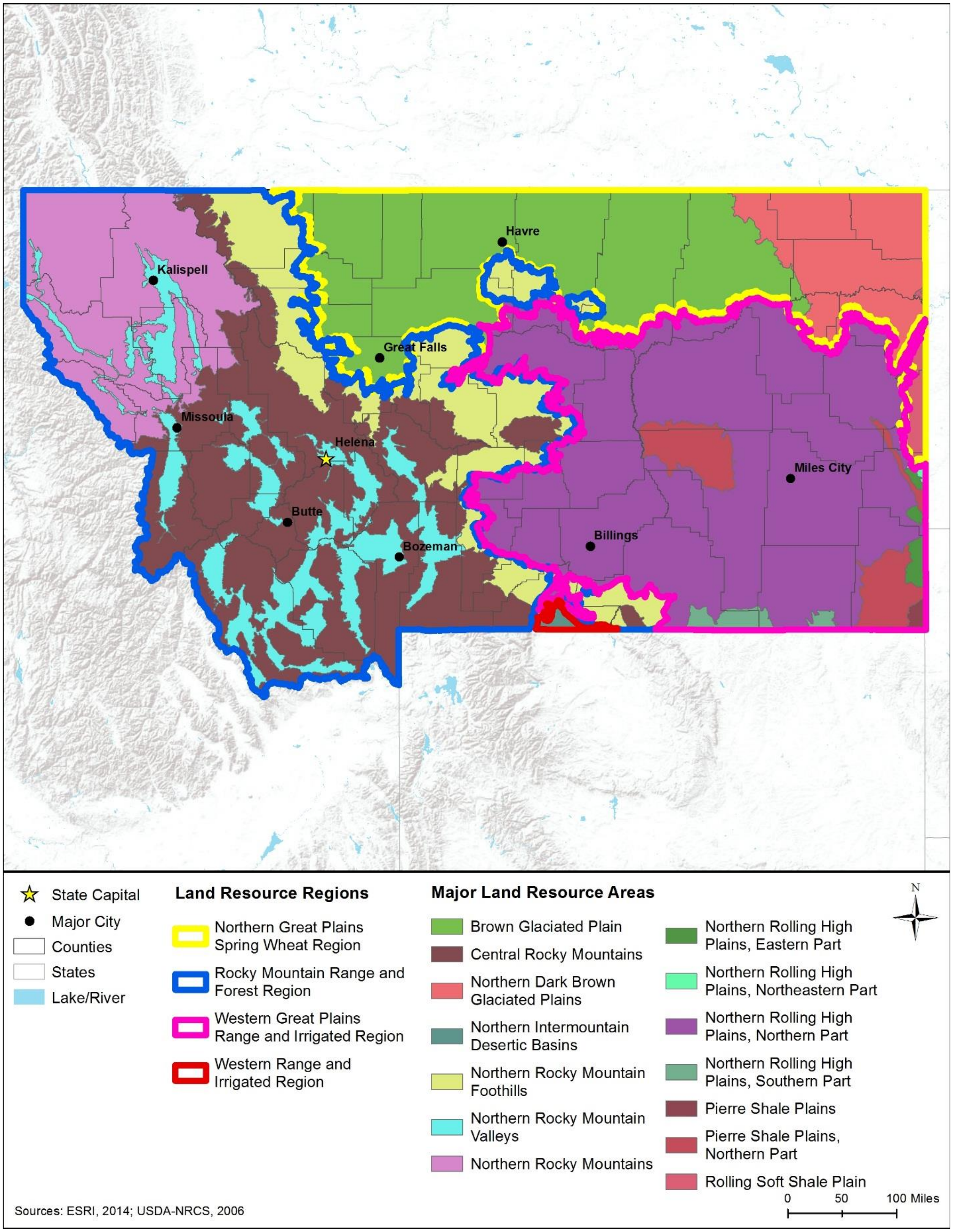


Figure 11.1.2-1: Locations of Major Land Resource Areas in Montana

Table 11.1.2-2: Characteristics of Major Land Resource Areas in Montana

MLRA Name	Region of State	Soil Characteristics
Brown Glaciated Plain	North-Central	Alfisols[a], Entisols[b], and Mollisols[c] are the dominant soil orders. Soils in this MLRA are clayey or loamy[d]. They are well drained and deep.
Central Rocky Mountains	Southwest	Alfisols, Inceptisols[e] and Mollisols are the prevalent soil orders in this MLRA.
Northern Dark Brown Glaciated Plains	Northeast	Inceptisols and Mollisols are the dominant soil orders. Soils in this MLRA are loamy or clayey, ranging from well drained to moderately well drained. They are typically very deep.
Northern Intermountain Desertic Basins	Far South-Central	Entisols[f] and Aridisols[g] dominate the soil order regime. These soils are loamy and well drained. They range from shallow to very deep.
Northern Rocky Mountain Foothills	West	Mollisols and Entisols are the predominant soil orders. They are clayey or loamy and typically well drained. They range from shallow to very deep.
Northern Rocky Mountain Valleys	West	Aridisols, Inceptisols, and Mollisols are the dominant soil orders. They are loamy or loamy skeletal with great depth, and are well drained.
Northern Rocky Mountains	West	Alfisols, Andisols,[h] and Inceptisols are the predominant soil orders. These soils range from shallow to very deep. Most of the soil texture classes can be found in these soils, and therefore range from well drained to very poorly drained.
Northern Rolling High Plains, Eastern Part	Far Southeast	Alfisols, Entisols, Inceptisols, and Mollisols are the dominant soil orders. These soils are typically well drained and range from very deep to shallow. They tend to be clayey or loamy.
Northern Rolling High Plains, Northeastern Part	Far Southeast	Entisols, Inceptisols, and Mollisols are the prevalent soil orders in this MLRA. These soils range from very deep to shallow. They tend to be well drained and loamy.
Northern Rolling High Plains, Northern Part	Central and East	Entisols and Inceptisols are the dominant soil orders. These soils range from very deep to shallow. They are typically well drained and tend to be clayey or loamy.
Northern Rolling High Plains, Southern Part	Far Southeast	Aridisols and Entisols are the dominant soil orders in this MLRA. These soils range from very deep to shallow. They are typically well drained and tend to be clayey or loamy.
Pierre Shale Plains	Far Southeast	Alfisols, Entisols, Mollisols, Inceptisols, and Vertisols[i] are all dominant soil orders, with Mollisols to a lesser extent. These soils range from very deep to shallow. They are clayey, and typically well drained.
Pierre Shale Plains, Northern Part	Central and Southeast	Alfisols, Entisols, and Vertisols are the predominant soil orders in this MLRA. They range from very deep to shallow. They are clayey, and typically well drained.
Rolling Soft Shale Plain	Far East	Entisols and Mollisols are the dominant soil orders. They range from very deep to shallow, and from moderately well drained to somewhat excessively drained. They are typically loamy or clayey.

Source: (NRCS, 2006)

[a] "Soils found in semiarid to moist areas that are formed from weathering processes that leach clay minerals and other constituents out of the surface layer and into the subsoil. They are productive for most crop, are primarily formed under forest or mixed vegetative cover, and make up nearly 10% of the world's ice-free land surface." (NRCS, 2015b)

[b] "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, 2015b)
[c] "Soils that have a dark colored surface horizon relatively high in content of organic matter. They are base rich throughout and quite fertile. Mollisols form under grass in climates that have a moderate to pronounced seasonal moisture deficit." (NRCS, 2015b)
[d] Loamy Soil: "[A soil] that combines [sand, silt, and clay] in relatively equal amounts." (Purdue University Consumer Horticulture, 2006)
[e] "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, 2015b)
[f] "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, 2015b)
[g] "Soils that are too dry for the growth of mesophytic plants. Lack of moisture greatly restricts the intensity of the weathering process and limits most soil development processes to the upper part of the soils. They make up about 12% of the world's ice-free land surface."
[h] "These soils tend to be highly productive, and are common in cool areas with moderate to high precipitation, especially in areas associated with volcanic materials. They make up about 1% of the world's ice-free land surface." (NRCS, 2015b)
[i] "These soils have a high content of expanding clay minerals and undergo pronounced changes in volume with changes in moisture. Because they swell when wet, they transmit water very slowly and have undergone little leaching. They tend to be fairly high in natural fertility. These soils make up about 2% of the world's ice-free land surface." (NRCS, 2015b)

11.1.2.4. 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[15]; there are 12 soil orders in the world and they are characterized by both observed and inferred[16] 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, 2015c). The STATSGO2[17] soil database identifies 26 different soil suborders in Montana (NRCS, 2015d). FirstNet used the STATSGO2 database to obtain soils information at the programmatic level to ensure consistency across all the states and territories. This regional information provides a sufficient level of detail for a programmatic analysis. The best available soils data and information, including the use of the more detailed SSURGO database, will be used, as appropriate, during subsequent site-specific assessments. Figure 11.1.2-2 depicts the distribution of the soil suborders, and Table 11.1.2-3 provides a summary of the major physical-chemical characteristics of the various soil suborders found.

[15] Science of naming and classifying organisms or specimens
[16] "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, 2015c)
[17] STATSGO2 is the Digital General Soil Map of the United States that shows general soil association units across the landscape of the nation. Developed by the National Cooperative Soil Survey, STATSGO2 supersedes the State Soil Geographic (STATSGO) dataset; 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, 2015d)

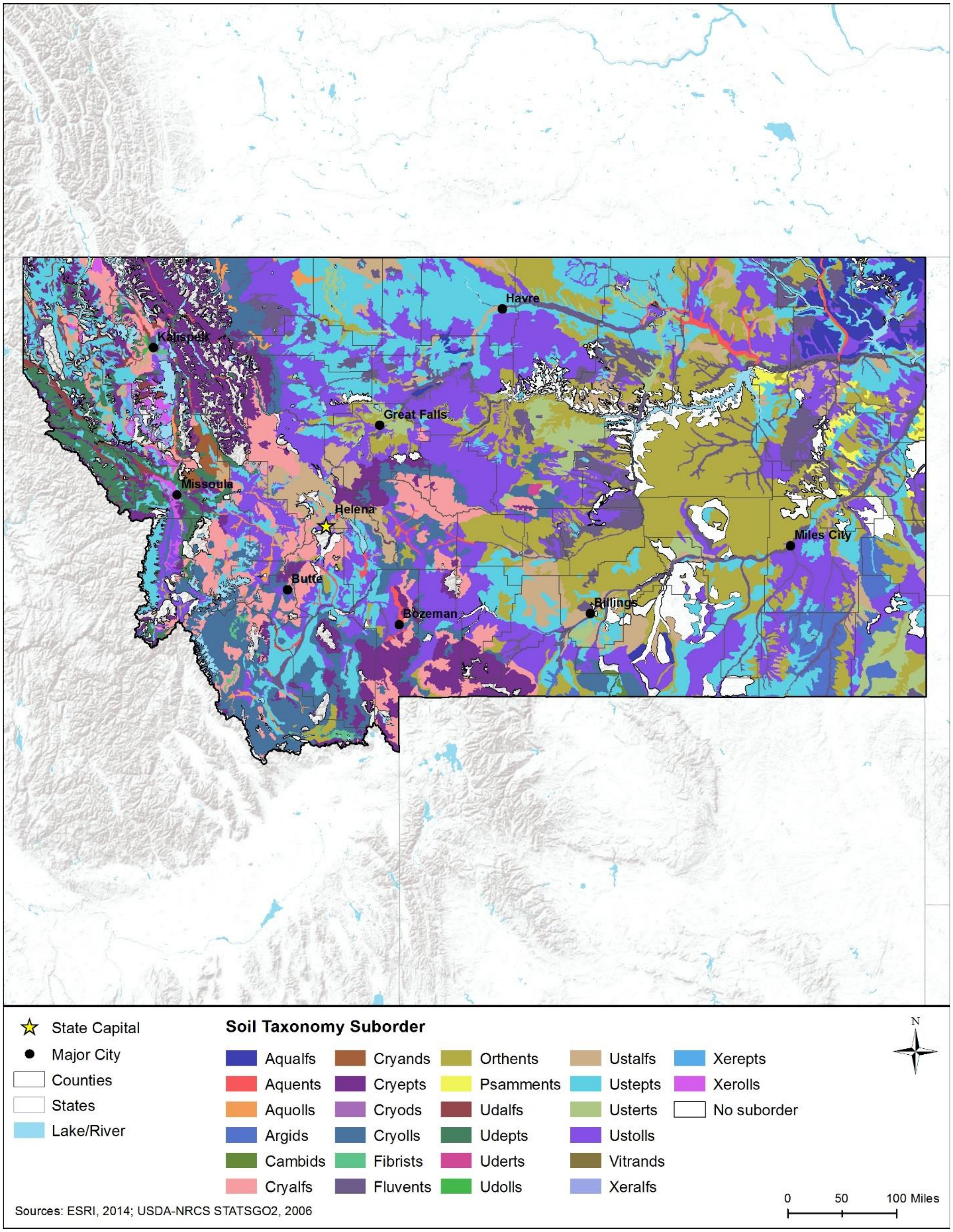


Figure 11.1.2-2: Montana Soil Taxonomy Suborders

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Table 11.1.2-3: Major Characteristics of Soil Suborders[a] Found in Montana, as depicted in Figure 11.1.2-2

Soil Order	Soil Suborder	Ecological Site Description	Soil Texture	Slope (%)	Drainage Class	Hydric[b] Soil	Hydrologic Group	Runoff Potential[c]	Permeability	Erosion Potential	Compaction and Rutting Potential	Limitation for Construction
Alfisols	Aqualfs	Generally have warm and aquic (saturated with water long enough to cause oxygen depletion) conditions. Aqualfs are used as cropland for growing corn, soybeans, and rice, and most have some artificial drainage or other water control. Nearly all Aqualfs have likely supported forest vegetation in the past.	Clay, clay loam	0-2	Poorly drained	Yes	D	High	Very Low	High	High, due to hydric soil and poor drainage conditions	Erosion and Compaction
Entisols	Aquents	Widely distributed, with some forming in sandy deposits, and most forming in recent sediments. Aquents support vegetation that tolerates either permanent or periodic wetness, and are mostly used for pasture, cropland, forest, or wildlife habitat.	Extremely gravelly loamy[d] sand, silt loam, silty clay, silty clay loam, stratified sandy loam to silty clay loam	0-2	Poorly drained to moderately well drained	Yes, No	C, D	Medium, High	Low, Very Low	Medium to High, depending on slope	High, due to hydric soil and poor drainage conditions	Erosion and Compaction
Mollisols	Aquolls	Aquolls support grass, sedge, and forb vegetation, as well as some forest vegetation. However, most have been artificially drained and utilized as cropland.	Clay loam, extremely gravelly sand, loam, silt loam, silty clay, silty clay loam, stratified gravelly loamy sand to coarse sandy loam, very gravelly sandy loam	0-8	Poorly drained to very poorly drained	Yes, No	C, D	Medium, High	Low, Very Low	Medium to High, depending on slope	High, due to hydric soil and poor drainage conditions	Erosion and Compaction
Aridisols	Argids	Argids are found in the western United States. They are primarily used as wildlife habitat or rangeland, although some can also be used as cropland, if irrigated.	Clay loam, extremely gravelly sand, loam, silt loam, silty clay loam, very gravelly clay loam	0-35	Well drained	No	B, C	Medium	Moderate, Low	Medium	Low	Erosion
Aridisols	Cambids	Cambids are found in the western United States, with little soil development. They are primarily used as wildlife habitat or rangeland, although some can also be used as cropland, if irrigated.	Loam	4-8	Well drained	No	C	Medium	Low	Medium	Low	Erosion
Alfisols	Cryalfs	Cryalfs are cold weather soils found primarily at high elevations. Due to the cold, short growing season, the majority of these soils are utilized as forest.	Channery[e] sandy clay loam, clay loam, cobbly[f] clay, cobbly sandy clay loam, cobbly sandy loam, gravelly loam, gravelly silt loam, loam, very cobbly clay loam, very cobbly loam, very gravelly clay loam, very gravelly loam, very gravelly sandy clay loam, very gravelly silt loam, very gravelly silty clay loam, very gravelly very fine sandy loam	4-60	Well drained	No	B, C	Medium	Moderate, Low	Medium	Low	Erosion
Andisols	Cryands	Cryands are typically used as forest, and are primarily formed under vegetation in coniferous forests.	Silt loam, very cobbly silt loam, very gravelly silt loam	30-80	Well drained	No	B, D	Medium, High	Moderate, Very Low	Medium to High, depending on slope	Low	Erosion

Soil Order	Soil Suborder	Ecological Site Description	Soil Texture	Slope (%)	Drainage Class	Hydric[b] Soil	Hydrologic Group	Runoff Potential[c]	Permeability	Erosion Potential	Compaction and Rutting Potential	Limitation for Construction
Inceptisols	Cryepts	Cryepts are soils of high latitudes or high elevations, and support cold weather vegetation such as conifers and hardwoods. They are mostly used as forest or wildlife habitat, although some are also used as cropland.	Channery loam, channery silt loam, cobbly clay loam, cobbly loam, cobbly sandy loam, extremely channery loam, extremely cobbly sandy clay loam, extremely flaggy loam, extremely gravelly fine sandy loam, extremely gravelly sandy loam, extremely loamy stony coarse sand, gravelly loam, gravelly silt loam, loam, silt loam, silty clay loam, variable, very channery sandy loam, very gravelly coarse sandy loam, very gravelly loam, very gravelly sandy loam	4-80	Excessively drained to well drained	No	A, B, C, D	Low, Medium, High	High, Moderate, Low, Very Low	Low to High, depending on slope	Low	Erosion
Spodosols	Cryods	Cryods are soils of high latitudes and/or high elevations, with coniferous forest vegetation, and are used as forest or wildlife habitat.	Very gravelly clay loam	2-35	Well drained	No	C	Medium	Low	Medium	Low	Erosion
Mollisols	Cryolls	Cryolls are generally freely drained, cold weather soils. They are primarily used as rangeland, along with some forest and pasture. Forest, grass, or grass/shrub vegetation are supported with these soils.	Channery silt loam, clay loam, cobbly loam, extremely cobbly loam, extremely cobbly sandy loam, extremely flaggy loam, extremely gravelly loam, extremely stony sandy loam, gravelly clay, gravelly clay loam, gravelly loam, gravelly loamy coarse sand, loam, sandy loam, silt loam, silty clay, silty clay loam, unweathered bedrock, very cobbly sandy clay loam, very cobbly sandy loam, very flaggy sandy loam, very gravelly clay loam, very gravelly coarse sandy loam, Very gravelly fine sandy loam, very gravelly loam, very gravelly loamy coarse sand, very gravelly sandy loam, very stony clay loam, very stony loam, weathered bedrock	0-70	Well drained to somewhat poorly drained	No	B, C, D	Medium, High	Moderate, Low, Very Low	Medium to High, depending on slope	Low	Erosion
Histosols	Fibrists	Fibrists are slightly decomposed wet Histosols that support natural vegetation including shrubs, forbs[g], grasses, and widely spaced small trees.	Gravelly sandy loam, mucky peat, peat	0-4	Poorly drained to very poorly drained	Yes	D	High	Very Low	High	High, due to hydric soil and poor drainage conditions	Erosion and Compaction

Soil Order	Soil Suborder	Ecological Site Description	Soil Texture	Slope (%)	Drainage Class	Hydric[b] Soil	Hydrologic Group	Runoff Potential[c]	Permeability	Erosion Potential	Compaction and Rutting Potential	Limitation for Construction
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.	Clay loam, extremely gravelly loamy coarse sand, fine sandy loam, gravelly sandy loam, loam, loamy sand, sandy loam, silt loam, silty clay loam, stratified extremely gravelly sand to very gravelly loamy sand, stratified fine sand to loamy fine sand, stratified fine sandy loam to clay, stratified fine sandy loam to clay loam, stratified fine sandy loam to silty clay loam, stratified loam to silty clay loam, stratified loamy fine sand to clay loam, stratified loamy fine sand to silt loam, stratified loamy sand to fine sandy loam, stratified sandy loam to clay loam, stratified silt loam to clay, stratified very cobbly loamy sand to silt loam, stratified very fine sandy loam to silty clay loam, very gravelly sand	0-8	Poorly drained to somewhat excessively drained	No	A, B, C, D	Low, Medium, High	High, Moderate, Low, Very Low	Low to High, depending on slope	Low	Erosion
Entisols	Orthents	Orthents are commonly found on recent erosional surfaces and are used primarily as rangeland, pasture, or wildlife habitat.	Channery sandy loam, clay, clay loam, extremely cobbly loamy fine sand, extremely gravelly loam, fine sandy loam, fragmented material, gravelly sandy loam, loam, loamy coarse sand, sandy loam, silt loam, silty clay, Silty clay loam, unweathered bedrock, very gravelly loam, weathered bedrock	0-70	Excessively drained to moderately well drained	No	A, B, C, D	Low, Medium, High	High, Moderate, Low, Very Low	Low to High, depending on slope	Low	Erosion
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, weathered bedrock	4-45	Excessively drained to somewhat excessively drained	No	A, D	Low, High	High, Very Low	Low to High, depending on slope	Low	Erosion
Alfisols	Udalfs	Udalfs have an udic (humid or subhumid climate) moisture regime, and are believed to have supported forest vegetation at some time during development.	Gravelly loam, silt loam, silty clay loam	0-35	Well drained to somewhat poorly drained	No	B, C, D	Medium, High	Moderate, Low, Very Low	Medium to High, depending on slope	Low	Erosion

Soil Order	Soil Suborder	Ecological Site Description	Soil Texture	Slope (%)	Drainage Class	Hydric[b] Soil	Hydrologic Group	Runoff Potential[c]	Permeability	Erosion Potential	Compaction and Rutting Potential	Limitation for Construction
Inceptisols	Udepts	Udepts have an udic or perudic (saturated with water long enough to cause oxygen depletion) moisture regime, and are mainly freely drained. Most of these soils currently support or formerly supported forest vegetation, with mostly coniferous forest in the Northwest and mixed or hardwood forest in the East. Some also support shrub or grass vegetation, and in addition to being used as forest, some have been cleared and are used as cropland or pasture.	Extremely gravelly coarse sandy loam, extremely gravelly fine sandy loam, extremely gravelly loam, extremely gravelly sandy loam, fine sandy loam, gravelly loam	2-70	Somewhat excessively drained to well drained	No	B	Medium	Moderate	Medium	Low	Erosion
Vertisols	Uderts	Uderts are found in humid areas, and primarily used as cropland, forest, or pasture. They have low permeability, and water usually must be drained from the surface of cropland.	Clay	4-25	Somewhat poorly drained	No	D	High	Very Low	High	Low	Erosion
Mollisols	Udolls	Udolls are found in humid climates. They are more or less freely drained, and have historically supported tall grass prairie. They are used as pasture or rangeland, and as cropland in areas with little slope.	Gravelly loam	15-30	Well drained	No	B	Medium	Moderate	Medium	Low	Erosion
Alfisols	Ustalfs	Ustalfs are primarily used for grazing or cropland, and they support savanna and grassland vegetation. They are found in areas with a marked dry season.	Clay, clay loam, extremely channery clay loam, extremely gravelly loam, fine sand, gravelly ashy sandy clay loam, gravelly clay loam, gravelly loam, gravelly sandy loam, loam, silt loam, silty clay, silty clay loam, very cobbly loam, very gravelly clay loam, very gravelly loam, very gravelly sandy clay loam	0-60	Somewhat excessively drained to somewhat poorly drained	No, Yes	B, C, D	Medium, High	Moderate, Low, Very Low	Medium to High, depending on slope	High, due to hydric soil and poor drainage conditions	Erosion and Compaction
Inceptisols	Ustepts	Ustepts are freely drained soils, typically used as pasture or cropland, although some support forest, rangeland, and wildlife habitat.	Channery loam, clay loam, cobbly loam, extremely channery loam, extremely gravelly fine sandy loam, extremely gravelly loam, extremely gravelly sandy loam, fine sandy loam, gravelly loam, gravelly sandy loam, loam, sandy loam, silt loam, silty clay loam, stratified loamy sand to gravelly loam, stratified sandy loam to clay loam, unweathered bedrock, very channery loam, very cobbly loam, very gravelly loam, Very gravelly sandy loam, weathered bedrock	0-75	Excessively drained to somewhat poorly drained	No	B, C, D	Medium, High	Moderate, Low, Very Low	Medium to High, depending on slope	Low	Erosion

Soil Order	Soil Suborder	Ecological Site Description	Soil Texture	Slope (%)	Drainage Class	Hydric[b] Soil	Hydrologic Group	Runoff Potential[c]	Permeability	Erosion Potential	Compaction and Rutting Potential	Limitation for Construction
Vertisols	Usterts	Usterts are soils with low permeability, and receive low rainfall amounts. They support grasses and forbs, and are mostly used for rangeland or cropland. However, but due to their low permeability, they typically need to be artificially drained if irrigated, to prevent standing water and a buildup of salinity.	Clay, clay loam, silty clay, unweathered bedrock	0-45	Well drained	No	D	High	Very Low	High	Low	Erosion
Mollisols	Ustolls	Ustolls typically supported grass and forest vegetation, and are now primarily used as cropland or rangeland. They are generally freely drained, and found in subhumid to semiarid climates. Areas with drought are common, and blowing soil can be an issue.	Cemented, channery loam, clay, clay loam, cobbly loam, extremely channery loam, extremely cobbly loamy sand, extremely gravelly loam, extremely gravelly loamy sand, extremely stony clay loam, fine sandy loam, gravelly clay loam, gravelly fine sandy loam, gravelly loam, gravelly loamy fine sand, gravelly sandy loam, loam, loamy fine sand, loamy sand, sand, sand and gravel, sandy loam, silt loam, silty clay loam, stony silt loam, stratified extremely gravelly sandy loam to gravelly loam, stratified gravelly sandy loam to silty clay loam, unweathered bedrock, variable, very channery clay loam, very channery loam, very channery sandy loam, very cobbly loam, very cobbly silt loam, very fine sandy loam, very flaggy loam, Very gravelly loam, very gravelly loamy sand, very gravelly sand, very gravelly sandy loam, very stony clay loam, very stony sandy clay loam, weathered bedrock	0-70	Excessively drained to somewhat poorly drained	No	A, B, C, D	Low, Medium, High	High, Moderate, Low, Very Low	Low to High, depending on slope	Low	Erosion
Andisols	Vitrands	Vitrands are mostly utilized as forest, although some can be used for rangeland, or cleared and used for pasture or cropland. They are generally well drained, with a coarse texture and low water content. These soils typically form under coniferous forest vegetation.	Gravelly sandy loam, gravelly silt loam	5-90	Well drained	No	B	Medium	Moderate	Medium	Low	Erosion
Alfisols	Xeralfs	Xeralfs support warmer weather, drier vegetation such as annual grasses, forbs, and woody shrubs, along with cooler, wetter vegetation such as coniferous forest. They are typically used for forest, grazing, and croplands.	Clay, silty clay loam	0-30	Well drained	No	D	High	Very Low	High	Low	Erosion

Soil Order	Soil Suborder	Ecological Site Description	Soil Texture	Slope (%)	Drainage Class	Hydric[b] Soil	Hydrologic Group	Runoff Potential[c]	Permeability	Erosion Potential	Compaction and Rutting Potential	Limitation for Construction
Inceptisols	Xerepts	Xerepts support coniferous forest, shrubs, grasses, and trees, are typically used for forest, pasture, or croplands, and sometimes as wildlife habitat or rangeland. They are generally freely drained and found in the western United States.	Gravelly loam, silt loam, weathered bedrock	0-65	Well drained to excessively drained	No	B	Medium	Moderate	Medium	Low	Erosion
Mollisols	Xerolls	Xerolls are found on sloping lands in Mediterranean climates. They are generally freely drained, although typically dry for extended periods in summer. These soils are used for irrigated croplands, and those on very steep slopes are used for rangeland and forest.	Extremely gravelly sandy loam, gravelly loam, Gravelly sandy loam, loam, silt loam, Very cobbly clay loam, very gravelly loam	0-50	Excessively drained to moderately well drained	No	A, B, C, D	Low, Medium, High	High, Moderate, Low, Very Low	Low to High, depending on slope	Low	Erosion

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

[a] Soil suborders constitute a broad range of soil types. Within each suborder, the range of soil types may have a range of properties across the state, which result in multiple values being displayed in the table for that suborder.
[b] Hydric Soil: "A soil that formed under conditions of saturation, flooding or ponding long enough during the growing season to develop anaerobic conditions in the upper part" (NRCS, 2015e). Soil suborders constitute a broad range of soil types. Within each soil suborder, some specific soil types are hydric while others are not.
[c] Based on Runoff Potential, described in Section 11.1.2.5.
[d] Loamy Soil: "[A soil] that combines [sand, silt, and clay] in relatively equal amounts." (Purdue University Consumer Horticulture, 2006)
[e] Channery: "[Rock fragments or] Unattached pieces of rock 2 mm in diameter or larger that are strongly cemented or more resistant to rupture." (Soil Science Society of America, 2016)
[f] Cobbly: "Containing appreciable quantities of cobblestones. See also rock fragments." (Soil Science Society of America, 2016)
[g] Forbs: "Nonwoody, broad-leaved plants." (Virginia Department of Game and Inland Fisheries, 2016)

11.1.2.5. Runoff Potential

The NRCS uses four Hydrologic Soil Groups (A, B, C, and D) that are based on a soil's runoff potential.[18] Group A generally has the smallest runoff potential, whereas Group D generally has the greatest (Purdue University, 2015). Table 11.1.2-3 provides a summary of the runoff potential for each soil suborder in Montana.

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

Group B. Silt loam or loam soils. This group of soils has a "moderate infiltration rate when thoroughly wetted and consists chiefly or moderately deep to deep, moderately well to well drained soils with moderately fine to moderately coarse textures" (Purdue University, 2015). This group has medium runoff potential. Argids, Cryalfs, Cryands, Cryepts, Cryolls, Fluvents, Orthents, Udalfs, Udepts, Udolls, Ustalfs, Ustepts, Ustolls, Vitrands, Xerepts, and Xerolls fall into this category in Montana.

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. Aquents, Aquolls, Argids, Cambids, Cryalfs, Cryepts, Cryods, Cryolls, Fluvents, Orthents, Udalfs, Ustalfs, Ustepts, Ustolls, and Xerolls fall into this category in Montana.

Group D. Clay loam, silty clay loam, sandy clay, silty clay, or clay soils. This group of soils "has the highest runoff potential. They have very low infiltration rates when thoroughly wetted and consist chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with a claypan or clay layer at or near the surface and shallow soils over nearly impervious material" (Purdue University, 2015). Aqualfs, Aquents, Aquolls, Cryands, Cryepts, Cryolls, Fibrists, Fluvents, Orthents, Psamments, Udalfs, Uderts, Ustalfs, Ustepts, Usterts, Ustolls, Xeralfs, and Xerolls fall into this category in Montana.

11.1.2.6. Soil Erosion

"Soil erosion [is] 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, and degrade water quality and aquatic habitat. When topsoil is eroded, organic material is depleted, creating loss of nutrients available for plant growth. Soil particles

[18] Classifying soils is highly generalized and it is challenging to differentiate orders as soil properties can change with distance or physical properties. The soil suborders are described at a high level, therefore soil groups may be found in multiple hydrologic groups within a state, as composition, topography, etc. varies in different areas.
[19] Infiltration Rate: "The rate at which a soil under specified conditions absorbs falling rain, melting snow, or surface water expressed in depth of water per unit time." (FEMA, 2010)

displaced by wind can cause human health problems and reduced visibility, creating a public safety hazard (NRCS, 1996a). Table 11.1.2-3 provides a summary of the erosion potential for each soil suborder in Montana. Soils with the highest erosion potential in Montana include those in the Aqualfs, Aquents, Aquolls, Argids, Cambids, Cryalfs, Cryands, Cryepts, Cryods, Cryolls, Fibrists, Fluvents, Orthents, Psamments, Udalfs, Udepts, Uderts, Udolls, Ustalfs, Ustepts, Usterts, Ustolls, Vitrands, Xeralfs, Xerepts, and Xerolls suborders, which are found throughout the entire state (Figure 11.1.2-2).

11.1.2.7. 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 (USFS, 2009b). 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 11.1.2-3 provides a summary of the compaction and rutting potential for each soil suborder in Montana. Soils with the highest potential for compaction and rutting in Montana include those in the Aqualfs, Aquents, Aquolls, Fibrists, and Ustalfs suborders, which are found across the state (Figure 11.1.2-2).

11.1.3. Geology

11.1.3.1 Definition of the Resource

The U.S. Geological Survey (USGS) is the primary government organization responsible for the nation’s geological resources. USGS defines geology as an interdisciplinary science with a focus on the following aspects of earth sciences: geologic hazards and disasters, climate variability and change, energy and mineral resources, ecosystem and human health, and ground-water availability. Several of these elements are discussed in other Chapters of this Final PEIS, including Water Resources (Section 11.1.1.7), Human Health and Safety (Section 11.1.15), and Climate Change (Section 11.1.14).

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

- Section 11.1.3.3, Environmental Setting: Physiographic Regions and Provinces[20,21]
- Section 11.1.3.4, Surface Geology
- Section 11.1.3.5, Bedrock Geology[22]
- Section 11.1.3.6, Paleontological Resources[23]
- Section 11.1.3.7, Fossil Fuel and Mineral Resources
- Section 11.1.3.8, Geologic Hazards[24]

11.1.3.2 Specific Regulatory Considerations

The Proposed Action must meet the requirements of NEPA and other applicable laws and regulations. A list of applicable state laws and regulations is included in Table 11.1.3-1 below.

Table 11.1.3-1: Relevant Montana Geology Laws and Regulations

State Law / Regulation	Regulatory Agency	Applicability
State of Montana Building Codes	Montana Department of Labor and Industry (MTDLI)	Guidelines for seismic design
Excepted Activities on State Lands	Montana Department of Natural Resources and Conservation (MT DNRC)	Any collection or disturbance of paleontological sites on state lands requires a separate and specific authorization from MT DNRC.

Source: (MDEQ, 2015h) (MT DNRC, 2015a)

11.1.3.3 Environmental Setting: Physiographic Regions and Provinces

As a way to describe areas of the United States based on common landforms (i.e., not climate or vegetation), geologist Nevin Fenneman created the concept of physiographic regions in 1916. 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 local scale. (Fenneman, 1916)

[20] Physiographic regions: Areas of the United States that share commonalities based on topography, geography, and geology. (Fenneman, 1916)
[21] Physiographic provinces: Subsets within physiographic regions. (Fenneman, 1916)
[22] Bedrock: Solid rock beneath the soil and superficial rock. (USGS, 2015a)
[23] Paleontology: "Study of life in past geologic time based on fossil plants and animals." (USGS, 2015b)
[24] Geologic Hazards: "Any geological or hydrological process that poses a threat to people and/or their property, which includes but is not limited to volcanic eruptions, earthquakes, landslides, sinkholes, mudflows, flooding, and shoreline movements." (NPS, 2013)

Montana is composed of two physiographic regions; eastern Montana falls within the Interior Plains Region (Great Plains Province), while western Montana is within the Rocky Mountain System (Northern Rocky Mountains Province) (USGS, 2015c) (Figure 11.1.3-1). Montana's physiography is discussed in detail below.

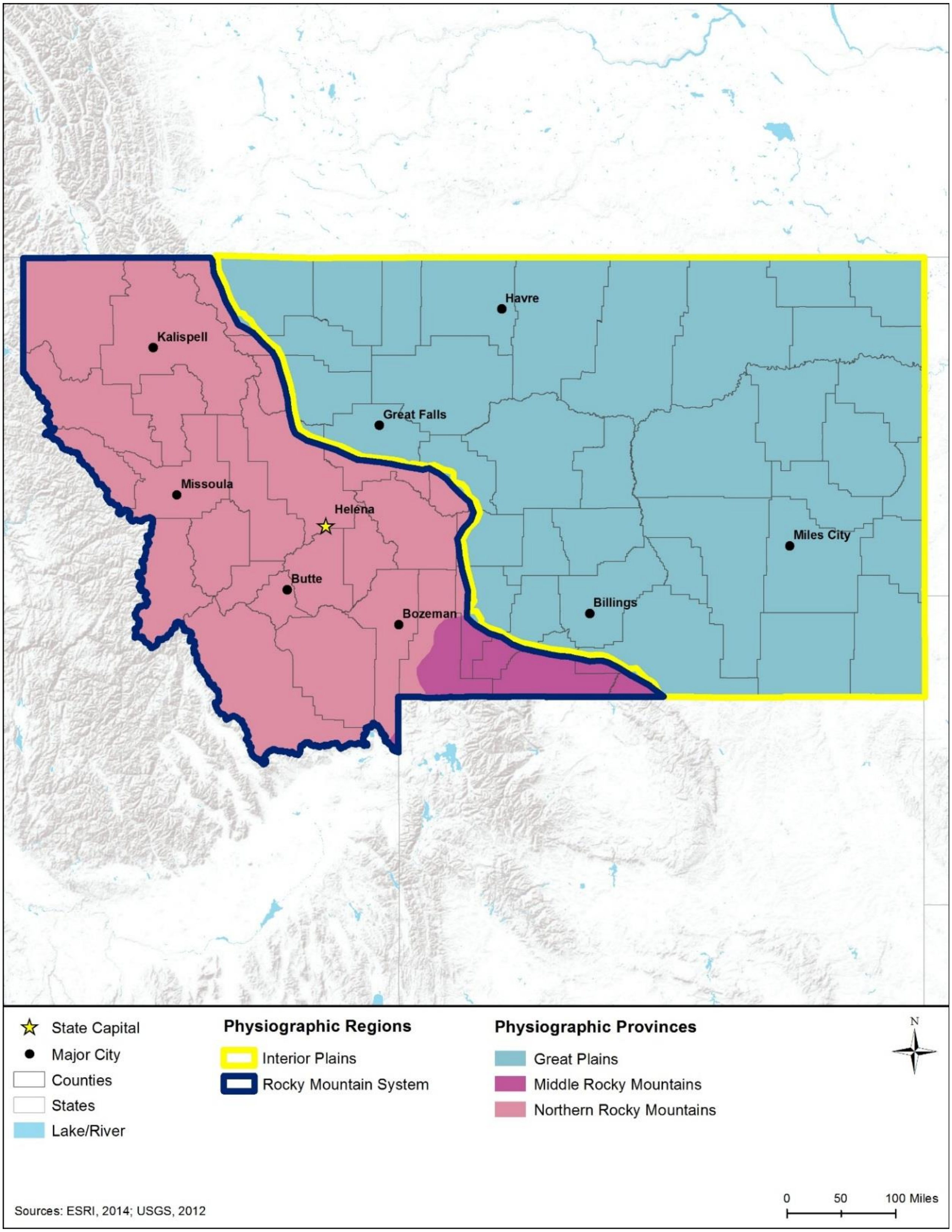

Figure 11.1.3-1: Physiographic Regions and Provinces of Montana

Interior Plains Region

The Interior Plains Region extends across much of the interior of the United States, roughly between the western edge of the Appalachian Highlands (near states including Ohio, Tennessee, and Alabama), and the eastern edge of the Rocky Mountain System (including states such as Montana, Wyoming, and Colorado) (Fenneman, 1916). Metamorphic[25] and igneous[26] rocks dating to the Precambrian Era (older than 542 million years ago [MYA]) underlie the entire region.[27] There is minimal topographic relief throughout the region, except for the Black Hills of South Dakota. During the Mesozoic Era, much of the Interior Plains were covered by oceans, resulting in the formation of sedimentary rocks,[28] which lie on top of the Precambrian basement rocks. Erosion from the Rocky Mountains to the west and the Ozark/Ouachita Mountains to the east, also contributed to the formation of sandstone,[29] mudstone,[30] and clay (USGS, 2014b).

As reported above, the Interior Plains Region within Montana is composed of one physiographic province: the Great Plains Province (USGS, 2003a).

<u>Great Plains Province</u> – The Great Plains Province includes more than 450,000 square miles throughout the United States and encompasses the western portion of the Interior Plains Region. The Great Plains Province, which is the second largest physiographic province in the United States, is noted for flat topography interrupted by the occasional hill or lowland (USGS, 2003a) (NPS, 2014a).

Within Montana, the Great Plains Province includes the entire state east of the Rocky Mountain foothills (USGS, 2015c). Elevations increase moving westward throughout the Great Plains, and reach roughly 5,000 feet above sea level (ASL) near the base of the Rocky Mountains in Montana (USGCRP, 2014a). Mesozoic (251 to 66 MYA) sedimentary rocks underlie much of the Great Plains throughout Montana; common rock types include shale,[31] siltstone,[32] and sandstone (USGS, 2015c).

Rocky Mountain System Region

The Rocky Mountains form a line from the northern border with Canada south into central New Mexico. The Rocky Mountains were created during the Laramide orogeny,[33] which occurred between 70 and 40 MYA. They formed due to the collision of the Pacific Ocean oceanic crust[34] with the North American continental crust. In most cases, convergence of oceanic crust with

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[25] Metamorphic: "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, 2015d).
[26] Igneous: "Rock formed when molten rock (magma) that has cooled and solidified (crystallized)" (USGS, 2015d)
[27] For consistency, this Final PEIS uses the University of California Berkeley Geologic Time Scale for all of the FirstNet PEIS state documents. Time scales differ among universities and researchers; FirstNet utilized a consistent time scale throughout, which may differ slightly from other sources.
[28] 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, 2014a)
[29] Sandstone: "Sedimentary rock made mostly of sand-sized grains." (USGS, 2015d)
[30] Mudstone: "A very fine-grained sedimentary rock formed from mud." (USGS, 2015d)
[31] Shale: "Sedimentary rock derived from mud. Commonly finely laminated (bedded). Particles in shale are commonly clay minerals mixed with tiny grains of quartz eroded from pre-existing rocks." (USGS, 2015d)
[32] Siltstone: "A sedimentary rock made mostly of silt-sized grains." (USGS, 2015d)
[33] Orogeny: "An episode of mountain building and/or intense rock deformation." (USGS, 2015d)
[34] Crust: "The rocky, relatively low density, outermost layer of the Earth." (USGS, 2015d)

continental crust results in mountain formation 200 to 400 miles from the coastline. However, given the low angle of subduction by which the oceanic crust passed under the less dense continental crust during the Laramide orogeny, this resulted in formation of the Rocky Mountains several hundred miles further inland than is normally observed (USGS, 2014c).

As reported above, the Rocky Mountain System Region within Montana is composed of two physiographic provinces: the Middle Rocky Mountains Province and the Northern Rocky Mountains Province (USGS, 2003a).

Middle Rocky Mountains Province – The Middle Rocky Mountains includes a (relatively) small portion of south-central Montana on the state's southern border with Wyoming. Within Montana, the Middle Rocky Mountains include the "Absaroka and Beartooth ranges north of Yellowstone National Park and the Bighorn and Pryor Mountains to the east" (USFWS, 2001). Granite Peak, Montana's highest point at 12,799 feet ASL, is within the Middle Rocky Mountains (USGS, 2016a). Folded mountains, inactive volcanic mountains, and uplifted fault blocks are prominent throughout the Middle Rocky Mountains (NPS, 2014b).

Northern Rocky Mountains Province – The Northern Rocky Mountains Province is characterized by mountain ranges separated by broad valleys. Mountain elevations range from 8,000 to 10,000 feet ASL, while valley elevations range from 3,000 to 5,000 feet ASL. Prominent mountains in Montana include: the Beaverhead Mountains, Mission Range, Tobacco Root Mountains, Bridger Range, Big Belt Mountains, and Crazy Mountains (USFWS, 2001). In general, the Northern Rocky Mountains Province is lower in elevation than the Middle Rocky Mountains Province (NPS, 2014b).

11.1.3.4 Surface Geology

Surficial geology is characterized by materials such as till,[35] sand and gravel, or clays that overlie bedrock. The surface terrain, which can include bedrock outcrops, provides information on the rock compositions and structural characteristics of the underlying geology. Because surface materials are exposed, they are subject to physical and chemical changes due to weathering from precipitation (rain and snow), wind and other weather events, and human-caused interference. Depending on the structural characteristics and chemical compositions of the surface materials, heavy precipitation can cause slope failures,[36] subsidence,[37] and erosion (Thompson, 2015).

Surficial deposits are common throughout parts of western Montana, especially in areas that have been impacted by glaciers. For example, in southwestern Montana's Centennial Valley,

[35] 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)

[36] Slope failure, also referred to as mass wasting, is the downslope movement of rock debris and soil in response to gravitational stresses. (Idaho State University, 2000)

[37] Subsidence: "Gradual settling or sudden sinking of the Earth's surface owing to subsurface movement of earth materials." (USGS, 2000)

Quaternary (within the last 2.6 million years) alluvial,[38] glacial, and eolian[39] deposits have been documented. Alluvial deposits are common on valley floors as stream gradients flatten out and their waters lose the ability to carry sediments. These deposits were more common during the Pleistocene Epoch (2.6 MYA to 11,700 years ago) due to the greater volume of snowmelt available for transporting sediment during this period. Glacial moraines[40] are also common in low-lying areas throughout the Centennial Valley (i.e., about 50 miles to the west of Yellowstone National Park) as they mark the terminal endpoint of historic glaciations. The Pinedale moraine dates to 15,000 to 18,000 years ago, and overlies the older Bull Lake moraine. Finally, eolian sand dunes that reach nearly 100 feet in height also are common on the northern side of the Centennial Valley (Pierce, Chesley-Preston, & Sojda, 2014).

Many valleys in western Montana contain "deposits of clay, sand, and sandstone." These deposits may be attributable to volcanic eruptions from neighboring areas (Alden, 1953).

[38] Alluvium: "Sand, gravel, and silt deposited by rivers and streams in a valley bottom." (USGS, 2015d)
[39] Eolian: "Term describing the process of wind erosion, transport, and deposition, and wind-created deposits and structures such as sand dunes." (USGS, 2015d)
[40] Moraine: "A hill-like pile of rock rubble located on or deposited by a glacier." (USGS, 2015d)

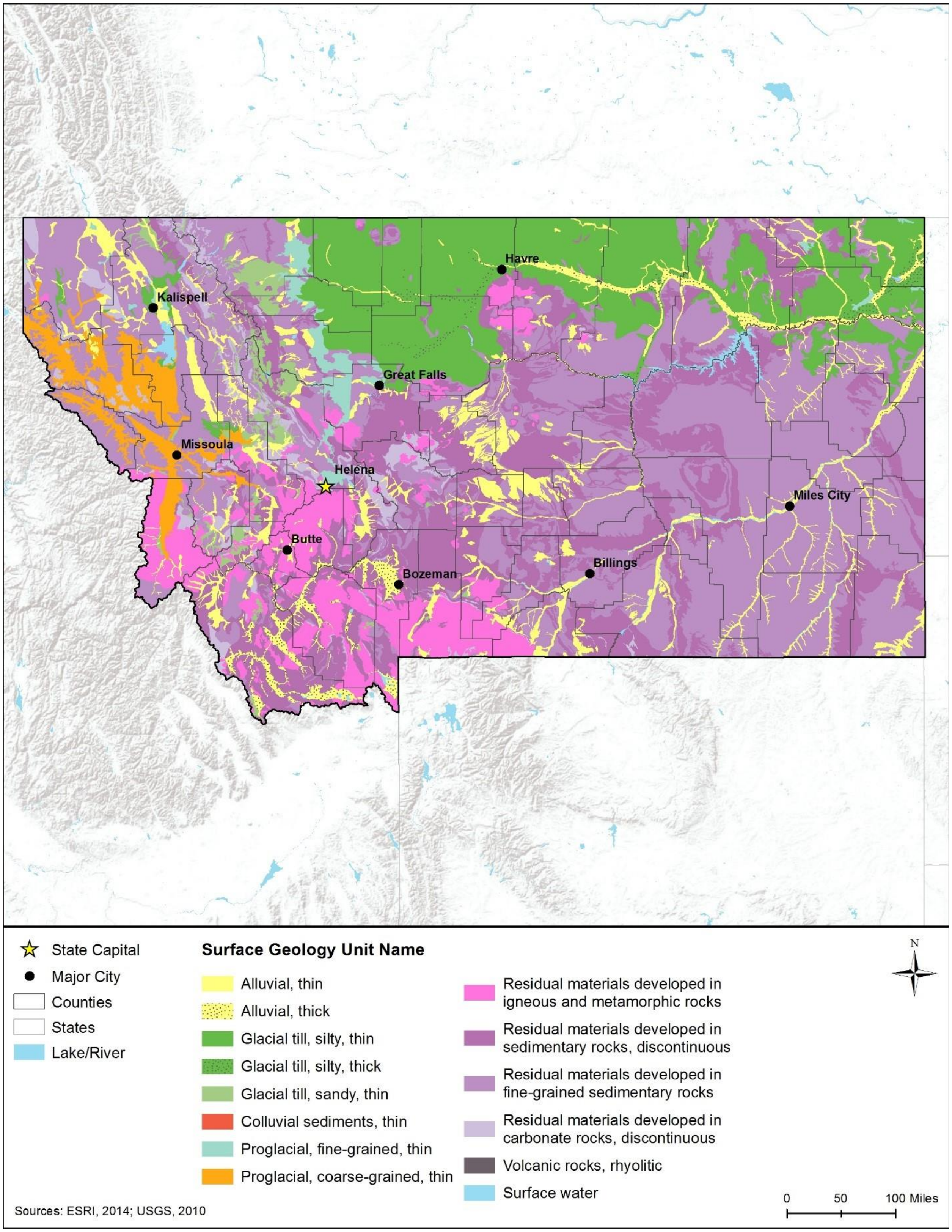

Figure 11.1.3-2: Generalized Surface Geology for Montana

11.1.3.5 Bedrock Geology

Bedrock geology analysis, and "the study of distribution, position, shape, and internal structure of rocks" (USGS, 2015e) reveals important information about a region's surface and subsurface characteristics (i.e., 3-dimensional geometry), including dip (slope of the formation),[41] rock composition, and regional tectonism.[42] These structural aspects of bedrock geology are often indicative of regional stability, as it relates to geologic hazards such as landslides, subsidence, earthquakes, and erosion (New Hampshire Department of Environmental Services, 2014).

Montana's bedrock geology varies significantly between the eastern and western portions of the state (USGS, 2015c). Eastern Montana is composed largely of sedimentary rocks that were deposited within the last 70 million years; two dominant units include the Upper Cretaceous (100 to 66 MYA), Bearpaw Shale and Paleocene (66 to 23 MYA), and Fort Union Formation and equivalents. The Bearpaw Shale contains an abundance of marine fossils that document the existence of the inland sea that covered Montana roughly 70 MYA (MDT, 2015b). The Fort Union Formation is notable for its extensive coal deposits (Roberts & Rossi, 1999).

Western Montana is composed of alternating valleys and mountain ranges underlain by metamorphic and igneous rocks, which indicate a long history of deformation events throughout the region. The ridges of northwestern Montana, are composed of Precambrian (older than 542 MYA), Paleozoic (542 to 251 MYA), and Mesozoic (251 to 66 MYA) sedimentary rocks. The southwestern ridges are underlain by Paleozoic metamorphic[43] rocks (e.g., schist[44] and gneiss[45]), topped by folded[46] and faulted[47] Paleozoic and Mesozoic rocks. In some locations in southwestern Montana, granitic rock has intruded into the older bedrock. "Tertiary [66 to 2.6 MYA] volcanic rocks overlie old eroded surfaces in many places, particularly in and near Yellowstone National Park" (Alden, 1953). Figure 11.1.3-3 displays the general bedrock geology for Montana.

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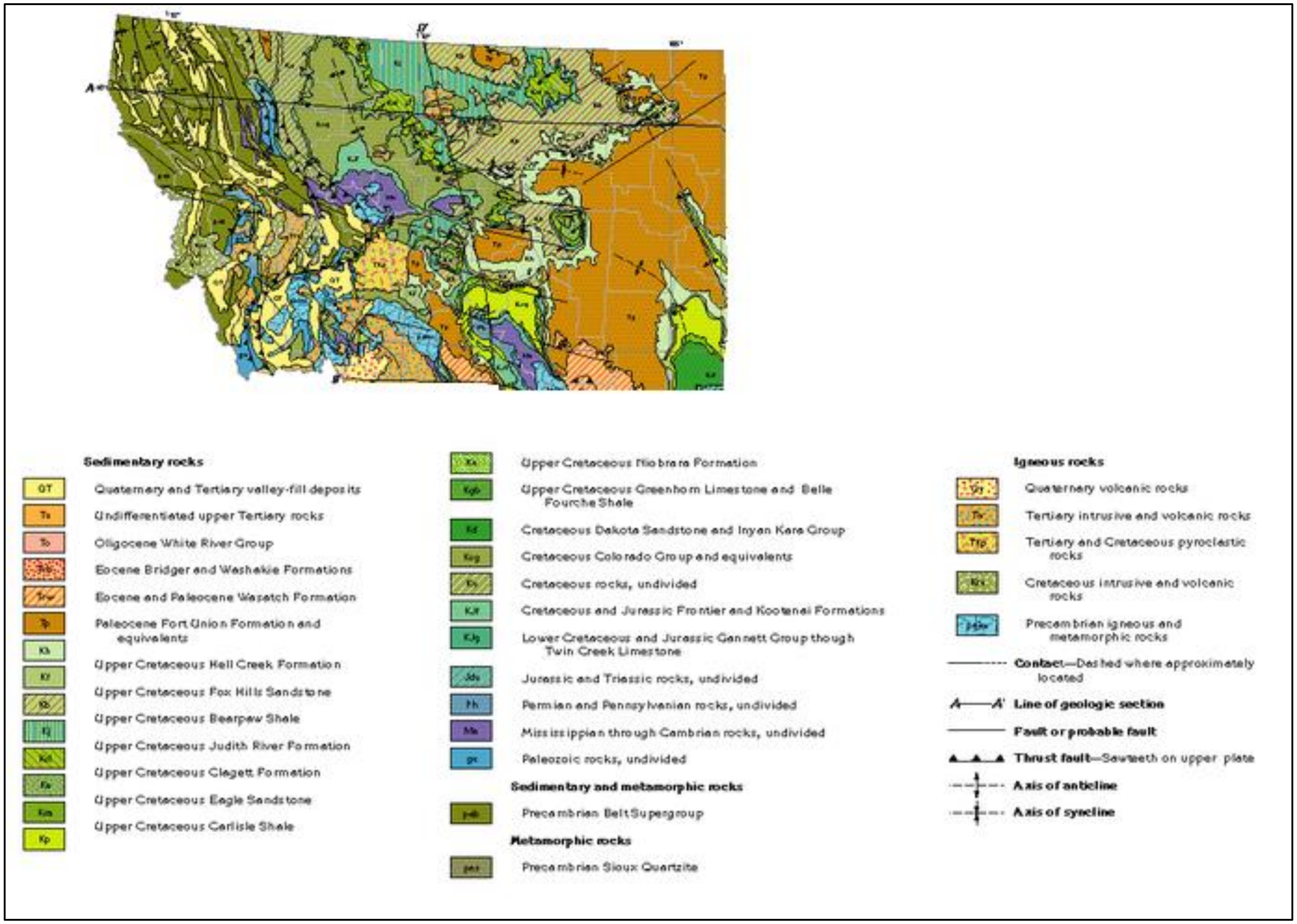
[41] Dip: "A measure of the angle between the flat horizon and the slope of a sedimentary layer, fault plane, metamorphic foliation, or other geologic structure." (NPS, 2000)
[42] Tectonism: "Structure forces affecting the deformation, uplift, and movement of the earth's crust." (USGS, 2016b)
[43] Metamorphic 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, 2015d)
[44] 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, 2015d)
[45] Gneiss: "A coarse-grained, foliated metamorphic rock that commonly has alternating bands of light and dark-colored minerals." (USGS, 2015d)
[46] Fold: "A bend or flexure in a rock." (USGS, 2005)
[47] Fault: "A surface along which a rock body has broken and been displaced." (USGS, 2005)



Source: (USGS, 2015c)

Figure 11.1.3-3: Generalized Bedrock Geology for Montana

11.1.3.6 Paleontological Resources

Montana contains some of the most densely populated fossil-bearing rocks in the world. The intermontane basins in the western part of the state have yielded many animal and mammal fossils from the last 65 million years. Eastern Montana has many rock exposures that contain dinosaur fossils (BLM, 2013). Marine fossils within sedimentary rocks in eastern Montana indicate that a warm, shallow sea covered this area throughout portions of the Paleozoic (542 to 251 MYA), Mesozoic (251 to 66 MYA), and early Cenozoic (66 MYA to present) Eras. As the Cenozoic Era progressed, the sea retreated, with the climate turning more wet and cool as glaciers expanded into the state. These conditions are reflected in the cold climate-adapted fossil record from this time (Paleontology Portal, 2015).

Source: (BLM, 2010)

Hadrosaur Fossil

Precambrian (older than 542 MYA) marine fossils recorded in Montana include stromatolites and trace fossils from marine animals as they crawled along the seafloor. The Paleozoic Era fossil record includes marine fossils such as brachiopods,[48] bryozoans,[49] corals, crinoids,[50] mollusks, conodonts,[51] sponges, and fish teeth. Trilobites[52] are also found in abundance throughout Cambrian Period (542 to 488 MYA) rocks. Carboniferous Period (359 to 299 MYA) rocks yield marine fossils including algae, arthropods,[53] bivalves,[54] brachiopods, cephalopods,[55] sponges, worms, and many species of fish (Paleontology Portal, 2015). Dinosaur fossils from the Mesozoic Era, such as the Hadrosaurs, Tyrannosaurus, and Triceratops, from the late Jurassic Period (161 to 146 MYA) to the late Cretaceous Period (146 to 66 MYA) have been found in Eastern Montana, along with marine fossils such as long-necked Plesiosaurs, flying reptiles, and Mosasaurs (BLM, 2013). The Hell Creek Formation in northeast Montana is particularly dense with fossils (Figure 11.1.3-4)

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

[49] Bryozoans: "Common name for any member of the phylum Bryozoa. Bryozoans are invertebrate aquatic organisms most commonly found in large colonies." (Smithsonian Institution, 2016)

[50] Crinoids: "The common name for any echinoderm of the class Crinoidea, including sea lilies, feather stars, etc. Crinoids are common fossils in the Paleozoic and persist to the present. Many species have stalks and radiating arms and feed on particles in the water column." Echinoderm: "Common name for members of the phylum Echinodermata. These organisms are characterized by bodies showing radial symmetry (usually in fives) and the presence of tube feet in most forms." (Smithsonian Institution, 2016)

[51] Conodonts: "Any member of a group of worm-like, vertebrate organisms common from the Ordovician to the Triassic. Conodont dental batteries are important tools for Paleozoic and early Mesozoic biostratigraphy." (Smithsonian Institution, 2016)

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

[53] Arthropods: "Any member of the phylum Arthropoda, which are characterized by jointed appendages, an exoskeleton, and segmented body parts. Arthropods are the most divere group of animals on Earth and include insects, crustaceans, arachnids, myriapods, and onychophorans as well as extinct forms like trilobites." (Smithsonian Institution, 2016)

[54] Bivalves: "A mollusk with a soft body enclosed by two distinct shells that are hinged and capable of opening and closing." (Smithsonian Institution, 2016)

[55] Cephalopods: "Any mollusk of the class Cephalopoda, which includes squids, octopus, and ammonites. They are characterized by the tentacles attached to their heads." (Smithsonian Institution, 2016)

(Goodwin, 2015). The Cretaceous Period also yields the state fossil of Montana, the duck-billed dinosaur Maiasaura peeblesorum (State of Montana, 1985). Cenozoic Era fossils from the Quaternary Period (2.6 MYA to present) are found mostly in the western part of the state, and include mammoths, musk ox, and dire wolves (Paleontology Portal, 2015).

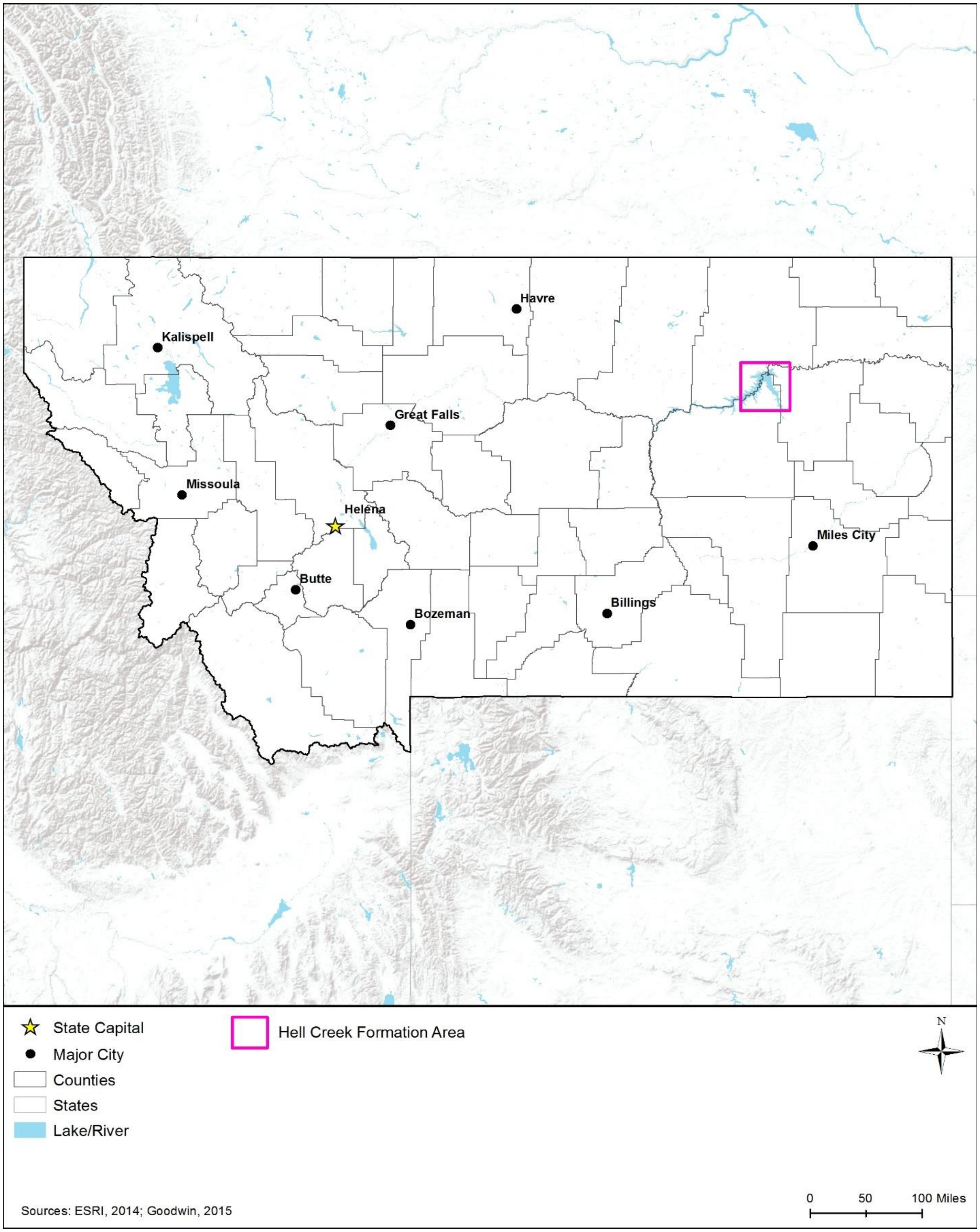


Figure 11.1.3-4: Hell Creek Formation in Montana

11.1.3.7 Fossil Fuel and Mineral Resources

Oil and Gas

In 2016, Montana produced 23.216 million barrels of crude oil (EIA, 2017), accounting for 0.7 percent of total nationwide production. Oil production in Montana is most common in the eastern portion of the state within the Williston Basin. The Bakken Shale Formation is among its most productive layers (EIA, 2014). "Approximately 450 million barrels of oil (MMBO) have been produced from the Bakken and Three Forks Formations in the United States since the 2008 assessment of the Bakken Formation" (USGS, 2013b).

In 2015, Montana produced 57.421 million cubic feet of natural gas, accounting for 0.2 percent of total nationwide production. About three-fourths of Montana's natural gas wells are in the north central part of the state, near the Canadian border, although there are also wells in the Williston Basin and near the Wyoming border (EIA, 2014).

Minerals

As of 2016, Montana's nonfuel mineral production value was $1.34B, ranking 21st nationwide, in terms of dollar value. Principal minerals extracted include palladium, molybdenum concentrates, copper, platimun, and gold. This accounts for 1.71% of the nationwide nonfuel total (USGS, 2016c). Montana also produces and mines natural gemstones, crushed stone, cadmium, clays (bentonite), copper, garnet (1st nationwide), lead, dimension stone,[56] talc (1st nationwide), and zinc (USGS, 2013c). Additionally, shale, peat, and sulfur are also produced and mined in Montana (USGS, 2001) (USGS, 2003b).

In 2015, Montana produced 41,864 thousand short tons of coal, accounting for a 4.7 percent of total nationwide production. Coal in Montana is largely produced from six extensive surface mines in the Powder River Basin in the southeastern corner of the state (EIA, 2014). Montana has about 25 percent of the nation's coal reserves – the largest of any state nationwide (MDEQ, 2011a).

11.1.3.8 Geologic Hazards

The four major geologic hazards of concern in Montana are volcanoes, earthquakes, landslides, and subsidence. While volcanoes do not occur in Montana, deposits from nearby volcanic eruptions have been observed in parts of the state (USGS, 2015f). The subsections below summarize current geologic hazards in Montana.

Volcanoes

Volcanic eruptions are not a major concern in Montana given that no volcanoes exist within the state and low probability of a nearby eruption in any given year. However, Montana is located in relatively close proximity to areas with the potential to experience volcanic activity, including the West Coast's Cascade Range and Wyoming's Yellowstone Caldera. According to

[56] 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, 2016d).

MTDPHHS, "[The Yellowstone Caldera] could pose a serious threat in the future…Cataclysmic eruptions 2.0, 1.3, and 0.6 million years ago ejected huge volumes of rhyolite magma; each eruption formed a caldera and extensive layers of thick pyroclastic-flow deposits. Fortunately for mankind, an eruption comparable in magnitude with those of Yellowstone has not occurred during recorded history" (MTDPHHS, 2015a).

Volcanic eruptions from the Cascades are more likely to affect Montana through the delivery of volcanic ash, though such impacts would be weather and wind dependent (MTDPHHS, 2015a). However, "Yellowstone is one of the most seismically active areas in the United States. Approximately 1,000 to 3,000 earthquakes occur each year in the Yellowstone area; most are not felt." (NPS, 2016a)

It is estimated that Montana has been affected by volcanic eruptions four times within the last 665,000 years. Most recently, parts of the state were buried in up to 0.2 inches of volcanic ash following the eruption of Mount Saint Helens in western Washington in May 1980. Historic eruptions, including one from Crater Lake in Oregon more than 7,000 years ago, are believed to have delivered more than six inches of volcanic ash throughout the state (MTDPHHS, 2015a).

Earthquakes

Between 1973 and March 2012, there were 16 earthquakes with a magnitude 4.5 (on the Richter scale[57]) or greater in Montana (USGS, 2014e). 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).

The shaking due to earthquakes can be significant many miles from its point of origin depending on the type of earthquake and the type of rock and soils beneath a given location. Crustal earthquakes, the most common, typically occur at depths of 6 to 12 miles; these earthquakes typically do not reach magnitudes higher than 6.0 on the Richter scale. 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" (Oregon Department of Geology, 2015). Subduction zones are found off the coast of Washington, Oregon, and Alaska (USGS, 2014f). Convergence boundaries between two tectonic plates can result in earthquakes with magnitudes that exceed 8.0 on the Richter scale (Oregon Department of Geology, 2015). The Great Falls Tectonic Zone runs through the west-central and southwestern portions of Montana (O'Neill, 2016); therefore, Montana may be subject to subduction zone earthquakes.

Montana's Largest Earthquake

The largest measured earthquake in Montana's history occurred in August 1959 and measured 7.3 on the Richter scale. The epicenter of the earthquake was in southwestern Montana near Hebgen Lake. This seismic event resulted in the creation of extensive fault scarps (i.e., cliffs) nearly 20 feet high as well as a significant landslide that blocked the flow of the Madison River and created a lake more than 170 feet deep. Twenty-eight people died due to the landslides associated with the Hebgen earthquake (USGS, 2012b).

Source: (USGS, 2012b)

Damage from Hebgen Lake Earthquake

Figure 11.1.3-5 depicts the seismic risk throughout Montana; the box surrounding the range of colors shows the seismic hazards in the state. The map indicates levels of horizontal shaking (measured in Peak Ground Acceleration) that have a two percent chance of being exceeded in a 50-year period. Units on the map are measured in terms of acceleration due to gravity (% g).

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

Most pre-1965 buildings are likely to experience damage with exceedances of 10% g, Post-1985 buildings (in California) have experienced only minor damage with shaking of 60% g (USGS, 2010).

Areas of greatest seismicity in Montana are concentrated in the southwest portions of the state near Yellowstone National Park and in the northwestern portion of the state. This area of seismicity, which includes two active major faults, is referred to as the Intermountain Seismic Belt, and is roughly 100 miles wide throughout Montana. Seven to ten small (magnitude 2.5 or smaller) earthquakes, on average, occur throughout this region on a daily basis (Montana Bureau of Mines and Geology, 2015).

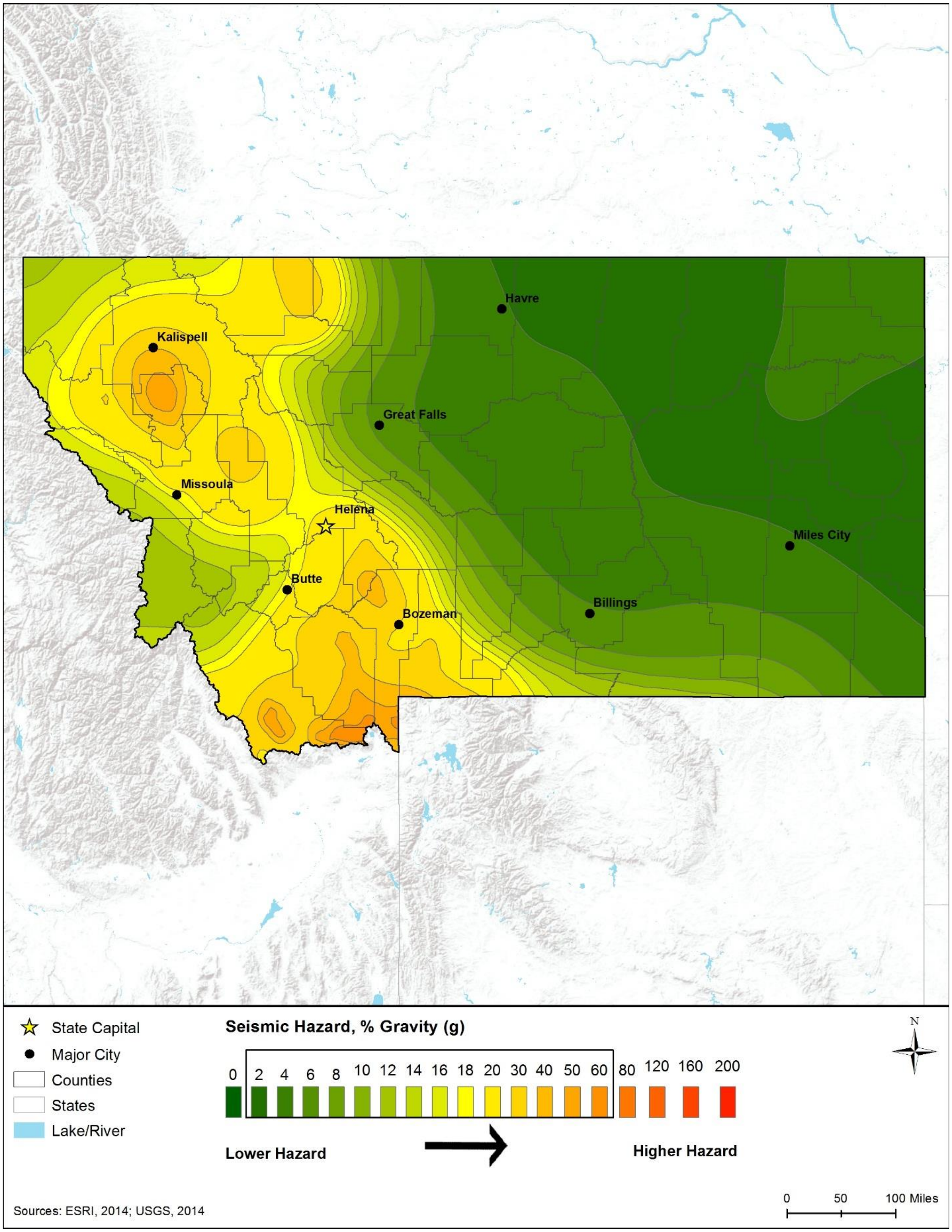


Figure 11.1.3-5: Montana 2014 Seismic Hazard Map

Landslides

Landslides are common occurrences in both urban and rural areas of Montana (Montana Disaster and Emergency Services, 2007). 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, 2003c). 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, 2003c).

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, 2003c).

Areas at risk to landslides in Montana are generally in the southern and western portions of the state. In particular, the counties of Jefferson, Beaverhead, and Park are the counties containing areas of greatest risk to landslides. A 2002 study by the Montana Bureau of Mines and Geology (MBMG) and the MDT documented more than 4,600 landslides in MDT District 2, which includes all of southwestern Montana. This study concluded that landslides generally correlate areas with faults; volcanic ash or other poorly consolidated sediments often underlie areas susceptible to landslides in Montana (Montana Disaster and Emergency Services, 2007).

As discussed above, the Hebgen Lake earthquake produced the most significant landslide event ever recorded in Montana. "Nearly 1.25 miles (2 km) of the Madison River and Montana Highway 287 were buried to depths as great as 394 feet (120 m)." A March 2005 landslide near Red Lodge, MT, was caused by a heavy precipitation event and resulted in damages to more than 12 miles of roadways (Montana Disaster and Emergency Services, 2007). Figure 11.1.3-6 shows landslide incidence and susceptibility throughout Montana.

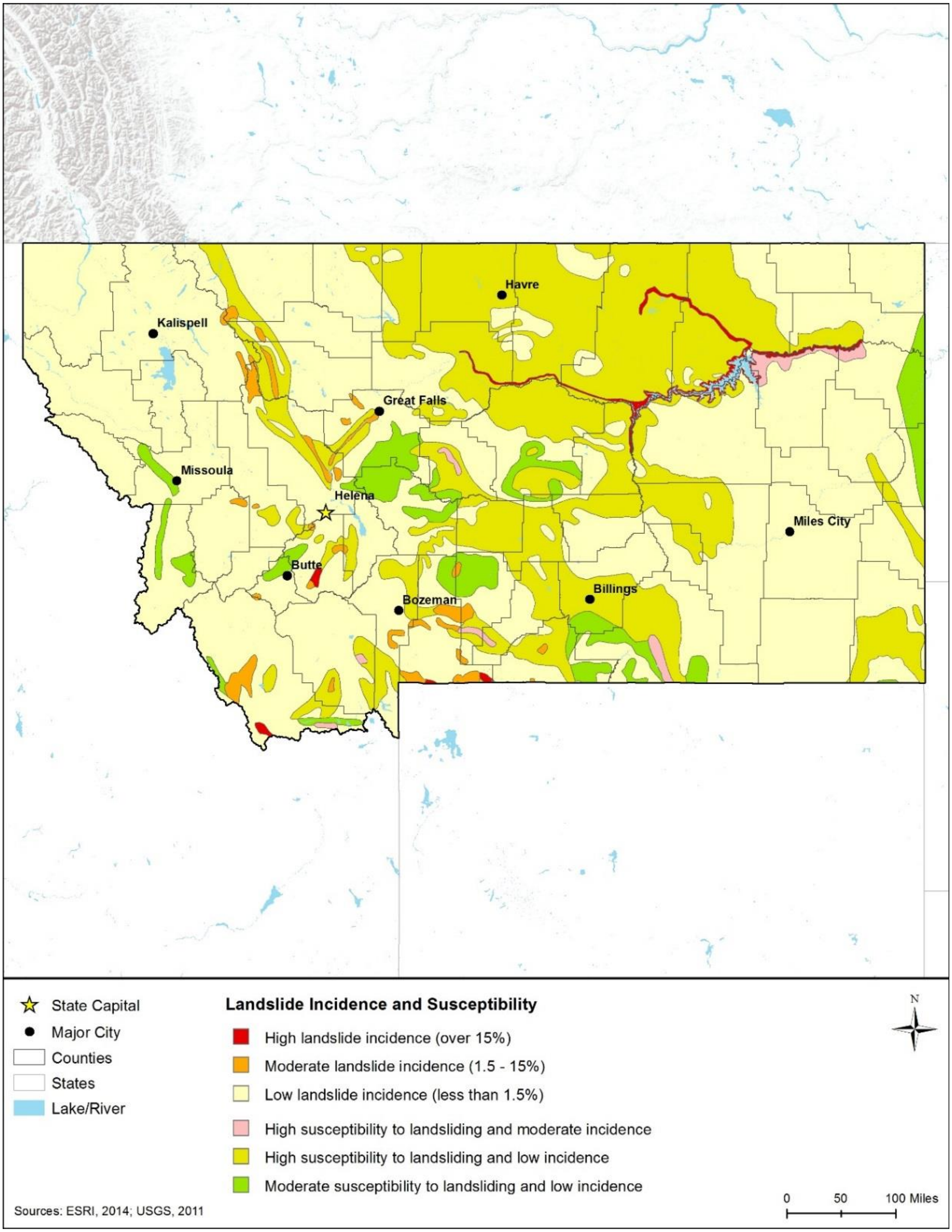


Figure 11.1.3-6: Montana Landslide Incidence and Susceptibility Hazard Map[58]

Land 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 (USGS, 2000). Land subsidence due to mine collapse poses a threat in Montana (CGFHMR, 1991).

More than 80 percent of subsidence in the U.S. 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 layers of silt or clay, which do not transport groundwater, confine an aquifer the lowered water pressure in the sand and gravel causes slow drainage of water from the clay and silt beds. The reduced water pressure compromises support for the clay and silt beds, causing them to collapse on one another. The effects of this compression are seen in the permanent lowering of the land surface elevation (USGS, 2000).

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

More than 6,000 abandoned mines have been documented in Montana, some of which are at risk of collapse (MDSL, 1995); most of Montana's mines are in the western portion of the state (MDEQ, 2015i). In recent years, a study was conducted for the potential for mine-induced subsidence at the Red Lodge Mine in southern Montana, north of Yellowstone National Park (MDEQ, 2014c). The study concluded that trough subsidence[59] had occurred on the order of 3 to 7 inches with the potential to cause "slight to appreciable" building damage.

Portions of western Montana are underlain by carbonate[60] rocks, which are subject to the formation of karst[61] topography (USGS, 2004). The Mississippian (359 to 318 MYA) Madison Limestone is the major geologic unit that contributes to the formation of karst topography throughout the Bighorn Basin in southern Montana. At Bighorn Canyon National Recreation Area, the Madison Limestone has contributed to the formation of more than 14 miles of caves (NPS, 2015a). Figure 11.1.3-7 displays the areas of Montana that are susceptible to the formation of karst topography.

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[58] Susceptibility hazards not indicated in Figure 11.1.3-6 where same or lower than incidence. Susceptibility to landslides is defined as the probable degree of response of areal rocks and soils to natural or artificial cutting or loading of slopes, or to anomalously high precipitation. High, moderate, and low susceptibility are delimited by the same percentages used in classifying the incidence of landslides. Some generalization was necessary at this scale, and several small areas of high incidence and susceptibility were slightly exaggerated (USGS, 2014g).

[59] Trough Subsidence: Subsidence that occurs "when the overlying soils (or overburden) [sag] downward due to the failure of remnant mine pillars or by punching of the pillars into a soft mine floor" (Pioneer Technical Services - Prepared for MDEQ, 2015).

[60] Carbonate Rocks: "A sedimentary rock made mainly of calcium carbonate ($CaCO_3$). Limestone and dolomite are common carbonate sedimentary rocks" (USGS, 2015d).

[61] Karst: "A distinctive landscape (topography) that can develop where the underlying bedrock, often limestone or marble, is partially dissolved by surface or ground water" (USGS, 2015d).

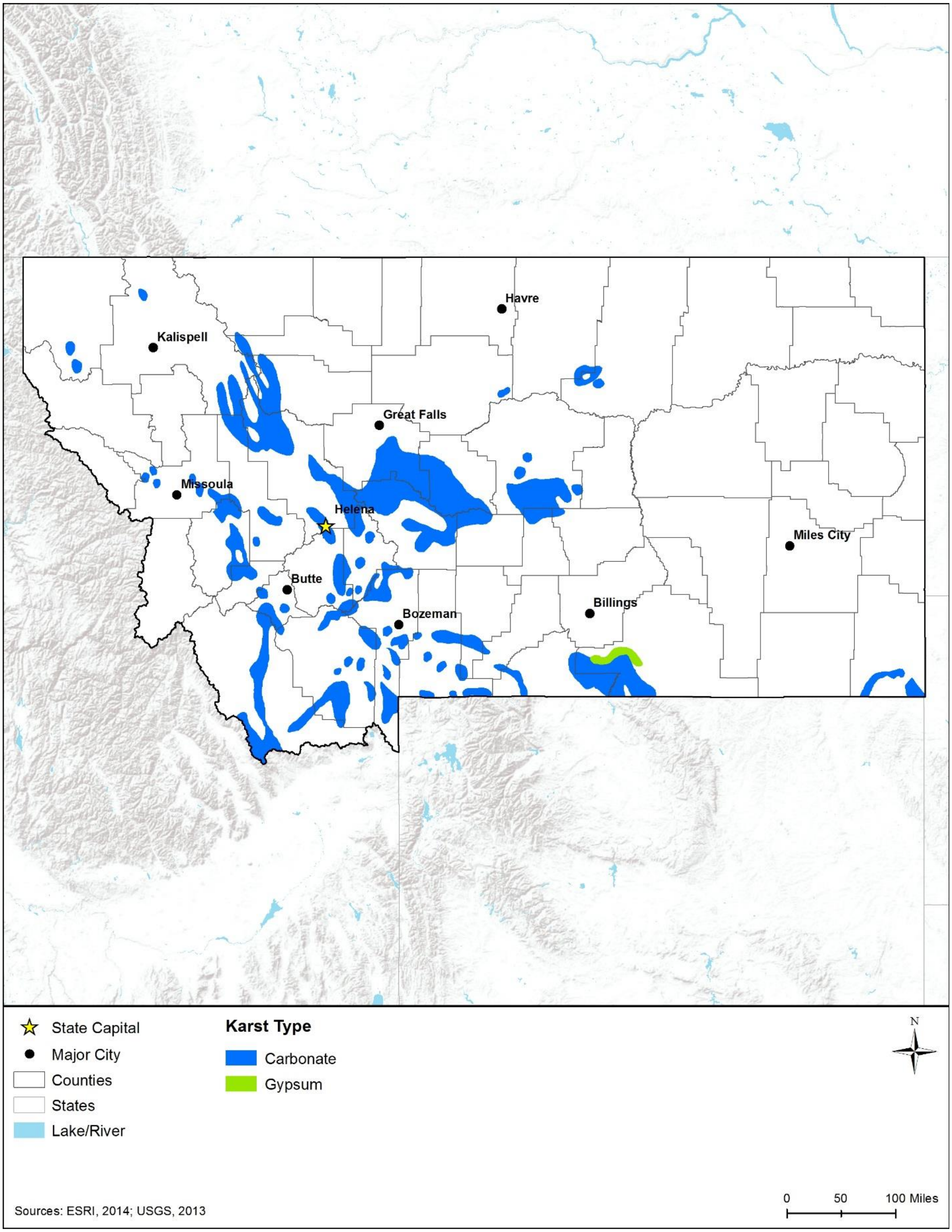

Figure 11.1.3-7: Montana Karst Map

11.1.4. Water Resources

11.1.4.1. Definition of the Resource

Water resources are defined as all surface waterbodies and groundwater systems including streams, rivers, lakes, canals, ditches, floodplains, aquifers, and other aquatic habitats (wetlands are discussed separately in Section 11.1.5, Wetlands). 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 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, 2014h).

11.1.4.2. Specific Regulatory Considerations

Federal laws relevant to protecting the quality and use of water resources are summarized in Appendix C, Environmental Laws and Regulations. Table 11.1.4-1 summarizes the major Montana laws and permitting requirements relevant to the state's water resources.

Table 11.1.4-1: Relevant Montana Water Laws and Regulations

State Law / Regulation	Regulatory Agency	Applicability
Montana Code Annotated 2015 85-2-401 through 436	MT DNRC	Water rights and appropriations.
Montana Pollutant Discharge Elimination System (MPDES)	MDEQ, Water Protection Bureau	Facilities discharging wastewater from point sources.[62] General permits cover various typical activities (e.g., construction dewatering, sand and gravel) while individual permits cover other activities outside the scope of general permits
		Discharges due to construction (affecting more than 1 acre), industrial activities, or non-traditional small municipal separate storm sewer systems
Short-Term Water Quality Standard for Turbidity Related to Construction Activity	MDEQ, Water Protection Bureau	Construction activities affecting streams unable to meet the numeric standard for turbidity.
Water Quality Certification	MDEQ, Water Protection Bureau	In accordance with Section 401 of the Clean Water Act (CWA), activities that may result in a discharge to waters of the U.S. require a Water Quality Certification from MDEQ indicating that the proposed activity will not violate state water quality standards.

[62] A point source is "any discernible, confined and discrete conveyance" (e.g., a "pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container") (USEPA, 2012a).

State Law / Regulation	Regulatory Agency	Applicability
Confederated Salish and Kootenai Tribes Water Quality Program	Tribal Water Quality Program, Environmental Protection Division	Projects "affecting reservation waters".
Floodplain Management	MT DNRC, Floodplain Management Section	Developments "within designated Special Flood Hazard Areas" (e.g., "placement of fill, roads, bridges, culverts, transmission lines, irrigation facilities, storage of equipment or materials, and excavation; new construction/development, placement, or replacement of manufactured homes; and new construction, additions, or substantial improvements to residential and commercial buildings").
Montana Water Quality Act	MDEQ, Water Protection Bureau	Prohibits degrading the water quality of "outstanding resource waters" of significant "environmental, ecological, or economic value".

Source: (MDEQ, 2013a) (MDEQ, 2013b) (MDEQ, 2014d) (MT DNRC, 2015b) (Horpestad, 2000).

11.1.4.3. Environmental Setting: Surface Water

Surface water resources are natural and engineered lakes, ponds, rivers, and streams. According to the MDEQ, Montana has 362,591 miles of streams; 13,167 mile of ditches and canals; and 699,629 acres of lakes and reservoirs (MDEQ, 2014e). These surface waters supply drinking, agricultural, and industrial water; provide aquatic habitat; and support swimming, fishing, and boating recreational use across the state (MDEQ, 2014e).

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). Montana's waters (lakes, rivers, and streams) are divided into four main river basins defined by the MDEQ for administrative and planning purposes (see Figure 11.1.4-1). These basins are the Columbia (also known as Clark Fork and Kootenai), Upper Missouri, Lower Missouri, and Yellowstone (MT DNRC, 2014a), (MDEQ, 2014e). Montana Appendix A, Table A-1, provides detailed information on the state's major river basins, as defined by the MDEQ. Visit dnrc.mt.gov/divisions/water/management/state-water-plan for information and additional maps about Montana's river basins locations, sizes, and water quality (MDEQ, 2015j).

The Columbia / Clark Fork and Koontenai River Basin lies in the mountainous terrain between the western border of Montana and the continental divide. The Yellowstone River Basin is located in the southeast corner of the state, has headwaters at the continental divide, and extends into Wyoming and North Dakota (MT DNRC, 2014b). The Upper and Lower Missouri basins occupy the majority of the land area of the state, sweeping from the Centennial Mountains in the southwest of Montana to the low-lying prairies of the northeast (MT DNRC, 2014c), (MT DNRC, 2014d).

Freshwater

As shown in Figure 11.1.4-1, there are nine major rivers in Montana: Kootenai, Flathead, Clark Fork, Milk, Missouri, Yellowstone, Powder, Tongue, and Bighorn. The Kootenai River, with headwaters in British Columbia, flows southeast through Montana before flowing northwest into Idaho. The Flathead River, also originating in British Columbia, flows into the Clark Fork River, whose headwaters are in western Montana. The Missouri River begins in Montana, joins the Milk River originating in Alberta, and flows into North Dakota to the east. The Yellowstone River starts in Wyoming and flows northeast across Montana. The Bighorn, Tongue, and Powder rivers all flow north from Wyoming and feed into the Yellowstone River (MT DNRC, 2014a).

Montana contains 1,257 reservoirs and 2,096 lakes (USGS, 2015g). Located in the Columbia/Clark Fork River Basin, Flathead Lake is "the largest [natural] freshwater lake west of the Mississippi River" (Figure 11.1.4-1) (MT DNRC, 2014e). The lake stretches approximately 27 miles by 16 miles and has a maximum depth of 370.7 feet. Water flows into Flathead Lake predominately from the Flathead River (accounting for approximately 85 percent of inflow), Swan River (approximately 10 percent), precipitation, and runoff (MDEQ, 2001).

Reservoirs in Montana are used for hydropower, recreation, flood control, fish and wildlife, and water storage for agricultural, municipal, and industrial applications. The MT DNRC owns and operates 22 dams and associated reservoirs, which collectively store 381,234 acre-feet of water. The MT Department of Fish, Wildlife, and Parks owns and operates 9 dams holding approximately 23,573 acre-feet of water (MT DNRC, 2015c). Additionally, the U.S. Department of Interior Bureau of Reclamation owns and operates 13 dams (DoI, 2015). As depicted in Figure 11.1.4-1, the major reservoirs and associated dams in Montana include:

- Bighorn Lake and Yellowtail Dam are located within the Yellowstone River Basin and hold 1,381,189 acre-feet of water used to generate 250 megawatts of electricity (MT DNRC, 2014b).
- Canyon Ferry Lake and Dam, located in the Upper Missouri River Basin, is the largest dam and reservoir in Montana, and holds 1,993,000 acre-feet of water (MT DNRC, 2014d).

Fort Peck Lake, located in the Lower Missouri Basin, has a holding capacity of 18,463,000 acre-feet and stores water from the Missouri River, Musselshell River, Fourchette Creek, and Dry Creek (USACE, 2015a).

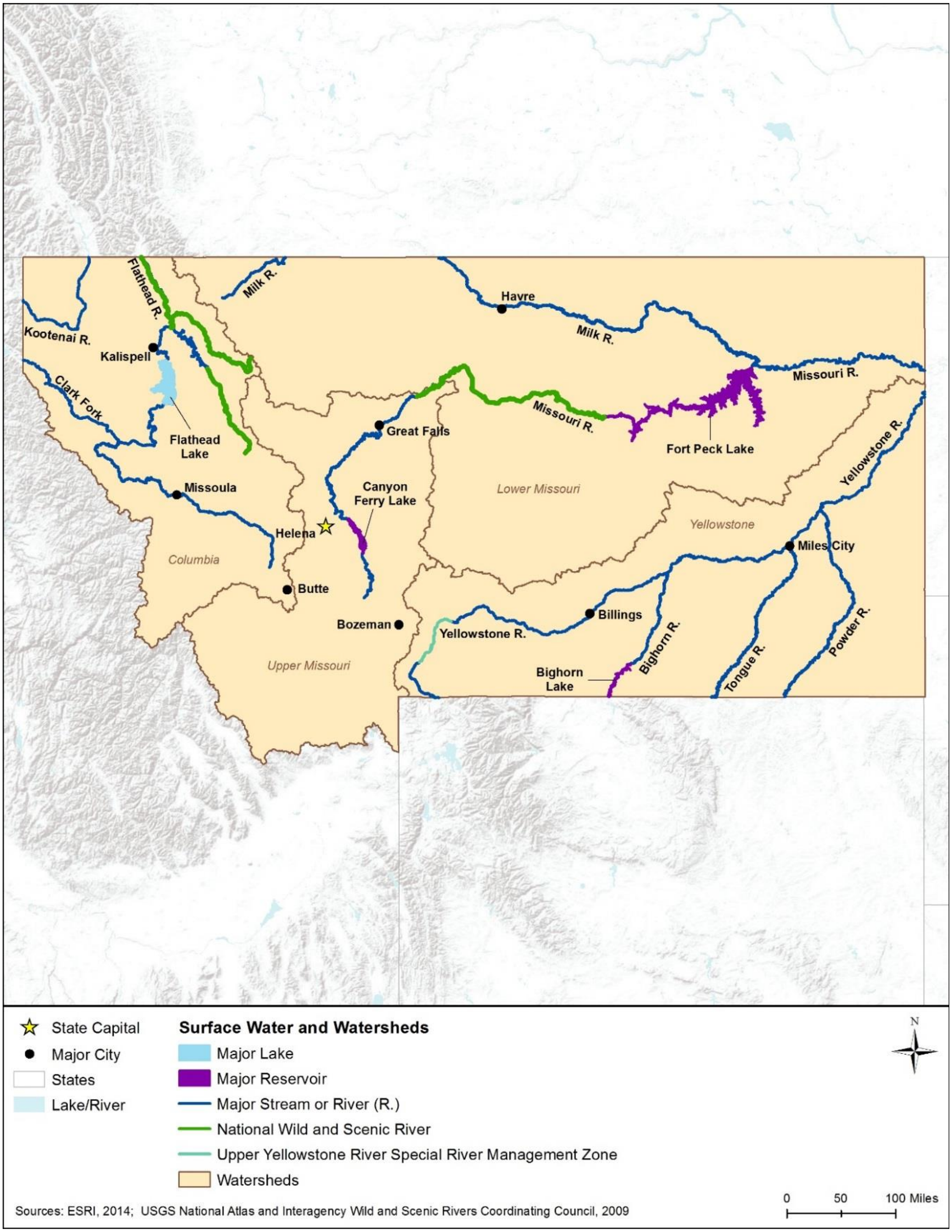

Figure 11.1.4-1: Montana Administrative Basins, defined by MDEQ, and Surface Waterbodies

11.1.4.4. Sensitive or Protected Waterbodies

Wild and Scenic Rivers

Portions of the Flathead River (north of the Hungry Horse Reservoir) and Missouri River (between Fort Benton and the Robinson Bridge) are federally designated National Wild and Scenic Rivers in Montana (Figure 11.1.4-1) (see Appendix C, Environmental Laws and Regulations, for more information about the Wild and Scenic Rivers Act). Designated sections of the Flathead River include 97.9 miles classified as wild, 40.7 miles as scenic, and 80.4 miles as recreational wherein the river flows through Glacier National Park, the Bob Marshall Wilderness area, and the Great Bear Wilderness area (National Wild and Scenic Rivers System, 2015a). Designated sections of the Missouri River include 64.0 miles classified as wild, 26.0 miles as scenic, and 59.0 miles as recreational (National Wild and Scenic Rivers System, 2015b). The river segments features 49 fish species including the endangered pallid sturgeon (BLM, 2015a) as well as cultural resources, including Fort Benton and portions of the Lewis and Clark National Historic Trail (BLM, 2015b). More information on Wild and Scenic Rivers is presented in Section 11.1.8, Visual Resources.

State Designated Outstanding Resource Waters

In addition to federally designated Wild and Scenic Rivers, Montana's Water Quality Act prohibits degrading the water quality of "outstanding resource waters" of significant "environmental, ecological, or economic value" (Horpestad, 2000). Surface waters within national parks and wilderness areas are automatically designated as outstanding resource waters (ORWs), and, although infrequently used, the statute allows other waters to be designated through a petition to the MDEQ Board of Environmental Review (Horpestad, 2000). The Gallatin River, from where it flows out of Yellowstone National Park to where it is joined by Spanish Creek, was initially petitioned to be an ORW in 2001 and has not received final designation (MDEQ, 2006).

State Designated Source Water Protection Areas

Source water is "untreated water from streams, rivers, lakes or underground aquifers that is used to provide public drinking water, as well to supply private wells used for human consumption" (USEPA, 2012b). Montana's Source Water Protection Program conducts technical assessments and provides findings to water utilities and localities. The assessment process involves delineating the waters and watersheds associated with a public water system and identifying and assessing contamination risks associated with those waters. Based on MDEQ assessments, water utilities and localities apply management strategies, including direct ownership of waters, issuance of permits to sources of potential contaminants, and implementation of best management practices in the watershed (MDEQ, 2015k).

11.1.4.5. 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 CWA, states are required to assess water quality and report a listing of impaired waters,[63] the causes of impairment, and probable sources. Table 11.1.4-2 summarizes the water quality of Montana's assessed major waterbodies by category, percent impaired, designated use,[64] cause, and probable sources. Approximately 85 percent of Montana's assessed rivers and streams, and 84 percent of the state's assessed lakes, reservoirs, and ponds are impaired. The main sources of impairment are agriculture practices, abandoned mines, and atmospheric deposition[65] (USEPA, 2015b).

Figure 11.1.4-2 shows the Section 303(d) waters in Montana as of 2014.

Table 11.1.4-2: Section 303(d) Impaired Waters of Montana, 2014

Water Type[a]	Amount of Waters Assessed[b] (Percent)	Amount Impaired (Percent)	Designated Uses of Impaired Waters	Top Causes of Impairment	Top Probable Sources for Impairment
Rivers and Streams	11.5%	85%	aquatic life, recreation, drinking water, and agricultural	changed shore vegetation, sediment, phosphorous	agriculture, grazing, irrigation
Lakes, Reservoirs, and Ponds	58%	84%	aquatic life, drinking water, agricultural, recreation	mercury, lead, phosphorous, sediment	abandoned mines, atmospheric deposition [c] historic bottom deposits, municipal point sources

Source: (USEPA, 2015b)

[a] Some waters may be considered for more than one water type.
[b] Montana has not assessed all waterbodies within the state.
[c] Atmospheric deposition: phenomena that occurs when pollutants are transferred from the air to the earth's surface and pollutants travel from the air into the water through rain and snow, falling particles, and absorption of the gas form of the pollutants into the water.

Various sources affect Montana's waterbodies causing impairments. The MDEQ has identified agriculture, forestry, transportation, urban and suburban pollution, mining and contaminated sediments, hydrologic modification,[66] recreation, and atmospheric deposition and climate change as the most significant nonpoint source contributors to impaired waters (MDEQ, 2014e). Nonpoint source pollution[67] accounts for 90 percent of stream and 80 percent of lake impairments in Montana while point source pollution is responsible for the remainder of stream and lake impairments (MDEQ, 2015l).

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

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

[65] Atmospheric deposition that occurs when pollutants are transferred from the air to the earth's surface and pollutants travel from the air into the water through rain and snow, falling particles, and absorption of the gas form of the pollutants into the water (USEPA, 2015a).

[66] Hydrologic modifications are "activities that disturb natural flow patterns of surface water and groundwater," (e.g., construction, dams and impoundments, channelization, dredging, and land reclamation activities) (USEPA, 1975).

[67] Nonpoint source pollution: a source of pollution that does not have an identifiable, specific physical location or a defined discharge point. Non-point source pollution includes nutrients that run off croplands, lawns, parking lots, streets and other land uses. It also includes nutrients that enter waterways via air pollution groundwater, or septic systems (USEPA, 2015a).

To address pollutant-impaired waters, Montana is in the process of developing total maximum daily loads (TMDLs). The USEPA defines a TMDL as "calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and an allocation of that load among the various sources of that pollutant" (USEPA, 2013a). TMDLs address both point and nonpoint source pollution, and build in a "margin of safety" to ensure pollutant reductions achieve desired water quality end states. TMDLs inform implementation plans that outline corrective actions to return impaired waters to designated uses (USEPA, 2013a).

By 2014, the state had developed approved TMDL documents or watershed plans for 664 specific waterbody segment-pollutant combinations; approximately 1,400 waterbody segment-pollutant combinations remain (MDEQ, 2016). At Flathead Lake, for example, TMDLs have been developed and approved for total nitrogen and phosphorous, but listed as impaired for mercury, polychlorinated biphenyls, and sedimentation/siltation. Pollution sources related to sewage disposal and atmospheric deposition have resulted in fish consumption advisories. More information, including final approved TMDL documents, are available from http://deq.mt.gov/Water/WQPB/TMDL/finalReports.

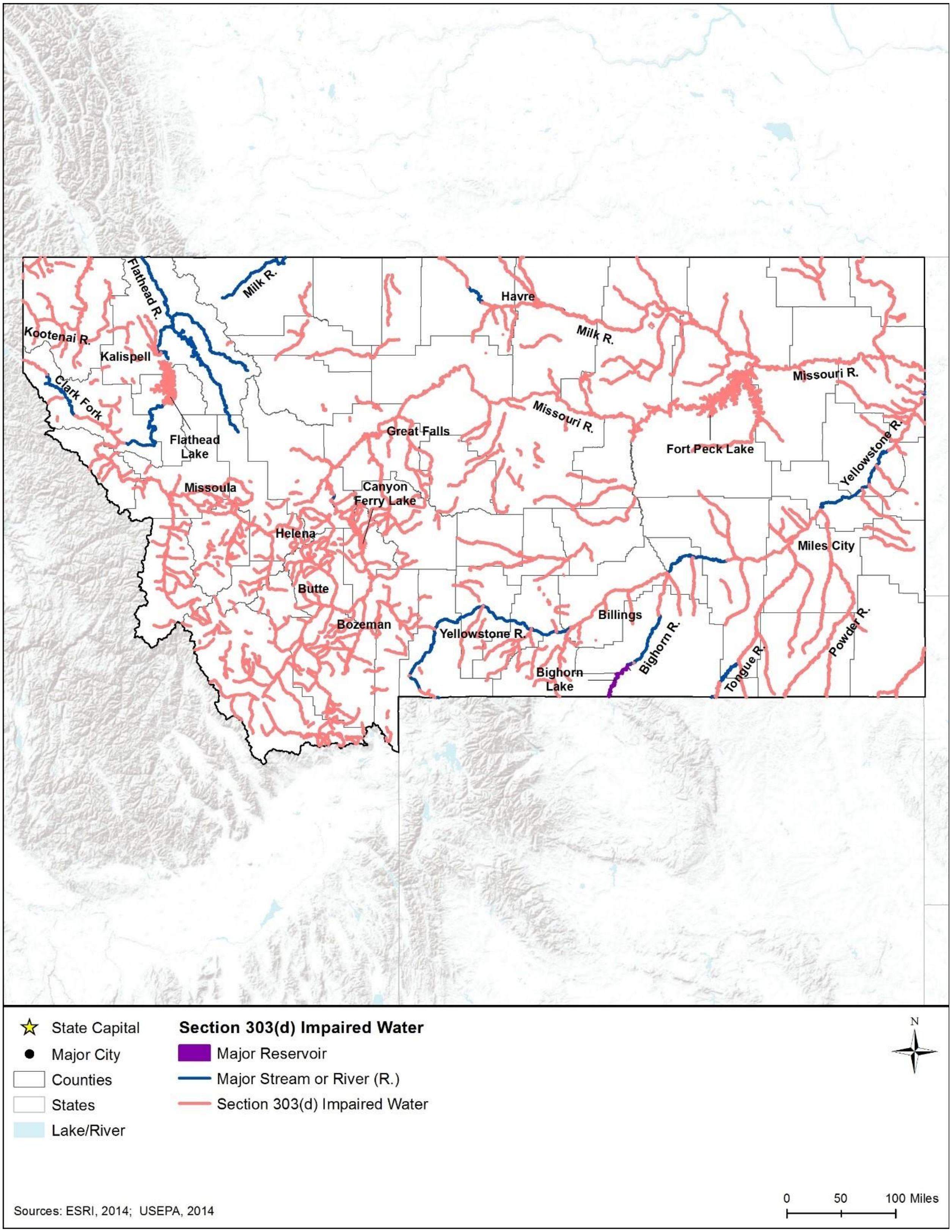

Figure 11.1.4-2: Section 303(d) Impaired Waters of Montana, 2014

11.1.4.6. Floodplains

The Federal Emergency Management Agency (FEMA) defines a floodplain or flood-prone area as "any land area susceptible to being inundated by water from any source" (44 Code of Federal Regulations [CFR] 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).

Riverine and lake floodplains are the primary types of floodplains in Montana. They occur along rivers, streams, or lakes where overbank flooding may occur, inundating adjacent land areas. In mountainous areas, such as the Rocky Mountains, 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).

Flooding is the leading cause for disaster declaration by the President of the U.S. and results in significant damage throughout the state annually (NOAA, 2015a). There are several types of flooding in Montana, often resulting in loss of life and damage to property, infrastructure, agriculture, and the environment. These include regional floods, flash floods, and ice-jam floods. Regional floods can last hours to days and occur over broad areas, while flash floods are more localized and occur rapidly. Conditions likely to produce an ice-jam flood occur when ice obstructs the flow of a river allowing water to accumulate upstream of the obstruction (MTDPHHS, 2015b).

Ice-jams are a particular problem in Montana, where 1,620-recorded events in the state exceed the sum of ice-jams in the remaining contiguous U.S. Ice-jams have resulted in deaths, displacement from homes, and environmental damage (e.g., fish kills). These events are most common in the Missouri, Yellowstone, and Milk rivers (MT DES, 2013).

Although some areas, such as floodplains, are more prone to flooding than others, no area in the state is exempt from flood hazards. Based on previous property losses from historical flooding

(1960 to 2012), flood damages are most severe in the Yellowstone river basin. Of the counties with the top five flood-related property losses, three are located in the Yellowstone watershed (Custer, Powder River, and Fallon). Musselshell and Flathead counties, located in the Lower Missouri and Columbia River basins, respectively, are among counties with noteworthy losses (MT DES, 2013).

Montana Ice Jams and Flooding

Throughout the 2013-2014 winter season, various weather systems deposited significant snowfall throughout central and eastern Montana. Following a colder-than-average winter, typical March temperatures caused increased snowmelt, excessive run-off, and the creation and breaking of ice jams, resulting in flash floods. The ice jam flooding damaged public infrastructure and private property and required evacuations (Bullock, 2014).

On April 17, 2014, President Obama declared a disaster for Montana, making federal aid available to the state (FEMA, 2014c). FEMA obligated over $1.9M in total public assistance grants in response to the flooding (FEMA, 2015a).

Source: : (MT Governor's Office of Community Service, 2014)

Between 1974 and 2011, public assistance for declared disasters exceeded $71M. Contributing significantly to this total was a Presidential Flood Disaster in 2010 affecting the Rocky Boy's Reservation for which $30.2M was received in federal aid. The flood required evacuations and damaged critical infrastructure including roads, water distribution lines, bridges, and a health clinic (MT DES, 2013).

Only three localities in Montana have floodplain management or zoning ordinances that restrict development within the 100-year floodplain, including Lewis and Clark County (MDEQ, 2011b) (Lewis and Clark County, 2016). FEMA provides floodplain management assistance, including mapping of 100-year floodplain limits, to 135 communities in Montana through the National Flood Insurance Program (NFIP) (FEMA, 2016). 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, 2015b). While the state forbids "building of new habitable structures in a designated floodway" and requires "buildings in the floodplain be elevated two feet above the Base Flood Elevation," these standards are generally not implemented as floodplains are not extensively mapped (MDEQ, 2011b). As an incentive, communities can voluntarily participate in the NFIP Community Rating System (CRS), which is a program that rewards communities by reducing flood insurance premiums in exchange for doing more than the minimum NFIP requirements for floodplain management. As of May 2014, Montana had 12 communities participating in the CRS (FEMA, 2014d).[68]

11.1.4.7. 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, 1999). When the water table reaches the ground surface, groundwater will reappear as either streams, lakes, pond,, or wetlands. This exchange between surface water and groundwater is an important feature of the hydrologic (water) cycle.

Montana's aquifers are grouped broadly into three classes in the Clark Fork and Kootenai Basins: shallow alluvium (unconfined and the most productive); basin-fill (deeper, less continuous, and generally less productive); and bedrock (discontinuous and only allowing for small supplies) (MT DNRC, 2014e). In the Lower Missouri River Basin, shallow alluvium[69] and glacial outwash aquifers are similar to those in the Clark Fork and Kootenai Basins; sandstone aquifers are the most commonly used although some produce water with high mineral concentrations unsuitable for typical use, and limestone aquifers are productive in karst formations (MT DNRC, 2014c). In the Upper Missouri River Basin, aquifer types are similar to those in the Clark Fork and Kootenai Basins, with the addition of terrace deposits[70] that are primarily recharged through irrigation water (MT DNRC, 2014d). Alluvial, sandstone, and bedrock aquifers exist in the Yellowstone Basin, similar to their counterparts in other major river basins of the state (MT DNRC, 2014b).

The Northern Rocky Mountains Intermontane Basins aquifer system provides water suitable for domestic and livestock purposes from shallow wells, while deep wells supply water of suitable quality and quantity for all purposes. Upper Cretaceous waters, while useable for domestic and livestock purposes, are too high in sodium content for agricultural irrigation. The Lower Cretaceous aquifer generally supplies saline water except for locations in central and southern Montana and is used for similar purposes to Upper Cretaceous waters. Lower Tertiary aquifer, although relatively impermeable, contains substantial freshwater. Paleozoic aquifers contain little freshwater, and at depth can contain brine or petroleum (USGS, 1996a).

Groundwater in Montana represents an important source for human use, such as irrigation, public supply, industrial uses, and livestock use (USGS, 2014j). Groundwater also plays an important role in providing constant inflow to streams maintaining base flow throughout the year (MT

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[68] A list of these 12 CRS communities can be found in the most recent FEMA CRS report dated May 1, 2014 (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).

[69] Alluvium is "clay, silt, sand, gravel or similar unconsolidated detrital material, deposited during comparatively recent geologic time by a stream or other body of running water, as a sorted or semi-sorted sediment" (USGS, 2014i).

[70] Terrace deposits are gravel or sand sediments that form a terrace, a level or near-level area of land, generally above a river or ocean and separated from it by a steeper slope (USGS, 2015h).

DNRC, 2014a). Generally, the water quality of Montana's aquifers is suitable for drinking and daily water needs; however, MDEQ identified contaminants and contamination sources, which are described in Section 5.1.3 of the 2014 Water Quality Integrated Report (MDEQ, 2014e).

Table 11.1.4-3 provides details on aquifer characteristics in the state; Figure 11.1.4-3 shows Montana's principal and sole source aquifers. The Pacific Northwest basaltic-rock aquifers are more extensive in other states and represent a relatively small area within Montana, and thus are not discussed in detail. For more information on the Pacific Northwest basaltic-rock aquifers, see Chapter 18, Wyoming, Section 18.1.4, Wyoming Groundwater.

Table 11.1.4-3: Description of Montana's Principal Aquifers

Aquifer Type and Name	Location in State	Groundwater Quality
Northern Rocky Mountains Intermontane Basins Semi-consolidated and unconsolidated sand and gravel	Western Montana	Water has low dissolved mineral content and nitrate, chloride, and sulfate concentrations below water quality standards.
Lower Cretaceous Consolidated sandstone with variable porosity and permeability	Eastern Montana to the Rocky Mountains	Water has high dissolved mineral content; in some locations (e.g., Williston Basin) the water is brine.
Lower Tertiary Semi-consolidated and consolidated sandstone	Central and eastern Montana	Aquifer contains freshwater, and accounts for most groundwater withdrawals.
Upper Cretaceous Consolidated sandstone with variable/low permeability	West-central to eastern Montana	Water is fresh only at shallow depths, and saline at depth. Water has high concentrations of dissolved minerals.
Paleozoic Confined limestone and dolomite, with solution caves	Eastern Montana to the Rocky Mountains	At depth, the water can have high concentrations of dissolved minerals and contain oil, gas, and brine.

Source: (USGS, 1996b) (USGS, 2003d) (Moody, Carr, Chase, & Paulson, 1986)

Sole Source Aquifers

The USEPA defines sole source aquifers (SSAs) as "an aquifer that supplies at least 50 percent of the drinking water consumed in the area overlying the aquifer" and are areas with no other drinking water sources (USEPA, 2015c). USEPA designated Montana's only SSA in 1988, the Missoula Valley Aquifer (as shown in Figure 11.1.4-3) (USEPA, 2015d). Historically, the Missoula Valley Aquifer was subject to contamination threats from a variety of events, such as a gasoline pipeline break, improperly disposed pesticides, leachate from the Browning-Ferris municipal landfill, diesel fuel from Burlington Northern Railroad, excessive nitrate levels from sewage disposal, coliform bacteria from irrigation canal recharge, and a gasoline-leaking underground storage tank (USEPA, 1988). Designating a groundwater resource as a SSA helps to protect the drinking water supply in that area and requires reviews for all federally funded proposed projects to ensure that the water source is not jeopardized (USEPA, 2015c).

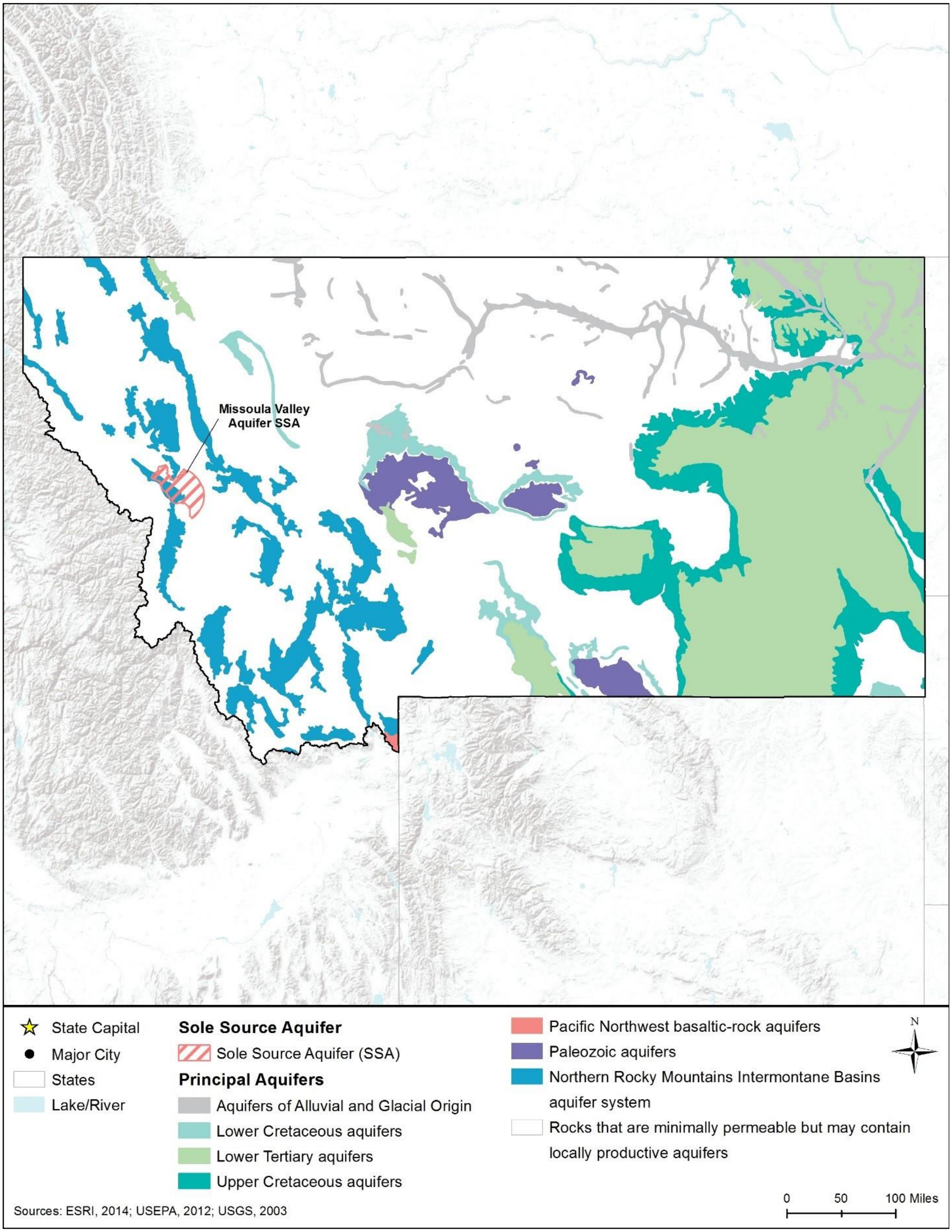

Figure 11.1.4-3: Principal and Sole Source Aquifers of Montana

11.1.5. Wetlands

11.1.5.1. Definition of the Resource

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

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

11.1.5.2. Specific Regulatory Considerations

Appendix C, Environmental Laws and Regulations, explains the pertinent federal laws protecting wetlands in detail. Table 11.1.5-1 summarizes the major Montana state laws and permitting requirements relevant to the state's wetlands.

Table 11.1.5-1: Relevant Montana Wetland Laws and Regulations

State Law / Regulation	Regulatory Agency	Applicability
CWA Section 404 permit, Montana regional conditions	U.S. Army Corps of Engineers (USACE), Omaha District	Activities resulting "in the discharge or placement of dredged or fill material into … wetlands" Regional conditions: Revoke all but seven nationwide permits for use in peatlands,[a] Require pre-construction notification (PCN) for allowable nationwide permits used in peatlands; Require PCN for activities "involving the discharge of dredge or fill material into scrub-shrub and/or forested wetlands" Generally prohibit "diversion or removal of sediment or alluvium from," "trench excavation and backfill for utility lines in," and PCN for utility line dredge and fill discharges in wetlands adjacent to the Upper Yellowstone Special River Management Zone "Limit clearing of … wetland vegetation to the absolute minimum necessary" Prohibit net loss of emergent wetlands due to "aquatic habitat restoration, establishment, and enhancement" activities.
Short-Term Water Quality Standard for Turbidity Related to Construction Activity	MDEQ, Water Protection Bureau	Construction activities affecting wetlands unable to meet the numeric standard for turbidity.

State Law / Regulation	Regulatory Agency	Applicability
Land-Use License or Easement on Navigable Waters	MT DNRC Land Office or Real Estate Management Bureau	Activities "in, over, below, or above a navigable river" that may affect riparian areas.
Stormwater Discharge General Permits	MDEQ, Water Protection Bureau	Activities discharging stormwater to wetlands. For construction activities, the regulated entity must submit a Notice of Intent, Stormwater Pollution Prevention Plan, and applicable fees.
Confederated Salish and Kootenai Tribes Water Quality Program	Tribal Water Quality Program, Environmental Protection Division	Projects "affecting reservation waters," including wetlands.
Water Quality Certification	MDEQ, Water Protection Bureau	In accordance with Section 401 of the CWA, activities that may result in a discharge to waters of the U.S., including wetlands, require a Water Quality Certification from MDEQ indicating that the proposed activity will not violate state water quality standards.

Source: (MT DNRC, 2015b) (USACE - Omaha District, 2012) (CSKT NRD, 1993) (MDEQ, 2014d)

[a] Peatlands are wetlands with a waterlogged, organic soil layer made up of partially decomposing plant material (USGS, 2015i).

11.1.5.3. Environmental Setting: Wetland Types and Functions

The U.S. Fish and Wildlife Service's (USFWS) National Wetlands Inventory (NWI) mapping adopted a national Wetlands Classification Standard (WCS) that classifies wetlands according to shared environmental factors, such as vegetation, soils, and hydrology, as defined in Cowardin et al (1979). The WCS includes five major wetland systems: Marine, Estuarine, Riverine, Lacustrine, and Palustrine (as detailed in Table 11.1.5-2). The first four of these include both wetlands and deepwater habitats but the Palustrine includes only wetland habitats.

- 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 30 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 are usually semi enclosed by land but have open, partly obstructed, or sporadic access to the open ocean, and the ocean water is at least occasionally diluted by freshwater runoff from the land."
- "Riverine System includes all wetlands and deepwater habitats contained within a channel with two exceptions (1) wetlands dominated by trees, shrubs, persistent emergent, emergent mosses, or lichens, and (2) habitats with water containing ocean-derived salts in excess of 0.5 ppt."
- 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 greater than 20 acres. Includes lakes, larger ponds, sloughs, lochs, bayous, etc.

- "Palustrine includes all nontidal wetlands dominated by trees, shrubs, persistent emergents, or emergent mosses or lichens, and all such wetlands that occur in tidal areas where salinity due to ocean-derived salt is below 0.5 percent." The System is characterized based on the type and duration of flooding; water chemistry, vegetation, or substrate characteristics (soil types) (Cowardin, Carter, Golet, & LaRoe, 1979) (FGDC, 2013).

In Montana, the main type of wetland is palustrine (freshwater), found on river and lake floodplains across the state. Table 11.1.5-2 uses 2014 NWI data to characterize and map Montana 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 that may be conducted, as appropriate, at the site-specific level once those locations are known. As shown in Figure 11.1.5-1 to Figure 11.1.5-4, palustrine emergent wetlands are the most common in the state, followed by lacustrine wetlands. The map codes and colorings in Table 11.1.5-2 correspond to the wetland types in the figures.[71]

Table 11.1.5-2: Montana Wetland Types, Descriptions, Location, and Amount, 2014

Wetland Type	Map Code and Color	Description [a]	Occurrence	Amount (acres)[b]
Palustrine forested wetland	PFO	PFO wetlands contain woody vegetation that are at least 20 feet tall. Floodplain forests, hardwood swamps, and silver maple-ash swamps are examples of PFO wetlands.	Western Montana	127,026
Palustrine scrub-shrub wetland	PSS	Woody vegetation less than 20 feet tall dominates PSS wetlands. Thickets and shrub swamps are examples of PSS wetlands.		
Palustrine emergent wetlands	PEM	PEM wetlands have erect, rooted, green-stemmed, annual, water-loving plants, excluding mosses and lichens present for most of the growing season in most years. PEM wetlands include freshwater marshes, wet meadows, fens, prairie potholes, and sloughs.	Throughout the state	743,834
Palustrine unconsolidated bottom	PUB	PUB and PAB wetlands are commonly known as freshwater ponds, and includes all wetlands with at least 25% cover of particles smaller than stones and a vegetative cover less than 30%.	Throughout the state	129,836

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

Wetland Type	Map Code and Color	Description [a]	Occurrence	Amount (acres)[b]
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[72], and other miscellaneous wetlands are included in this group.	Throughout the state	7,483
Riverine wetland	R	Riverine systems include rivers, creeks, and streams. They are contained in natural or artificial channels periodically or continuously containing flowing water.	Throughout the state	46,328
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 less than 8.2 feet deep.	Throughout the state	135,594
			TOTAL	**1,190,101**

Source: (Cowardin, Carter, Golet, & LaRoe, 1979) (FGDC, 2013) (USFWS, 2015a)

[a] The wetlands descriptions are based on information from the Federal Geographic Data Committee (FGDC)'s Classification of Wetland and Deepwater Habitats of the U.S. Based on Cowardin, et.al, (1979), some data have been revised based on the latest scientific advances. The USFWS uses these standards as the minimum guidelines for wetlands mapping efforts (FGDC, 2013).
[b] All acreages are rounded to the nearest whole number. The maps are prepared from the analysis of high altitude imagery. A margin of error is inherent in the use of imagery. The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted (USFWS, 2015b).

Palustrine Wetlands

In Montana, wetlands are grouped into several major types, described briefly below.

- Prairie potholes in northeast Montana and intermontane (i.e., valley) potholes near the Rocky Mountains are temporary and lasting "depressional" wetlands existing in indentations left by past glaciation (MDEQ, 2009a) (MDEQ, 2014f).
- Fens[73] are located sparsely throughout western Montana, and have been found to contain up to 19.4 feet of peat (MDEQ, 2009b).
- Beaver ponds are created by beaver dams that change flow characteristics of streams, contributing to increases in wetland areas throughout the state (MDEQ, 2009c).

[72] Saline seep is an area where saline groundwater discharges at the soil surface. Saline soils and salt tolerant plants characterize these wetland types (City of Lincoln, 2015).
[73] Fens "are peat-forming wetlands that receive nutrients from sources other than precipitation: usually from upslope sources through drainage from surrounding mineral soils and from groundwater movement" (USEPA, 2015e).

- Wet meadows, also present across Montana, form in "poorly drained areas such as shallow lake basins, low-lying farmland, and the land between shallow marshes and upland areas." These wetlands do not typically have standing water (MDEQ, 2009d).
- Lacustrine fringe wetlands occur adjacent to lake or reservoirs (MDEQ, 2009e) while wetlands adjacent to rivers are known as riparian (MDEQ, 2012).
- Seep and spring wetlands form where the water table meets the land surface, typically "on toe slopes or elevated terraces on the floodplain edge" (MDEQ, 2009f).
- Saline wetlands, a subset of seep and spring wetlands, are located most frequently east of the Rocky Mountains (MDEQ, 2009g). These wetlands contain brackish water due to high rates of evaporation of groundwater inputs with high mineral content (MFWP, 2010).

Based on NWI (2014) analysis, there are approximately 1.2 million acres of wetlands in Montana (USFWS, 2014a). Since 1800, Montana has lost 27 percent of its wetlands to agricultural land use (USGS, 1997). Currently, only 1 percent of the state's land area is wetland and the average wetland is only 2 acres in size (MDEQ, 2013c). Main threats to wetlands in Montana currently include oil and natural gas extraction, climate change, increased groundwater withdrawals, nonpoint source pollution, "hydrologic modification,"[74] and invasive species (MDEQ, 2013d).

The MDEQ administers the state's wetland program and the Montana Wetland Council, established in 1994, engages stakeholders across the state. Montana's strategy for wetland management aims for wetlands growth through conservation and restoration activities, improved mapping, monitoring, and assessment, engagement at all levels of government, research on vulnerable and impacted wetlands, and public outreach and education (MDEQ, 2013d).

[74] Hydrologic modifications are "activities that disturb natural flow patterns of surface water and groundwater," (e.g., construction, dams and impoundments, channelization, dredging, and land reclamation activities) (USEPA, 1975).

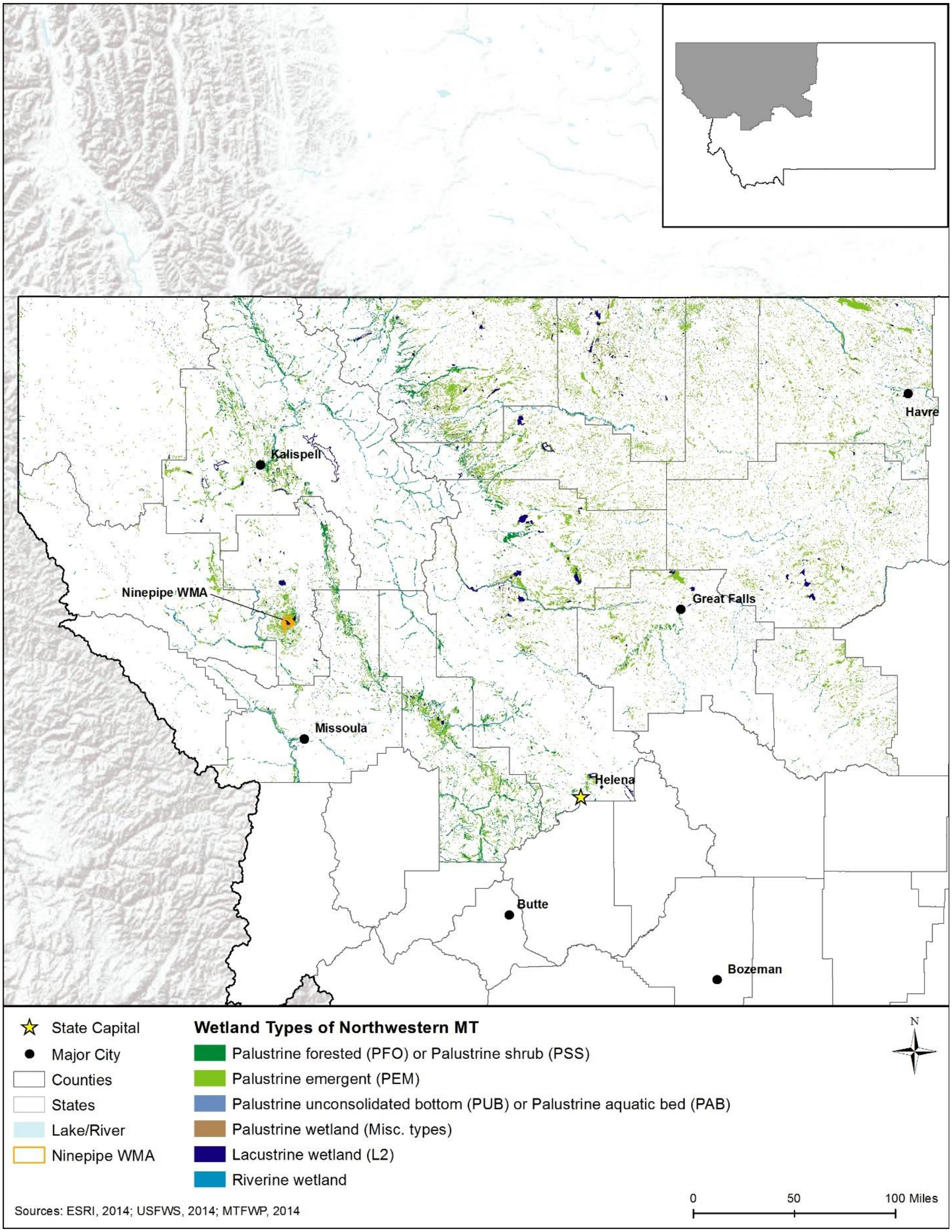

Figure 11.1.5-1: Wetlands by Type, Northwest Montana, 2014

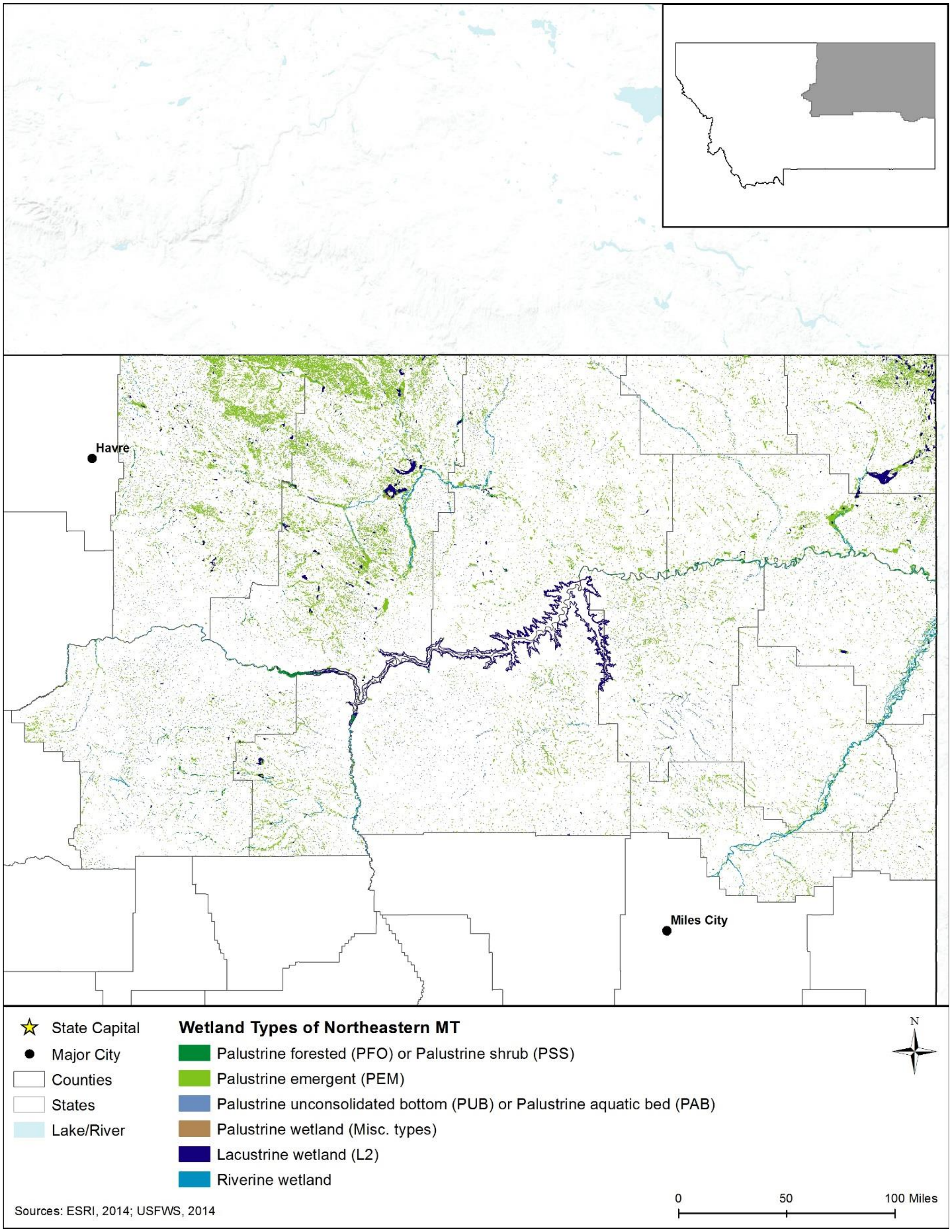

Figure 11.1.5-2: Wetlands by Type, Northeast Montana, 2014

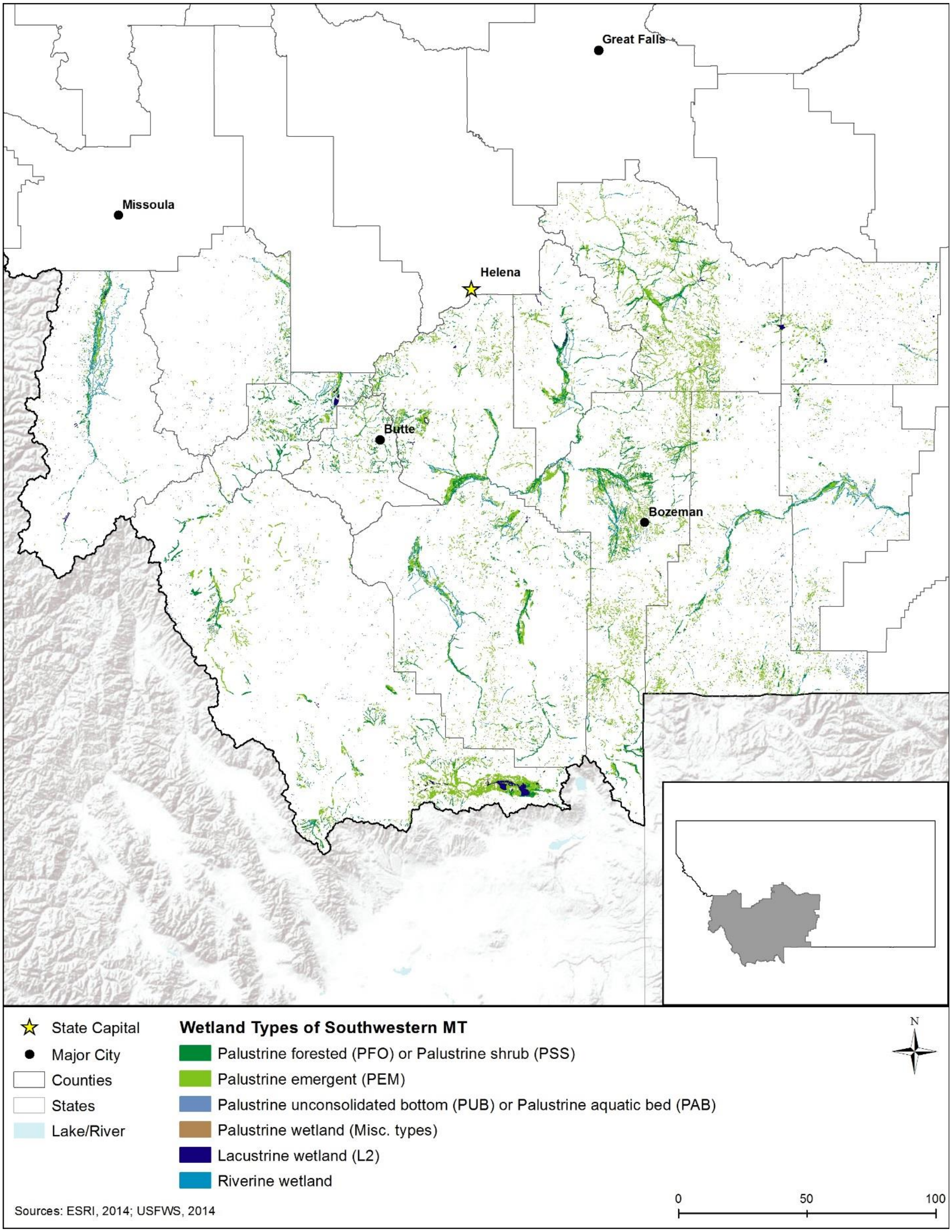

Figure 11.1.5-3: Wetlands by Type, Southwest Montana, 2014

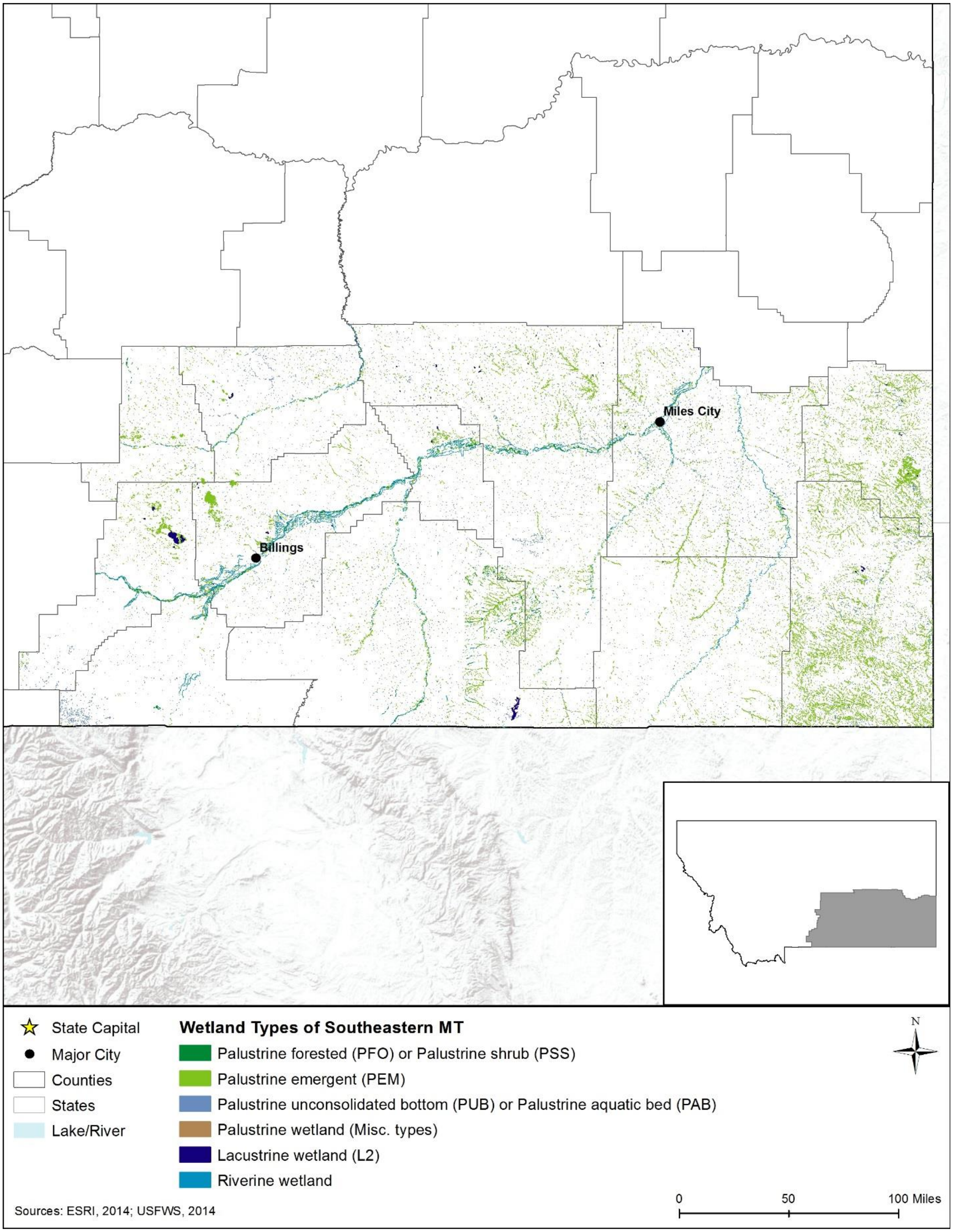

Figure 11.1.5-4: Wetlands by Type, Southeast Montana, 2014

11.1.5.4. Wetlands of Special Concern or Value

In addition to protections under the state's 401 Certification and the national CWA, Montana considers certain wetland communities as areas of special value. These include peatlands, scrub-shrub and forested wetlands, wetlands in the Special River Management Zone of the Upper Yellowstone River, and prairie potholes. There are no regulated high quality wetlands in Montana.

Peatlands

In Montana, areas classified as peatlands are protected under USACE Nationwide Permit regional conditions. Peatlands are "waterlogged areas with a surface accumulation of peat (organic matter) 30 centimeters (12 inches) or more thick" (USACE - Omaha District, 2012). Generally in Montana, USACE Nationwide Permits are revoked for activities in peatlands, except for those governing maintenance; scientific measurement devices; surveys; oil and hazardous substance response operations; aquatic habitat restoration, establishment, or enhancement; enforcement action responses; and hazardous/toxic waste cleanup. Before engaging in any of these activities in a peatland, regulated entities are required to notify the USACE (USACE - Omaha District, 2012).

Scrub-Shrub and Forested Wetlands

Pre-construction notification is required for activities occurring in PSS or PFO wetlands for USACE Nationwide Permit regional conditions (USACE - Omaha District, 2012).

Special River Management Zone of the Upper Yellowstone River

Wetlands adjacent to the Upper Yellowstone River are included in a special river management zone (see Figure 11.1.4-1 in Water Resources), stretching 48 miles through the towns of Emigrant, Livingston, and Springdale, which was established to address "cumulative effects of bank stabilization and other channel modifications on the physical, biological, and cultural attributes of the upper Yellowstone River" (USACE, 2011). Management provisions resulted in several regional conditions on USACE Nationwide Permits in the zone affecting activities in wetlands (USACE, 2011). Prohibited activities include "diversion or removal of sediment or alluvium"[75] and construction of ponds, channels, and dams. Special restrictions apply to utility line activities including a trench excavation and backfill prohibition and USACE notification requirements for dredged and fill material discharge (USACE - Omaha District, 2012).

[75] Alluvium is "clay, silt, sand, gravel or similar unconsolidated detrital material, deposited during comparatively recent geologic time by a stream or other body of running water, as a sorted or semi-sorted sediment" (USGS, 2014i).

Prairie Potholes

Prairie potholes, depicted in Figure 11.1.5-5, serve important ecological function in providing habitat to migratory birds. Fifty to ninety percent of these wetlands in Montana have been have been drained for agricultural activities (USGS, 2011a). Two emerging threats to prairie potholes are increased oil and gas extraction and climate change. Oil and gas extraction can produce brine (i.e., "extremely saline water") that is stored in "buried reserve pits," or, in the case of hydraulic fracturing, "flow-back water" that can contaminate surface and groundwater, including prairie potholes (USGS, 2014k). Climate change is expected to reduce and change the distribution of precipitation, altering the presence of standing water in these temporary or seasonal prairie potholes (USGS, 2011b) (USGS, 2011a).

Source: (MDEQ, 2009a)

Figure 11.1.5-5: Prairie Pothole Wetlands in Montana

Other Important State Wetland Sites

- Montana has four Wetland Management Districts[76] located, from west to east along its northern border: Northwest Montana, Benton Lake, Bowdoin, and Northeast Montana. These districts contain various National Wildlife Refuges (NWR) (MFWP, 2013). For additional information about FWS Wetland Management Districts, see http://www.fws.gov/mountain-prairie/refuges/mt/.
- The Montana Fish, Wildlife and Parks (MFWP) Migratory Bird Wetland Program has restored, enhanced, created, or protected 8,862 acres of wetlands in the state as of 2013 (MFWP, 2013). More information on the program is available at http://fwp.mt.gov/fishAndWildlife/habitat/wildlife/programs/migratoryBirds/.
- Many Montana Fish Wildlife & Parks (MFWP) Wildlife Management Areas (WMAs), managed for "wildlife and wildlife habitat conservation," contain wetlands (MFWP, 2015a). The Ninepipe WMA (Figure 11.1.5-1) is home to a 124-acre wetland restoration and creation project (MFWP, 2009). For additional information regarding Montana WMAs, see http://fwp.mt.gov/fishAndWildlife/wma/.
- The U.S. Department of Agriculture (USDA) NRCS administers the Agricultural Conservation Easement Program, which includes wetland reserve easements and enhancement partnerships. These programs aim to protect and restore wetlands on private

[76] A Wetland Management District is an administrative organization that manages all the waterfowl production areas in a multi-county area. "Wetland Management Districts also work closely with the private landowners, government and nongovernment organizations, businesses and other federal agencies in their districts to improve wildlife habitat" (USFWS, 2012).

property (USDA, 2015a). More information is available at www.nrcs.usda.gov/wps/portal/nrcs/main/mt/programs/easements/acep/.
- The USDA Farm Service Agency administers the Farmable Wetlands Program, which "is designed to restore previously farmed wetlands and wetland buffer to improve both vegetation and water flow" (USDA, 2015b). To learn more about the program, visit www.fsa.usda.gov/programs-and-services/conservation-programs/farmable-wetlands/index.

For more information on Montana's wetland management districts, national wildlife refuges, wildlife management areas, conservation programs, and easements, see Section 11.1.8, Visual Resources, and Section 11.1.7, Land Use, Recreation, and Airspace.

11.1.6. Biological Resources

11.1.6.1. Definition of the Resource

This section describes the biological resources of Montana. Biological resources include terrestrial[77] vegetation, wildlife, fisheries and aquatic[78] habitats, and threatened[79] and endangered[80] species as well as species of conservation concern. Wildlife habitat and associated biological ecosystems are also important components of biological resources. Because of the significant topographic variation within the state, Montana supports a wide diversity[81] of biological resources ranging from prairie settings in the eastern portion of the state, to boreal forests and alpine meadows in the mountainous areas of western Montana. Each of these topics is discussed in more detail below.

11.1.6.2. Specific Regulatory Considerations

The federal laws relevant to the protection and management of biological resources in Montana are summarized in detail in Section 1.8 and Appendix C, Environmental Laws and Regulations. Table 11.1.6-1 summarizes major state laws relevant to Montana's biological resources.

[77] Terrestrial: "Pertaining to land" (USEPA, 2015f).
[78] Aquatic: "Pertaining to water" (USEPA, 2015f).
[79] 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)).
[80] 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)).
[81] Diversity: "An ecological measure of the variety of organisms present in a habitat" (USEPA, 2015f).

Table 11.1.6-1: Relevant Montana Biological Resources Laws and Regulations

State Law / Regulation	Regulatory Agency	Applicability
County Noxious Weed Control Act (Montana Code Annotated [MCA] 7-22-2101 through 2154)	County Weed Management Districts	Requires each county in Montana to establish, implement, and enforce a noxious weed plan and management standards. As set forth under the provisions of this Act, the Montana Department of Agriculture (MDA) is responsible for establishing and updating the list of prohibited and regulated noxious weeds.
Montana Aquatic Invasive Species Act (MCA 80-7-1001 through 1015	MDA, MFWP, MT DNRC, MDT	Establishes a program for detecting, preventing and controlling aquatic invasive species[a] and for the creation of statewide species list.
The Nongame and Endangered Species Conservation Act (MCA 87-5-101 to 87-5-132)	MFWP	Provides protection for the "taking, possession, transportation, exportation, processing, sale or offer for sale, or shipment" of nongame fish and wildlife species indigenous to Montana that are threatened with extinction [b] (87-5-103, MCA).

Source: (Montana Legislature, 2015a)

[a] Invasive species: "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, 2015g).
[b] Extinction: "The disappearance of a species from part or all of its range" (USEPA, 2015g).

11.1.6.3. Terrestrial Vegetation

The distribution of flora within the state is a function of the characteristic geology,[82] soils, climate,[83] and water of a given geographic area and correlates with distinct areas identified as ecoregions.[84] 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, 2015c) (World Wildlife Fund Global, 2015).

Ecoregion boundaries often coincide with physiographic[85] regions of a state. In Montana, the two main physiographic regions include the Rocky Mountains and Interior Plains (Fenneman, 1916). 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 divides North America into 15 broad Level I ecoregions. These Level I ecoregions are further divided into 50 Level II ecoregions. These Level II ecoregions are further divided into 182 smaller Level III ecoregions. This Section

[82] "Geology is the study of the planet earth- the materials it is made of, the processes that act on those materials, the products formed, and the history of the planet and its life forms since its origin" (USEPA, 2015f).
[83] 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, 2015f).
[84] Ecoregion: "A relatively homogeneous ecological area defined by similarity of climate, landform, soil, potential natural vegetation, hydrology, or other ecologically relevant variables" (USEPA, 2015f).
[85] Physiographic: "The natural, physical form of the landscape" (USEPA, 2015f).

provides an overview of the terrestrial vegetation resources for Montana at USEPA Level III. (USEPA, 2016a).

As shown in Figure 11.1.6-1, the USEPA divides Montana into seven Level III ecoregions. The seven ecoregions support a variety of different plant communities, all predicated on their general location within the state, with five of them occurring in the Rocky Mountain physiographic region and two occurring in the Great Plains region. Communities range from coniferous[86] forest and alpine communities in the Rocky Mountain region in western Montana, to prairie communities in the Great Plains region within the eastern portion of the state. Areas in the Northern and Canadian Rockies are influenced further by the sub-climates found in these regions. Table 11.1.6-2 provides a summary of the general abiotic[87] characteristics, vegetative communities, and the typical vegetation found within each of the seven Montana ecoregions.

Figure 11.1.6-1 presents a map of the state and the EPA Level III Ecoregions present in the state. Ecoregions are broadly defined areas that share similar characteristics, such as climate, geology, soils, and other environmental conditions, and represent ecosystems contained within a region.

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

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

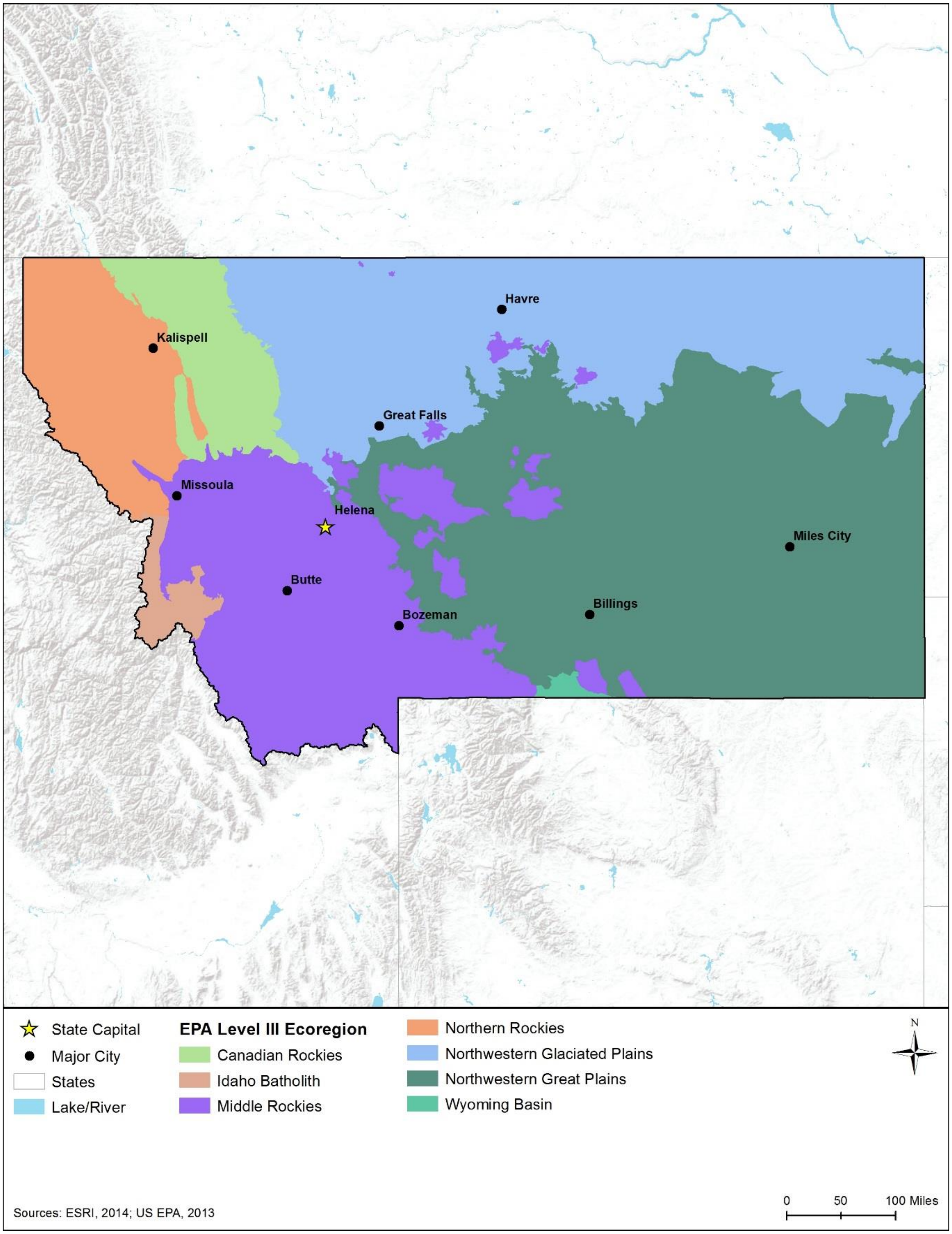

Figure 11.1.6-1: USEPA Level III Ecoregions in Montana

Table 11.1.6-2: Level III Ecoregions of Montana

Ecoregion Number	Ecoregion Description	Abiotic Characterization	General Vegetative Communities	Typical Dominant Vegetation
Geographic Region: Rocky Mountains				
15	Northern Rockies	A rugged mountainous region composed mostly of maritime influenced coniferous forest ,on extensive thick volcanic ash deposits with alpine characteristics at the highest elevations and numerous glacial[a] lakes.	Douglas-fir Forest, Lodgepole Pine Forest, Fir-Spruce Forest, Hemlock Forest	**Conifer Trees –** subalpine fir *(Abies lasiocarpa)*, Douglas fir *(Pseudotsuga menziesii)*, grand fir *(Abies grandis)*, ponderosa pine *(Pinus ponderosa)*, white bark pine *(Pinus albicaulis)*, mountain hemlock *(Tsuga mertensiana)*, Engelmann spruce (*Picea engelmannii*), and lodgepole pine (*Pinus contorta*).
16	Idaho Batholith[b]	A partially glaciated mountainous plateau[c]. Coniferous forests experience less maritime influence compared to the Northern Rockies. The mountain basins are the origin for a large number of perennial streams.[d]	Douglas-fir Forest, Lodgepole Pine Forest, and Fir-Spruce Forest	**Conifer Trees –** subalpine fir, douglas fir, grand fir, ponderosa pine, Englemann spruce, and lodgepole pine
17	Middle Rockies	Composed of a mix of montane forest types, alpine areas, and grass and shrub covered intermontane valleys and foothills.	Englemann Spruce Forest, Douglas-fir Forest, and Subalpine-fir Forest.	**Conifer Trees –**Douglas fir, lodgepole pine, and western white pine (*Pinus monticola*).
18	Wyoming Basin	An intermontane basin composed of arid grasslands and shrublands.	Douglas-fir Forest, and Lodgepole Pine Forest	**Conifer Trees –**Douglas fir, lodgepole pine, and western white pine.
41	Canadian Rockies	This region is at higher elevation than the adjacent Northern Rockies and is strongly influenced by maritime air masses. This montane region is composed of high elevation Spruce-fir forests and alpine areas at the highest elevations.	Douglas-fir Forest, Lodgepole Pine Forest, and Fir-Spruce Forest	**Conifer Trees –** subalpine fir, Douglas fir, grand fir, ponderosa pine, white bark pine, mountain hemlock, Engelmann spruce, and lodgepole pine.

Ecoregion Number	Ecoregion Description	Abiotic Characterization	General Vegetative Communities	Typical Dominant Vegetation
Geographic Region: Great Plains				
42	Northwestern Glaciated Plains	A transitional area between the Northern Glaciated Plains and the Northwestern Great plains. Prairie Pothole[e] wetlands are common throughout this region.	Native vegetation is mixed grass prairie.	**Forbs/Grasses** – western wheatgrass (*Pascopyrum smithii*), thickspike wheatgrass (*Elymus lanceolatus*), green needlegrass (*Nassella viridula*), blue grama (*Bouteloua gracilis*), and needle-and-thread grass (*Hesperostipa comata*)
43	Northwestern Great Plains	A semiarid[f] rolling plain of native grasslands broken up by occasional buttes[g] and badlandsh.[h]	Native grasslands	**Shrubs** – Wyoming big sagebrush (*Artemisia tridentata*), silver sagebrush (*Artemisia cana*), rubber rabbitbrush (*Ericameria nauseosa*), green rabbitbrush (*Ericameria teretifolia*), and antelope bitterbrush (*Purshia tridentata*). **Forbs/Grasses** – western wheatgrass, blue grama, needle-and-thread grass, and buffalo grass (*Bouteloua dactyloides*).

Sources: (Fenneman, 1916) (MFWP and MNHP, 2015) (USEPA, 2015h)

[a] Glacial: "Of or pertaining to distinctive processes and features produced by or derived from glaciers and ice sheets" (USEPA, 2015g).
[b] "A batholith is a very lager mass of intrusive igneous rock that forms when magma solidifies at depth. A batholith must have greater than 100 square kilometers (40 square miles) of exposed area (USGS, 2015j).
[c] Plateau: "An elevated plain, tableland or flat-topped region of considerable extent" (USEPA, 2015g).
[d] Perennial stream: "A stream that runs continuously throughout the year" (USEPA, 2015g).
[e] "Prairie potholes are depressional freshwater wetlands formed by glaciers moving across the landscape" (USEPA, 2015g).
[f] Semi-arid land ecosystem: "The interacting system of a biological community and its non-living environmental surroundings in regions that have between 10 to 20 inches of rainfall and are capable of sustaining some grasses and shrubs but not woodland" (USEPA, 2015g).
[g] "Buttes are smaller mesas that stand conspicuously alone, but were once part of a larger mesa before erosion separated it" (NPS, 2015b).
[h] "Badlands form when soft sedimentary rock is extensively eroded in a dry climate" (NPS, 2015c).

Communities of Concern

Montana contains vegetative communities of concern that include rare 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[88] that could result from implementation of an action.

The Montana Natural Heritage Program (MNHP) 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 MNHP ranking system assesses rarity using a state rank (S1, S2, S3, S4, S5) that indicates its rarity within Montana (Montana Natural Heritage Program, 2015a). Communities ranked as an S1 by the MNHP are 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 communities[89] in Montana; these communities represent the rarest terrestrial habitat in the state (MFWP and MNHP, 2015) Two vegetative communities are ranked as S1 and comprise less than 1 percent of Montana's total land area[90]. Both of these communities occur within western Montana in the Rocky Mountains region (MFWP and MNHP, 2015). Montana Appendix B, Table B-1 provides a description of the communities of conservation concern in Montana along with their state rank, distribution, abundance, and the associated USEPA Level III ecoregions.

Nuisance and Invasive Plants

There are a large number of undesirable plant species that are considered nuisance and invasive plants in Montana. 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 (Government Printing Office, 2011). The U.S. government has designated certain plant species as noxious weeds in accordance with the Plant Protection Act of 2000 (7 U.S.C. 7701 et seq.). As of September 2014, 112 federally recognized noxious weed species have been catalogued in the U.S., 88 of which are terrestrial, 19 aquatic, and 5 parasitic (USDA, 2014).

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[88] 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, 2015f).
[89] S1 – Communities are "at high risk because of extremely limited and/or rapidly declining population numbers, range and/or habitat, making it highly vulnerable to global extinction or extirpation in the state" (MFWP and MNHP, 2015).
[90] Montana encompasses approximately 145,546 square miles of land area" (U.S. Census Bureau, 2010).

Noxious weeds are a threat to Montana's rangeland,[91] cropland, pastureland,[92] forests, and wildlands, which comprise approximately 98 percent of the total land area of the state. Noxious weeds can have adverse ecological and economic impacts to these resources by displacing native species, degrading wildlife habitat, and increasing soil erosion[93] (Montana Department of Agriculture, 2015). The Montana County Weed Control Act (Montana Code Annotated (MCA) 7-22-2101 through 2154) stipulates that the MDA be responsible for the establishment of the statewide noxious weed list and updates to that list, as necessary. In addition, the Act further stipulates that each county is responsible for implementing and enforcing noxious weed management. Further, individual counties in Montana may also develop a list of noxious weeds to be regulated at the county level. A total of 32 state-listed noxious weeds/complexes and 3 additional plants (Priority 3) are regulated in Montana as set forth in the Administrative Rules of Montana (ARM) 4.5.206 to 4.5.210. None of these species occur on the Federal Noxious Weed List (USDA, 2014). Of these species/complexes, 31 of them are terrestrial and 4 are aquatic species (Montana Department of Agriculture, 2013). The following species by vegetation type are regulated in Montana:

- **Aquatic** – curlyleaf pondweed (*Potamogeton crispus*), Eurasian watermilfoil (*Myriophyllum spicatum*), hydrilla (*Hydrilla verticillata*), and flowering rush (*Butomus umbellatus*).
- **Shrubs** – Russian olive (*Elaeagnus angustifolia*) and saltcedar (*Tamarix spp*).
- **Terrestrial Forbs and Grasses** – knotweed complex, meadow hawkweed complex, blueweed (*Echium vulgare*), Canada thistle (*Cirsium arvense*), cheatgrass (*Bromus tectorum*), common tansy (*Tanacetum vulgare*), dalmatian toadflax (*Linaria dalmatica*), diffuse knapweed (*Centaurea diffusa*), Dyer's woad (*Isatis tinctoria*), field bindweed (*Convolvulus arvensis*), hoary alyssum (*Berteroa incana*), houndstongue (*Cynoglossum officinale*), leafy spurge (*Euphorbia esula*), orange hawkweed (*Hieracium aurantiacum*), oxeye daisy (*Leucanthemum vulgare*), perennial pepperweed (*Lepidium latifolium*), purple loosestrife (*Lythrum salicaria*), rush skeletonweed (*Chondrilla juncea*), Russian knapweed (Acroptilon repens), scotch broom (*Cytisus scoparius*), St. Johnswort (*Hypericum perforatum*), spotted knapweed (*Centaurea stoebe*), sulfur cinquefoil (*Potentilla recta*), tall buttercup (*Ranunculus acris*), tansy ragwort (*Senecio jacobaea*), whitetop (*Cardaria draba*), yellowflag iris (*Iris pseudacorus*), yellow starthistle (*Centaurea solstitialis*), and yellow toadflax (Linaria vulgaris).

[91] Rangeland: "A Land cover/use category on which the climax or potential plant cover is composed principally of native grasses, grass like plants, forbs or shrubs suitable for grazing and browsing, and introduced forage species that are managed like rangeland" (USEPA, 2015f).

[92] Pastureland: "Land used primarily for the production of domesticated forage plants for livestock" (USEPA, 2015f).

[93] 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, 2015f).

11.1.6.4. Terrestrial Wildlife

This section discusses terrestrial wildlife species in Montana, divided among mammals,[94] birds,[95] reptiles and amphibians,[96] and invertebrates.[97] 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,[98] nongame animals, game birds, waterfowl, and migratory birds as well as their habitats within Montana. 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. According to Montana Fish Wildlife and Parks (MFWP) the state is home to 110 mammal species, 250 resident bird species, 170 migratory bird species 17 reptile species, 15 amphibian species, and more than 10,000 invertebrate species (Montana Audubon Society, 2012).

Mammals

Common and widespread mammalian species in Montana include the mule deer, white-tailed deer, and elk. Most mammals are widely distributed in the state; however, there are some species, such as the big horn sheep and mountain goat that are found primarily in the mountainous areas in the western portion of the state. A number of threatened and endangered mammals are located in Montana. Section 11.1.6.6, Threatened and Endangered Species and Species of Conservation Concern, identifies these protected species. Montana Appendix B, Table B-1 provides detailed information on the state's species of conservation concern.

In Montana, white-tailed deer (*Odocoileus virginianus*), mule deer (*Odocoileus heminonus*), elk (*Cervus sp.*), moose (*Alces alces*), pronghorn (*Antilocapra americana*), big horn sheep (*Ovis canadensis*), mountain goat (*Oreamnos americanus*), mountain lion (*Puma concolor*), bison (*Bison bison*), 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 birds (MFWP, 2015b). The following eight species of furbearers may be legally hunted or trapped in the Montana: beaver (*Castor canadensis*), otter (*Lontra canadensis*), muskrat (*Ondatra zibethicus*), mink (*Neovison vison*), marten (*Martes martes*), fisher (*Martes pennanti*), bobcat (*Lynx rufus*), and swift fox (*Vulpes velox*). Feral boars (*Sus Scrofa*) are an invasive species and that can causes extensive damage and disease threats to public property, native ecosystems, livestock health, and human health (USDA, 2016); however, there are currently no established populations in Montana (Invasive.org, 2010).

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[94] 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, 2015f)

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

[96] 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, 2015f)

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

[98] Furbearer is the name given to mammals that traditionally have been hunted and trapped primarily for fur. (USEPA, 2015f)

Montana has identified 15 mammals as Species of Greatest Conservation Need (SGCN). The SGCN list consists of at-risk species that are rare or declining, and State Wildlife Grants can provide funding for efforts to reduce their potential to be listed as endangered. Although these species have been targeted for conservation they are not currently under legal protection. The SGCN 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) (MFWP, 2005).

Birds

The number of native bird species documented in Montana varies according to the timing of the data collection effort, changes in bird taxonomy,[99] 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 rivers and lakes, plains, etc.) found in Montana support a large variety of bird species.

As of 2012, 420 species of resident and migratory birds have been documented in Montana (Montana Audubon Society, 2012) (Skaar, 2012), with 250 of those species known to have breeding populations[100] in Montana (MFWP, 2015c). Among the 420 extant[101] species in Montana, 19 SGCN have been identified (MFWP, 2005).

Montana is located within both the Central and Pacific Flyways. Covering the eastern two-thirds of Montana, the Central Flyway spans from the Gulf Coast of Texas to the Canadian boreal forest. The Pacific Flyway covers the western third of Montana and spans from the west coast of Mexico to the arctic. 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). Invasive bird species, such as the mute swan (*Cygnus olor*) are not protected by the MBTA (USFWS, 2013b).

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 in the entire state all year (eBird, 2015a). Golden eagles are generally found around mountains and cliffs where they nest. Golden eagles are found in the southern and eastern parts of the state, and are seen all year (eBird, 2015b).

A number of Important Bird Areas (IBAs) have also been identified in Montana. The IBA program is an international bird conservation initiative with a goal of identifying the most

[99] Taxonomy: "A formal representation of relationships between items in a hierarchical structure" (USEPA, 2015f).
[100] 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, 2015f).
[101] Extant: "A species that is currently in existence (the opposite of extinct)" (USEPA, 2015f).

important places for birds, and to conserve these areas. These IBAs are identified according to standardized, scientific criteria through a collaborative effort among state, national, and international conservation-oriented non-governmental organizations, state and federal government agencies, local conservation groups, academics, grassroots environmentalists, and birders. These IBAs link global and continental bird conservation priorities to local sites that provide key habitat for native bird populations. IBAs provide essential habitat for one or more species of birds.

According to the Montana Audubon Society, a total of 42 IBAs, covering approximately 10 million acres, have been identified in Montana, including breeding,[102] migratory stop-over, feeding, and over-wintering areas, and a variety of habitats such as native grasslands, grasslands, sage brush, and wetland/riparian[103] areas (Montana Audubon Society, 2015). These IBAs are widely distributed throughout the state, although the largest concentration of IBAs are located in the central and north central regions of the state, within the Great Plains and Rocky Mountains. Figure 11.1.6-2 depicts the IBAs in Montana. Musselshell Sage-steppe covers 3 million acres within these geographic areas. Montana's IBAs are mostly sage-steppe communities that are key habitat to the greater-sage grouse (Montana Audubon Society, 2015). Other IBAs such as Freezout Lake, located in northwest Montana, are an important migration stop and breeding ground for many waterfowl species.

A number of threatened and endangered birds are located in Montana, including the greater-sage grouse. Section 11.1.6.6, Threatened and Endangered Species and Species of Conservation Concern, identifies these protected species.

[102] Breeding range: "The area utilized by an organism during the reproductive phase of its life cycle and during the time that young are reared" (USEPA, 2015f).
[103] Riparian: "Referring to the areas adjacent to rivers and streams with a differing density, diversity, and productivity of plant and animal species relative to nearby uplands" (USEPA, 2015f).

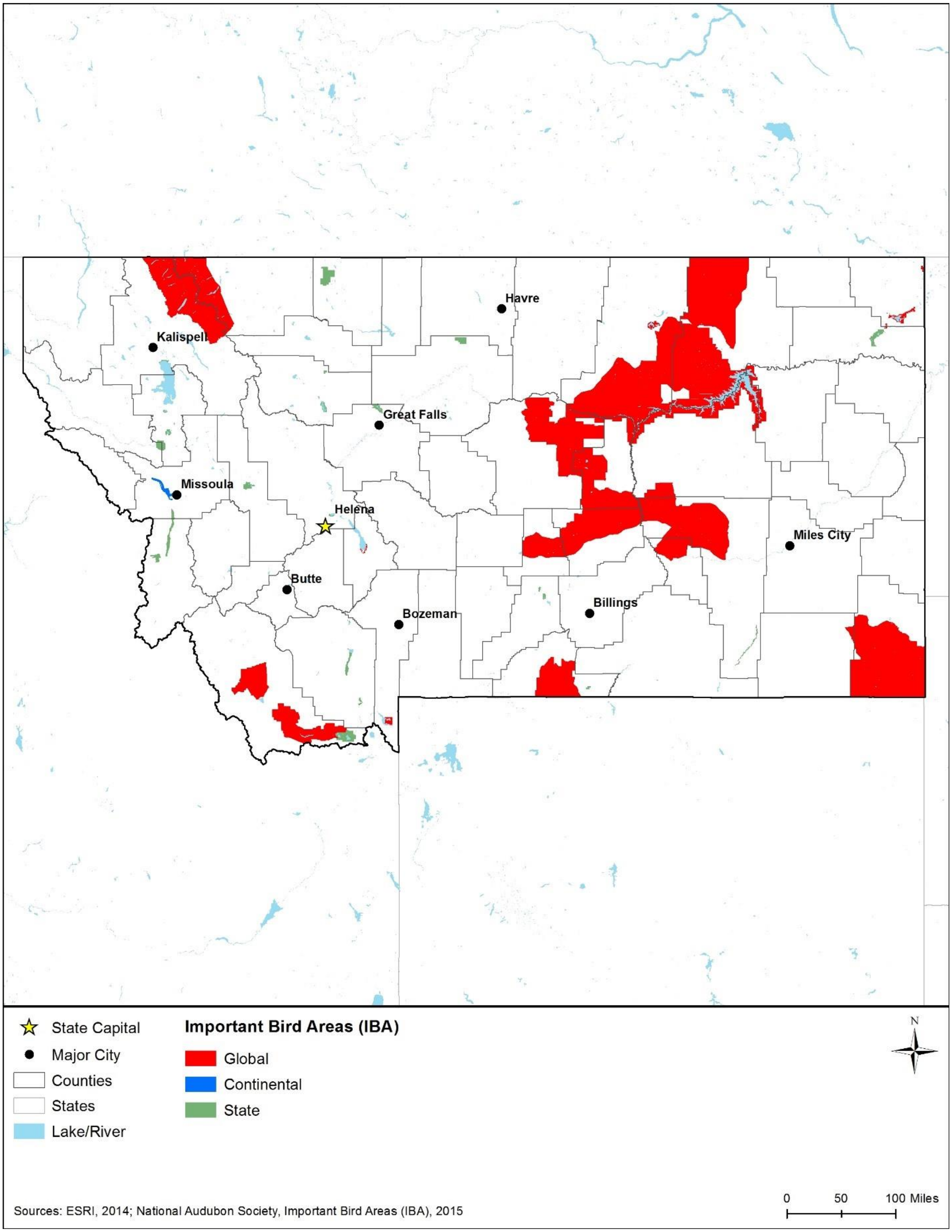


Figure 11.1.6-2: Important Bird Areas in Montana

Reptiles and Amphibians

A total of 32 native reptile and amphibian species, such as salamanders, frogs and toads, turtles, lizards, and snakes, occur in Montana (MFWP and MNHP, 2015). These species occur in a wide variety of habitats from the arid plains in the east to moist coniferous forests in the west. Very few species are widespread throughout the state, and are commonly found in either the plains region in the east or the mountainous region in the west. For example, the snapping turtle (*Chelydra serpentina*) is found in the backwaters of major rivers in southeast Montana, although it has been introduced in other parts of the state (Montana Field Guide, 2016). Montana has identified eight reptile and amphibian species as SGCN.

Montana's reptile and amphibian species are classified as nongame species. Montana Code Annotated (MCA) 87-5-116 prohibits nongame species from being harvested for commercial purposes with the exception of the prairie rattlesnake (*Crotalus viridis*). However, this law does not protect Montana's reptile and amphibian species from being taken for noncommercial purposes (Maxell, 2009). The red-eared slider (*Trachemys scripta elegans*) (a turtle species) and African clawed frog (*Xenopus laevis*) are regulated in Montana under MCA87-5-709. Both of these species are highly adaptable and can threaten native wildlife by competing with them for food sources and also spread disease (ISSG, 2010).

Invertebrates

Montana is home to more than 2,000 species of terrestrial invertebrates, including a wide variety of bees, hornets, wasps, butterflies, moths, beetles, flies, dragonflies, damselflies, spiders, mites, and nematodes (MFWP, 2005). These invertebrates provide an abundant food source for mammals, birds, reptiles, amphibians, and other invertebrates. In the U.S., one third of all agricultural output depends on pollinators.[104] In natural systems, the size and health of the pollinator 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 as pollinators of flowering plants that provide food, fiber, animal forage, and ecological services like soil and water conservation" (Delphia, O'Neill, & Prajzner, 2011). "As a group, native pollinators are threatened by habitat loss, pesticides, disease, and parasites" (NRCS, 2009). It is estimated that several hundred species of bees occur in Montana, but the official number is unknown. Similarly, the number of butterfly species that occur in the state is unknown, but species from five families have been recorded (MFWP and MNHP, 2015). The MFWP determined not to include invertebrates for consideration on the SGCN list due to the number of invertebrates' species, with the exception of mussels and crayfish. One mussel has been included, the western pearlyshell (*Margaritifera falcata*), and no crayfish are included at this time (MFWP, 2005).

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

Invasive Wildlife Species

Montana has adopted regulations that prohibit or regulate the possession, transport, importation, sale, purchase, and introduction of select terrestrial wildlife species. MFWP maintains a list of prohibited[105] species and a list of controlled[106] species. These lists are presented in Administrative Rules of Montana (ARM) 12.6.2215 and ARM 12.6.2208, respectively. The prohibited species list has 2 amphibian species, 2 bird species, 33 mammal species including the Russian and Eurasian boar (*Sus scrofa scrofa*), and 12 reptile species. The controlled species list has 19 species of birds and 1 mammal species (MFWP, 2015e). Other species, such as the gypsy moth (*Lymantria dispar*), Asian longhorn beetle (*Anoplophora glabripennis*), and emerald ash borer (*Agrilus plannipennis*) are of particular concern in Montana and are closely monitored by the state (MT DNRC, 2016).

Invasive wildlife species are important to consider when proposing a project since project activities may result in conditions that favor the growth and spread of invasive wildlife populations. These situations may result from directly altering the landscape or habitat to a condition that is more favorable for an invasive species, or by altering the landscape or habitat to a condition that is less favorable for a native species.

11.1.6.5. Fisheries and Aquatic Habitat

This section discusses the aquatic wildlife species in Montana, including freshwater fish and invertebrates. A summary of non-native and/or invasive aquatic species is also presented. A distinctive feature of the Montana landscape with regard to aquatic wildlife is the cold water trout streams and rivers west of the continental divide. These water bodies, often fed by snowmelt, provide habitat for a variety of aquatic wildlife that require a high dissolved oxygen content and low sediment load. No essential fish habitat (EFH) identified by the Magnuson-Stevens Fishery Conservation and Management Act exists in the state of Montana. Critical habitat for threatened and endangered fish species, as defined by the ESA, does exist within Montana and is discussed in Section 11.1.6.6, Threatened and Endangered Species and Species of Conservation Concern.

Freshwater Fish

Montana is home to breeding populations of more than 85 species of freshwater fish, ranging in size from small darters and minnows to larger species such as salmon and sturgeon. These species are grouped into 21 families, as follows: bullheads/catfishes (*Amerirus sp.*), burbot (*Lota lota*), drums (*Sciaenidae sp.*), gars (*Lepisosteidae sp.*), killfishes (*Fundulidae*), livebearers (mosquito fish [*Gambusia affinis*], mollis [*Haplophryne mollis*], and swordtails [*Xiphophorus hellerii*]), minnows (*Phoxinus sp.*), mooneyes (*Hiodon sp.*), mudminnows (*Novumbra sp.*), paddlefishes (*Polydon sp.*), perches (*Perca sp.*), pikes/pickerels (*Esox sp.*), sculpins (*Cottus sp.*),

[105] Prohibited species: "live, exotic wildlife species, subspecies, or hybrid of that species, including viable embryos or gametes, that may not be possessed, sold, purchased, exchanged, or transported in Montana, except as provided in MCA 87-5-709 or ARM 12.6.2220" (MFWP, 2015d).
[106] Controlled species: "live, exotic wildlife species, subspecies, or hybrid of species that may not be imported, possessed, sold, purchased or exchanged in Montana unless a person obtains written authorization from the department" (MFWP, 2015e).

smelt (*Osmeridae sp.*), sticklebacks (*Gasterosteidae sp.*), sturgeons (*Acipenseridae sp.*), suckers (*Catostomidae sp.*), sunfishes (*Mola sp.*), temperate basses (*Micropterus sp.*), trout (*Salmo sp.*), and trout-perch (*Percopsis omiscomaycus*). A brief description of those families that contain common species, notable sport fish species, or species of concern is listed below (MFWP and MNHP, 2015).

The bullheads/catfishes family includes four species, which include the channel catfish (*Ictalurus punctatus*), stone cat (*Notorus flavus*), yellow bullhead (*Ameiurus natalis*), and black bullhead (*Ameiurus melas*). The channel catfish prefers large rivers and lowland lakes and is found in the Yellowstone and Missouri River drainages in the eastern two-thirds of Montana. It is also a widely recognized game fish and avidly sought after by Montana sport fishermen (MFWP and MNHP, 2015). The stone cat, yellow bullhead, and black bullhead are smaller members of the catfish family that rarely reach an adequate size to be targeted by fisherman.

The burbot is found in large streams and cold deep lakes and reservoirs. Burbot can be found throughout the state with the exception of the mountainous regions in western Montana. The burbot is listed as a SGCN in Montana and its decline is believed to be caused in part by the construction of the Libby Dam on the Kootenai River (MFWP and MNHP, 2015) (MFWP, 2005).

Approximately 24 species of minnows occur in Montana, with 5 of them being introduced (i.e., nonnative) species. Common minnow species in Montana include the fathead minnow (*Pimephales promelas*), fathead chub (*Semotilus atromaculatis*), emerald shiner (*Notropis atherinoides*), longnose dace (*Rhinichthys cataractae*), and lake chub (*Couesius plumbeus*). The minnow family contains two SGCN, the sturgeon chub (*Macrhybopsis gelida*) and the sicklefin chub (*Macrhybopsis meeki*) (MFWP, 2005), that are confined to the main channels of large turbid rivers, and only inhabit the lower Missouri, Yellowstone, and Powder rivers in central and eastern Montana. Minnows are not typically a popular sportfish, but are a commercially important fish and an important prey source for larger fish and other wildlife (MFWP and MNHP, 2015).

The shortnose gar (*Lepisosteus platostomus*) is the only species of gar in Montana and it is listed as a SGCN (MFWP, 2005). It has an extremely limited range in Montana, primarily being documented in the Missouri River downstream of Fort Peck Dam. The shortnose gar is typically found in large rivers, oxbow lakes, and backwaters (MFWP and MNHP, 2015).

The paddlefish family (*Polyodon sp.*) in Montana is comprised of just one species, which is listed as a SGCN (MFWP, 2005). Paddlefish inhabit slow or quiet areas of large rivers or reservoirs, and is only found in the lower Missouri and Yellowstone rivers in central and eastern Montana. Montana’s paddlefish population is self-sustaining and has been known to produce individual fish upwards of 150 pounds. The population is strong enough to support a recreational fishery, but harvest numbers are monitored closely (MFWP and MNHP, 2015).

A total of four species of perch occur in Montana, including large members such as yellow perch (*Perca flavescens*), walleye (*Sander vitreus*), and sauger (*Sander canadensis*). Walleye occur in large lakes and reservoirs and are an important sport fish in Montana’s eastern drainages.

The sauger is listed as a SGCN in Montana (MFWP, 2005). The sauger's preferred habitat includes large turbid river systems and shallow muddy areas of lakes and reservoirs (MFWP and MNHP, 2015). The Iowa Darter (*Etheostoma exile*) is typically only found in small streams and reservoirs (MFWP and MNHP, 2015).

Two species of pike/pickeral occur in Montana's waters, the northern pike (*Esox lucius*) and the tiger muskellunge (*Esox masquinongy*). The northern pike has a larger distribution throughout Montana compared to the tiger muskellunge, which is a sterile hybrid between a northern pike and a muskellunge. Both species are found in bays of lakes and reservoirs with dense weed growth. The northern pike's voracious predatory nature has made it an excellent sport fish throughout Montana (MFWP and MNHP, 2015).

The sturgeon family is comprised of three species in Montana including pallid sturgeon (*Scaphirhynchus albus*), shovelnose sturgeon (*Scaphirhynchus platorynchus*), and white sturgeon (*Acipenser transmontanus*). The white sturgeon and the pallid sturgeon are both listed as SGCN and listed as endangered under the federal ESA (see Section 11.1.6.6). The pallid and shovelnose sturgeon are primarily found in Montana's lower Yellowstone and Missouri rivers. In contrast the white sturgeon is limited to a small landlocked population that exists in the Kootenai River in northwest Montana. The depression in populations of sturgeon is the result of over-collection of these species for caviar and loss of habitat. Recovery plans have been designed for both the pallid sturgeon and the white sturgeon to attempt to return the populations to sustainable levels (MFWP, 2005).

The sucker family includes nine species in Montana. Common and widespread species include the longnose sucker (*Catostomus catostomus*), the white sucker (*Catostomus commersonii*), and the river carpsucker (*Carpiodes carpio*). The blue sucker (*Cycleptus elongates*) is a SGCN in Montana and is found in central and eastern Montana, primarily in the Yellowstone and Missouri rivers. Blue suckers prefer large river systems with low turbidity[107] and swift current (MFWP and MNHP, 2015).

The sunfish family includes eight species, many of which are highly popular with sport fishermen. The most commonly encountered species are the bluegill (*Lepomis macrochirus*), black crappie (*Pomoxis nigromaculatus*), white crappie (*Pomoxix annularis*), and largemouth bass (*Micropterus salmoides*). These sunfish species live in a wide variety of habitats, including rocky, cool lakes streams, and reservoirs (MFWP and MNHP, 2015).

Montana has 16 species in the trout family. Some of the most common are brown trout (*Salmo trutta*) and rainbow trout (*Oncorhynchus mykiss*). These species are among the most popular game fish in Montana. They occupy the cold water streams and mountain lakes throughout the state (MFWP and MNHP, 2015). The trout family also contains six SGCN, the arctic grayling (*Thymallus arcticus*), the bull trout (*Salvelinus malma*), the westslope cutthroat trout (*Onchorhynchyus clarki*), the Yellowstone cutthroat trout (*O. clarki bouvieri*), the Columbian

[107] Turbidity: "The cloudy appearance of water caused by the presence of suspended and colloidal matter. Turbidity indicates the clarity of water and is an optical property of the water based on the amount of light reflected by suspended particles." (USEPA, 2015f)

River redband trout (*O. mykiss gairdneri*), and the lake trout (*Salvelinus namaycush*) (MFWP, 2005). The bull trout is also listed as threatened under the federal ESA (see Section 11.1.6.6).

The trout-perch (*Percopsis omiscomaycus*) is the only Montana species in the trout-perch family and it is listed as a SGCN (MFWP, 2005). This species displays traits of both the trout and perch families. The distribution of trout-perch is limited to northwest Montana and is contained within Glacier National Park and the Blackfeet Indian Reservation. Due to their small size trout-perch are not sought by sport fishermen and are classified as a nongame fish in Montana (MFWP and MNHP, 2015).

Shellfish and Other Invertebrates

Montana is home to over 180 mollusk species and approximately 30 species of crustaceans (State of Montana, 2016b). Six freshwater bivalve[108] species occur in Montana's waters. These species include the giant floater (*Anodonta grandis*), fatmucket (*Lampsillis siliquoidea*), western pearlshell (*Margaritifera falcata*), black sandshell (*Ligumia recta*), white heelsplitter (*Lasmigona complanata*), and the mapleleaf (*Quadrula fragosa*) (Stagliano, 2015). The western pearlshell (*Margaritifera falceta*) is a SGCN (MFWP, 2005). The western pearlshell inhabits the coldwater trout streams in Montana west of the continental divide. River diversions and impoundments are a primary threat to this species. Montana's waters are also home to approximately 37 species of small fingerclams. Aside from a multitude of freshwater invertebrates whose adult forms are terrestrial insects (e.g., flies, beetles, etc.), other well-known Montana freshwater invertebrates include a variety of crayfish, fairy shrimp, amphipods, and pillbug species (MFWP and MNHP, 2015).

Invasive Aquatic Species

As previously discussed, Montana has adopted regulations that prohibit or regulate the possession, transport, importation, sale, purchase and introduction of select invasive species, both plants and animals. MFWP maintains a list of prohibited species and a list of controlled species. These lists are presented in ARM 12.6.2215 and ARM 12.6.2208, respectively. The list of prohibited aquatic species includes 1 crustacean, 10 fish, and 3 mollusks (MFWP, 2014). The list of controlled aquatic species includes three fish species (MFWP, 2015e). Prohibited Aquatic Species that have been detected in Montana include the New Zealand Mudsnail (*Potamopyrgus antipodarum*), faucet snail (*Bithynia tentaculata*), and the red-rim melania (*Melanoides tuberculata*) (MFWP, 2014).

11.1.6.6. 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 the state of Montana. The USFWS Montana Field Office has listed 5 federally endangered and 10 federally threatened species known to occur in Montana. Of these listed species, three of them have

[108] Bivalve: "An aquatic mollusk whose compressed body is enclosed within a hinged shell. For example, clams, oysters and mussels are bivalves" (USEPA, 2015f)

designated critical habitat[109]. Three candidate[110] species are also identified by USFWS as occurring within the state (USFWS, 2015c). Candidate species are not afforded statutory protection under the ESA; however, the USFWS recommends taking these species into consideration during environmental planning and impact analyses because they could be listed in the future (USFWS, 2014b). The federally listed species include 4 mammals, 6 birds, 3 fish, 1 invertebrate, and 4 plants (USFWS, 2015c), and are described in the following sections. Figure 11.1.6-3 depicts the critical habitat in Montana for Canada lynx (*Lynx canadensis*), piping plover (*Charadrius melodus*), and Columbia River basin bull trout (*Salvelinus confluentus*). Federal land management agencies maintain lists of species of concern for their landholdings; these lists are not discussed below as they are maintained independently from the ESA. For future site-specific analysis on those lands, consultation with the appropriate land management agency would be required.

The Montana FWP is responsible for administering the Nongame and Endangered Species Conservation Act and for maintaining the state's list of endangered species. Species provided further protection under state law include the whooping crane (*Grus americana*) and black-footed ferret (*Mustela nigripes*), pursuant to the ARM 12.5.201.

[109] 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)).
[110] Candidate species are plants and animals that the USFWS has "sufficient information on their biological status and threats to propose them as endangered or threatened under the ESA, but for which development of a proposed listing regulation is precluded by other higher priority listing activities" (USFWS, 2014b).

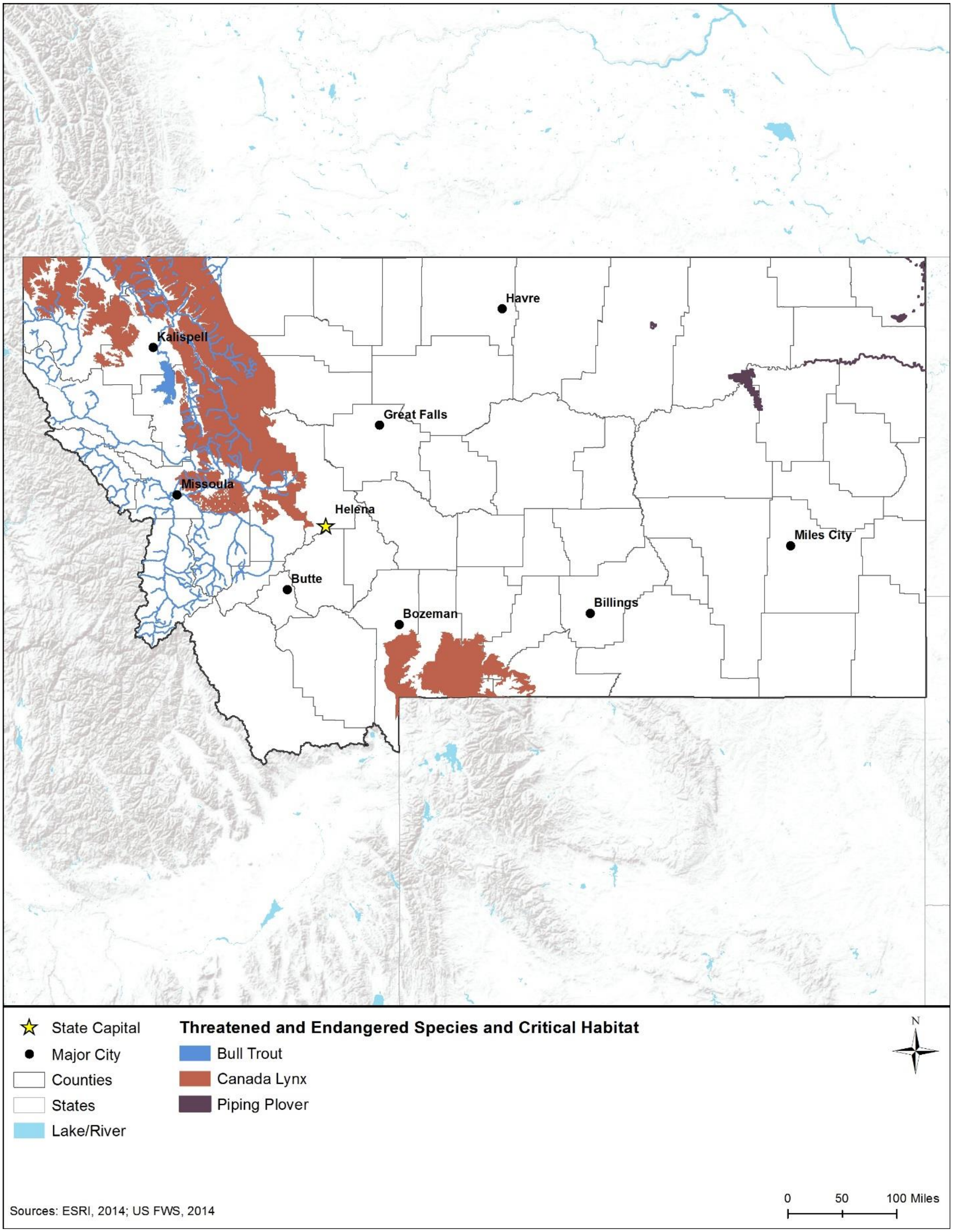


Figure 11.1.6-3: ESA Designated Critical Habitat for Montana

Mammals

One endangered and three threatened mammal species are known to occur in Montana, as summarized in Table 11.1.6-3. Canada lynx (*Lynx canadensis*) and grizzly bears (*Ursus arctos horribilis*) are found in western Montana, while the black-footed ferret (*Mustela nigripes*) and northern long-eared bat (*Myotis septentrionalis*) are eastern Montana species (USFWS, 2015c). Information on the habitat, distribution, and threats to the survival and recovery of each of these species in Montana is provided below.

Table 11.1.6-3: Federally Listed Mammal Species of Montana

Common Name	Scientific Name	Federal Status	Critical Habitat in Montana	Habitat Description
Black-footed Ferret	*Mustela nigripes*	Endangered/Non-Essential Experimental Population	No	Found in prairie dog complexes in eastern portion of the state.
Canada Lynx	*Lynx canadensis*	Threatened	Yes; portions of 16 counties.	Found in montane spruce/fir forests in the western portion of the state.
Grizzly Bear	*Ursus arctos horribilis*	Threatened	No	Occurs in alpine/subalpine coniferous forests in the western part of the state.
Northern Long-eared Bat	*Myotis septentrionalis*	Threatened	No	Summer roosting occurs in live trees and snags; hibernacula includes caves and abandoned mines. Found in the eastern portion of the state.

Source: (USFWS, 2015c)

Black-footed Ferret. The endangered black-footed ferret is a member of the weasel family; it is a "slender, wiry animal with black feet, a black face mask, and black-tipped tail" that ranges from19 to 24 inches in length and 1.4 to 2.5 pounds (USFWS, 2010). The ferret was first listed as endangered under early endangered species legislation in 1967 (32 FR 4001, March 11, 1967) and was "grandfathered into the ESA of 1973" (USFWS, 2013c). In 1986, only 18 individuals were known to exist within its range. The last remaining individuals in the wild were captured near Meeteetse, Wyoming, and were used to develop experimental populations in Arizona, Colorado, Montana, South Dakota, Utah, and Wyoming. In 1994, a nonessential experimental population[111] was created in north-central Montana at the UL Bend NWR and Bureau of Land Management (BLM) "40 Complex" (USFWS, 2013c). Based on 2001 USFWS population estimates, there were "more than 1,000 black-footed ferrets in the wild, and another 280 living in breeding facilities" (USFWS, 2010).

Suitable habitat for the black-footed ferret consists of native grasslands inhabited by prairie dogs. The survival of black-footed ferrets is directly connected to prairie dog abundance and habitat, as

[111] For ESA Section 7 consultation purposes, "nonessential experimental populations are treated as though they are proposed for listing (except on National Wildlife Refuge System and National Park System lands, where they are treated as a species listed as threatened" (59 FR 42699, August 18, 1994).

prairie dog burrows are used for shelter as well as dens to rear their young. In addition, over 90 percent of the black-footed ferret's diet is composed of prairie dogs. The primary causes for this species' near extinction was the loss of habitat and prey resulting from conversion of prairies to agriculture or other uses, and prairie dog eradication programs (MFWP and MNHP, 2015).

Canada Lynx. The threatened Canada lynx is a cat (ranging from 30 to 35 inches long and 14 to 31 pounds) with "large, well-furred paws, long, black ear tufts, and a short, black-tipped tail" that separates it from a bobcat (*Lynx rufus*) (USFWS, 2013d). This cat inhabits boreal forests dominated by spruce and fir, and is skilled at hunting in deep snow. Their primary prey is the snowshoe hare (*Lepus americanus*) and as a result the abundance and survival of the Canada lynx is directly related to the density and health of regional snowshoe hare populations. Only a few places in the lower 48 states regularly support the Canada lynx populations. Northwestern Montana is one of these areas, with the majority of lynx habitat occurring on public lands (USFWS, 2013d) (USFWS, 2015c). Critical habitat has been designated for the Canada lynx population in the Northern Rockies within northwestern Montana in Flathead, Glacier, Lincoln, Lake, Granite, Lewis and Clark, Lincoln, Missoula, Pondera, Powell, and Teton counties; and the Yellowstone National Park population within southwestern Montana in Carbon, Gallatin, Park, Sweet Grass, and Stillwater counties (USFWS, 2015d). Critical habitat for the two lynx populations in Montana is illustrated on Figure 11.1.6-3.

Canada Lynx Photo credit: USFWS

The Canada lynx was listed in 2000 primarily due to concerns with regard to habitat destruction, and need for more regulatory control and consistent guidance for forest management activities. Given the lynx travels back and forth between the U.S. and Canada, contiguous habitat is important for this species. In addition, snowshoe hare habitat is also important because of the direct link between snowshoe hare abundance and lynx abundance and survival. While accidental injury or death of lynx from hunting or trapping is possible, available data do not indicate this to be a cause for low species densities (USFWS, 2005a) (USFWS, 2013d).

Grizzly Bear. The threatened grizzly bear, also known as the brown bear, is differentiated from a black bear by its "concave face, high-humped shoulders, and long, curved claws." The fur ranges in color from "light brown to nearly black." A male grizzly bear "stands at approximately 7 feet tall and weighs from 300 to 600 pounds (and occasionally more than 800 pounds)," while females weigh "between 200 to 400 pounds" (USFWS, 2007). This species is found in Idaho, Montana, Washington, and Wyoming in the conterminous U.S. within five distinct population areas (USFWS, 2007) (Servheen, 1993). Portions of the North Continental Divide population reside in northwestern Montana, while the Yellowstone population occurs in the southwestern portion of the state (MFWP and MNHP, 2015) (USFWS, 2007) (Servheen, 1993).

Suitable habitat ranges from alpine forests to mixed shrub fields to grasslands. Grizzlies tend to be at lower elevations in the spring and higher elevations during hibernation. Hibernation usually begins in October or November and lasts until March, sometimes extending to May (USFWS, 2007). The primary threats to this species include conflicts with humans, such as livestock depredation or unregulated hunting, and habitat loss or fragmentation[112] from various types of development ranging from new roads, logging, energy and mineral exploration, and recreation (Servheen, 1993) (USFWS, 2007).

Northern Long-eared Bat. The northern long-eared bat is "a medium-sized bat with a body length of 3 to 3.7 inches and a wingspan of 9 to 10 inches" (USFWS, 2015e); it was listed as threatened under the ESA in May 2015 (80 FR 17974, April 2, 2015). The northern long-eared bat's range includes 37 states from the east coast to the north-central U.S. (USFWS, 2015e). Eastern Montana represents its far western range in the U.S. (USFWS, 2015c). Suitable winter habitat includes caves and abandoned mines, while trees and snags provide suitable roosting habitat the remainder of the year (USFWS, 2014c) (USFWS, 2015e). In Montana, the winter hibernation season is from October 1st to May 15th, and the summer maternity season is from April 1st to September 30th (USFWS, 2014c).

The main threat to this bat is white-nose syndrome; this disease began in New York in 2006 and is now found in at least two-thirds of the bat's range. The USFWS estimates species numbers have declined up to 99 percent based on historical hibernacula counts as a result of this disease. Because populations have declined so dramatically, development activities that permanently or temporarily remove forested habitat now have a greater potential to directly or indirectly effect the northern long-eared bat depending on the time of year habitat impacts occur. 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. Protection of hibernacula using gates to exclude human entry and minimizing the loss or disturbance of roosting summer habitat are recommended to prevent further loss of this species (USFWS, 2014c) (USFWS, 2015e).

Birds

Two endangered, three threatened, and one candidate bird species are federally listed and known to occur in Montana, as summarized in Table 11.1.6-4. Red knots (*Calidris canutus rufa*), Sprague's pipits (*Anthus spragueii*), and whooping cranes (*Grus americana*) are found in the eastern interior plains of Montana, while yellow-billed cuckoos (*Coccyzus americanus*) are found only in western Montana. The least tern (*Sterna antillarum*) have slightly larger ranges occurring throughout eastern, central, and southwestern Montana. The piping plover (*Charadrius melodus*) has been identified a candidate species in Montana (USFWS, 2015c). Information on the habitat, distribution, and threats to the survival and recovery of each of these species in Montana is provided below.

[112] Fragmentation: "The breaking up of large and continuous ecosystems, communities, and habitats into smaller areas that are surrounded by altered or disturbed land or aquatic substrate" (USEPA, 2015f).

Table 11.1.6-4: Federally Listed Bird Species of Montana

Common Name	Scientific Name	Federal Status	Critical Habitat in Montana	Habitat Description
Least Tern	*Sterna antillarum*	Endangered	No	Found in eastern Montana along beaches, Missouri River sandbars, and in Yellowstone National Park.
Piping Plover	*Charadrius melodus*	Threatened	Yes; portions of seven counties.	Beaches and shorelines along alkali lakes, reservoirs, and the Missouri River in northeastern Montana.
Red Knot	*Calidris canutus rufa*	Threatened	No	Occurs as a migrant along shorelines in the interior plains of eastern Montana.
Yellow-billed Cuckoo (western population)	*Coccyzus americanus*	Threatened	No	Occurs in forested riparian corridors with cottonwoods (*Populus* spp.) and willows (*Salix* spp.) in western Montana.
Whooping Crane	*Grus americana*	Endangered	No	Migrant species in eastern Montana; occurs in wetland habitat.

Source: (USFWS, 2015c)

Least Tern. The endangered least tern is eight to nine inches in length with a wingspan of approximately 20 inches; it is the smallest of the five tern species found in Montana. This bird is a summer resident in the state and breeds along several major river systems in the U.S., which include the Missouri, Ohio, Red, and Rio Grande rivers (MFWP, 2006) (USFWS, 2014d). Montana's least tern population is low compared to other states, and a recovery goal of 50 adult birds was established for the state. Based on monitoring efforts, the state has met or is exceeding this level (MFWP, 2006).

Suitable habitat for least terns consists of relatively unvegetated sandbars near rivers, reservoirs, and other open water habitat. The primary threat to this species is the destruction and degradation of habitat. Nest disturbance and predation can also be factors. The primary causes of habitat loss historically have been dam construction, recreational activities, and the alteration of flow regimes along major river systems (MFWP, 2006) (USFWS, 2014d).

Piping Plover. The threatened piping plover is a small, migratory shorebird; it is approximately 6.5 to 7 inches in length with a wingspan up to 19 inches and weighs between 1.5 to 2.3 ounces. The piping plover occurs in the Northern Great Plains, along the Atlantic Coast, and in the Great Lakes Area within the U.S. for approximately 3 to 4 months during the summer breeding season. This species is a summer resident of northeastern Montana. Suitable habitat consists of open, sparsely vegetated beaches composed of sand or gravel on islands or shorelines of inland lakes or rivers. Nesting often occurs in palustrine wetlands[113] in the Northern Great Plains (USFWS, 2003). The threats to piping plovers include destruction and degradation of preferred habitat resulting from construction and development activities and water control structures, nest predation, and nest abandonment caused by human presence or disturbance (USFWS, 1988) (MFWP and MNHP, 2015). In Montana, four critical habitat units have been delineated geographically for the purpose of conserving this species that encompass alkali lake, wetland, and riverine habitats (MFWP and MNHP, 2015). Critical habitat for the piping plover in Montana is illustrated on Figure 11.1.6-3.

Red Knot. The threatened red knot is approximately nine inches in length with a wingspan of approximately 20 inches. This species migrates annually from its breeding grounds above the Arctic Circle to the tip of South America where it winters. During spring and fall migration, the red knot travels in "non-stop segments of 1,500 miles and more, ending at stop sites called staging areas" (USFWS, 2005b). The red knot is a rare migrant in Montana (MFWP and MNHP, 2015).

Red knots use large wetlands and lakes in eastern Montana as migratory stopovers (MFWP and MNHP, 2015). Threats to this species include impacts to the reduced availability for foraging at staging areas and reduction of arctic breeding habitat as a result of climate change (USFWS, 2014e).

Yellow-billed Cuckoo. The threatened western yellow-billed cuckoo is approximately 12 inches in length and weighs approximately two ounces (MFWP and MNHP, 2015). This shy, migrant bird winters in South America and breeds in the western U.S. The western yellow-billed cuckoo is considered a separate population from its eastern counterpart. Currently, the western yellow-billed cuckoo is only known to breed in Arizona, California, Colorado, Idaho, New Mexico, and Utah (Johnson, 2009). In Montana, it is only known to occur in June and July; no evidence of this species breeding has been documented in the state (MFWP and MNHP, 2015).

Preferred habitat consists of riparian forested habitat dominated by cottonwood and willow trees, and in particular contiguous stands of these tree species that exceed 25 acres in size. This species does not tend to breed in forested areas with minimal canopy cover and invasive species. Loss of suitable forested habitat along streams and rivers due to habitat fragmentation, proliferation of invasive species, and conversion of land to other uses are considered the primary threats to this species (Johnson, 2009) (USFWS, 2015c). (MFWP and MNHP, 2015)

[113] Palustrine wetlands: "Palustrine wetlands include nontidal wetlands dominated by trees, shrubs, persistent emergent, emergent mosses, or lichens" (USEPA, 2015f).

Whooping Crane. The endangered whooping crane is the "tallest North American bird." Males, which are larger than females, can reach up to five feet in height (Canadian Wildlife Service & USFWS, 2007) (USFWS, 2014f). The whooping crane nests in Canada and in Florida and Wisconsin in the U.S. (Canadian Wildlife Service & USFWS, 2007). In Montana, the whooping crane occurs as a spring and fall migrant, and has been observed from early April to late October (MFWP and MNHP, 2015).

Whooping Crane Photo credit: USFWS

Suitable habitat for the whooping crane consists of marshes, wet meadows and prairies, riverine habitats, and agricultural fields (Canadian Wildlife Service & USFWS, 2007) (MFWP and MNHP, 2015). Historical reasons for this species' decline include displacement by humans, loss of habitat, and hunting. Currently, the main reasons for this species' decline is the "limited genetics of the population, loss and degradation of migration stopover habitat, construction of additional power lines, degradation of coastal ecosystems, and threat of chemical spills" (Canadian Wildlife Service & USFWS, 2007).

Fish

Two endangered and one threatened fish species are federally listed and known to occur in Montana, as summarized in Table 11.1.6-5. Bull trout (*Salvelinus confluentus*) and white sturgeon (*Acipenser transmontanus*) are found in northwestern Montana, while the pallid sturgeon (*Scaphirhynchus albus*) is located in central and eastern Montana (USFWS, 2015c). Information on the habitat, distribution, and threats to the survival and recovery of each of these species in Montana is provided below.

Table 11.1.6-5: Federally Listed Fish Species of Montana

Common Name	Scientific Name	Federal Status [a]	Critical Habitat in Montana	Habitat Description
Bull Trout	*Salvelinus confluentus*	Threatened	Yes; portions of 12 counties.	Rivers, streams, lakes, and reservoirs within the Clark Fork, Flathead, Kootenai, St. Mary, and Belly River basins.
Pallid Sturgeon	*Scaphirhynchus albus*	Endangered	No	Missouri and Yellowstone rivers.
White Sturgeon	*Acipenser transmontanus*	Endangered	No	Kootenai River (Lincoln County).

Source: (USFWS, 2015c)

Bull Trout. The threatened bull trout is a member of the salmon family. Adult bull trout range in size from 6 to 24 inches with migratory brook trout being approximately twice the size of residents. Bull trout up to 25 pounds have been captured in Flathead Lake in Montana (MFWP and MNHP, 2015). Bull trout are found in Idaho, Montana, Nevada, Oregon, and Washington. Streams and rivers in Montana and Idaho serve as the headwaters for this species. Bull trout populations are typically migratory, but not exclusively. Migratory bull trout spawn in smaller streams, and inhabit rivers and lakes during other portions of their lifecycle (USFWS, 2014g).

Similar to other salmonid species, bull trout have specific habitat requirements. They require cold water typically less than 12°C, good water quality, stable and undisturbed stream channels, and clean gravel substrate for spawning. The greatest threats to this species include fish passage restrictions that lead to habitat fragmentation, impacts to water quality due to land management activities, overfishing, hybridization with other trout species, and the potential for increased water temperatures due to climate change (USFWS, 2014g). Critical habitat for the bull trout in Montana is illustrated on Figure 11.1.6-3.

Pallid Sturgeon. The pallid sturgeon is a long, slender fish with a long life span (reaching up to 40 years) that grows up to 60 inches in length and 65 pounds in weight. The species is pale colored with a shovel shaped snout, armored body[114], and skeleton made of cartilage. The pallid sturgeon is found in the Missouri River, Yellowstone River, and some of its larger tributaries in Montana. This species range also includes the Missouri-Mississippi confluence, and the Mississippi River down to New Orleans, Louisiana (USFWS, 2014h). During spring and summer, pallid sturgeon are typically found in the Yellowstone River and in the Missouri River below its confluence with the Yellowstone River during the remainder of the year (MFWP and MNHP, 2015).

Pallid Sturgeon Photo credit: USFWS

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

White Sturgeon. The endangered white sturgeon is a large fish with a cartilaginous skeleton; the largest specimen on record weighed approximately 1,500 pounds. Ocean populations of white sturgeon tend to be much larger than the Kootenai River population that occurs in Idaho, Montana, and British Columbia, Canada. White sturgeon found in the Kootenai River are not known to exceed 200 pounds in Montana (MFWP and MNHP, 2015) (USFWS, 1999).

Suitable habitat for this species consists of rivers with cold water temperatures, good water quality, and unaltered flow. Alterations to the natural flow regime within the Kootenai River

[114] Pallid sturgeon have "five rows of sharp bony plates called scutes" (Nebraska Rare Species, 2014).

from the construction of Libby Dam and other human-induced land use alterations has contributed to the decline of this population (USFWS, 1999).

Invertebrates

No federally endangered or threatened invertebrates are listed for Montana. However, one federally listed candidate species, the meltwater lednian stonefly (*Lednia tumana*), occurs in Glacier National Park within high elevation meltwater streams. In the U.S., this species' entire range includes only two counties in Montana: Flathead and Glacier (USFWS, 2015c).

Plants

Three threatened and one candidate plant species are federally listed and known to occur in Montana (Table 11.1.6-6). Spalding's campion (Silene spaldingii) and water howellia (Howellia aquatilis) occur in northwestern Montana; and Ute ladie's tresses (Spiranthes diluvialis) occurs in the southwestern counties of Montana. The whitebark pine (Pinus albicaulis) has been identified a candidate species in Montana (USFWS, 2015c). Information on the habitat, distribution, and threats to the survival and recovery of each of these species in Montana is provided below.

Table 11.1.6-6: Federally Listed Plant Species of Montana

Common Name	Scientific Name	Federal Status	Critical Habitat in Montana	Habitat Description
Spalding's Campion (or "catchfly")	*Silene spaldingii*	Threatened	No	Open grasslands in Tobacco Valley and along Upper Flathead River and Fisher River drainages that contain rough fescue or bluebunch wheatgrass; occurs in Flathead, Lake, Lincoln and Sanders Counties in northwestern Montana.
Ute Ladies'-tresses	*Spiranthes diluvialis*	Threatened	No	Occurs in wetlands along rivers in five counties: Beaverhead, Broadwater Gallatin, Jefferson, and Madison.
Water Howellia	*Howellia aquatilis*	Threatened	No	Found in wetland habitats in Swan Valley within two Montana counties: Lake and Missoula.

Source: (USFWS, 2015c)

Spalding's Campion (or catchfly). The threatened Spaulding's catchfly is a perennial[115] herbaceous plant of the carnation family that can grow up to 30 inches in height and flowers from July to August. This plant gets its name because it is "covered in dense sticky hairs that frequently trap dust or insects" (USFWS, 2007). Its range includes Idaho, Montana, Oregon, Washington, and British Columbia, Canada. In Montana, Spaulding's catchfly is only found in the four northwestern-most counties of the state (MFWP and MNHP, 2015) (USFWS, 2007).

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

Suitable habitat for this species includes "open, mesic[116] grasslands or sagebrush-steppe communities" within valleys and along drainages, and occasionally open pine forests (USFWS, 2007). Typically, this species is associated with rough and Idaho fescues, Nelson's and Richard's needlegrasses, and bluebunch wheatgrass. Threats to this species include competition with nonnative invasive plants, fire suppression, small population sizes, livestock grazing and trampling, and land conversion (e.g., urban development or agricultural production), climate change, insect damage and disease, and off-road vehicle use (MFWP and MNHP, 2015) (USFWS, 2007).

Ute Ladies'-tresses. The threatened Ute ladies'-tresses is a perennial orchid that grows up to 24 inches in height and that typically flowers from early August to early September. The species occurs in Colorado, Idaho, Montana, Nebraska, Nevada, Utah, Washington, and Wyoming. In Montana, it occurs within five counties in the southwestern part of the state (MFWP and MNHP, 2015) (USFWS, 1995).

Suitable habitat for this species includes wetlands, wet meadows, and swales[117] near perennial streams or lakes with vegetation that is not overly dense. Threats to this species include urbanization, agriculture, recreation, grazing, and proliferation by nonnative invasive species (MFWP and MNHP, 2015) (USFWS, 1995).

Water Howellia. The threatened water howellia is an aquatic, winter annual ranging from 4 to 24 inches in height that flowers in late July to early August. This plant is typically submerged or floating in water (MFWP and MNHP, 2015) (USFWS, 1996). Populations within Swan Valley in Lake and Missoula counties, Montana make up two-thirds of all known occurrences in the U.S. This species is also known to occur in California, Idaho, Oregon, and Washington in the U.S. (USFWS, 1996).

11.1.7. Land Use, Recreation, and Airspace

Suitable habitat for this species consists of small depressional wetlands with a varied hydrologic regime[118] consisting of wet conditions during winter snowmelt and spring rains, and dry conditions by late summer. Important wetland habitat is often surrounded by deciduous[119] forest. The primary threats to this species and its habitat include timber harvesting, livestock grazing, invasion of nonnative invasive plants, and human-induced habitat conversion from increased urbanization, agriculture, and flood control measures (MFWP and MNHP, 2015) (USFWS, 1996).

[116] Mesic: "Soil condition that is medium-wet" (USEPA, 2015f).

[117] 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, 2015f).

[118] Hydrologic regime: "The system that describes the occurrence, distribution, and circulation of water on the earth and between the atmosphere" (USEPA, 2015f).

[119] 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, 2015f).

11.1.7.1. Definition of the Resource

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

Land Use and Recreation

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

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

Descriptions of land uses are presented in four primary categories: shrub and grassland, 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, 2015). 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 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, 2014b). 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 & 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, 2015b). The FAA works with state aviation officials and airport planners, military airspace managers, and other organizations in deciding how best to use airspace.

11.1.7.2. Specific Regulatory Considerations

Appendix C, Environmental Laws and Regulations, summarizes numerous federal laws and regulations that, to one degree or another, affect land use in Montana. However, local county, city, and village laws and regulations govern most site-specific land use controls and requirements. Furthermore, many land use controls and requirements are implemented and enforced under the umbrella of land use planning, often with the help and support of state authorities.

Local city and county planning agencies have the authority to develop and implement growth policies. These comprehensive plans incorporate consideration of the environment, agricultural and water facilities, public health and safety, as well as other local services. The state requires subdivision regulations for all cities, counties, and towns. Such subdivision regulations must comply with the local growth policy and applies to all division of land in lots of less than 160 acres. Although not required, Montana also authorizes zoning regulations in cities and towns, which are governed by a zoning commission and approved by the local council. A planning board oversees county ordinances, which are approved by the county commission (MDT, 2015c).

Because federal laws govern the nation's airspace, there are no specific Montana state laws that would alter the existing conditions relating to airspace for this Final PEIS.

11.1.7.3. Land Use and Ownership

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

Land Use

Table 11.1.7-1 identifies the major land uses in Montana. Shrub and grassland comprise the largest portion of land use, covering 57 percent of the state (Table 11.1.7-1 and Figure 11.1.7-1). Forest and woodland comprise 23 percent of Montana's total land. Agriculture comprises 16 percent of Montana land. Finally, developed areas account for approximately one percent of the state's total land area. The remaining percentage of land includes public land, surface water, and other land uses, shown in Figure 12.1.7-1, that are not associated with specific land uses (USGS, 2012d).

Table 11.1.7-1: Major Land Uses in Montana by Coverage Type

Land Use	Square Miles[a]	Percent of Land
Shrub and Grasslands	82,961	57%
Forest and Woodlands	32,748	23%
Agricultural	23,433	16%
Developed Land	2,038	1%
Public Land, Surface Water, and other Land Uses	4,366	3%

Source: (U.S. Census Bureau, 2015a) (USGS, 2012d)

[a] Square miles are rounded to the nearest whole number. The maps and tables are prepared from the analysis of GIS data and imagery; a margin of error may result 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. Other federal or state data sources may have slightly different totals.

Shrub and Grassland

Major uses of shrub and grassland areas in Montana include wildlife habitat preservation, livestock grazing (both range and pasture), ranching, and recreational activities associated with nature viewing (State of Montana, 2016c) (State of Montana, 2016d) (Montana BLM, 2013). Shrub and grassland areas can be found primarily in the central and eastern portions of the state, with some areas located in the southwest area of the state (Figure 11.1.7-1). Generally located on high, rolling land, and wide river valleys, prairie grasslands of Montana are located within the eastern two-thirds of the state. Intermountain/foothill grasslands are generally located between 1,800 and 5,400 feet elevation in western Montana within the Flathead, Mission, Missoula, Bitterroot River valleys, the North Fork of the Flathead River in Glacier National Park, and in mountains and foothills of the state. The largest, most concentrated areas of shrubland are located in northeast and northcentral Montana, with sagebrush being the dominant shrub (State of Montana, 2016c) (State of Montana, 2016d).

Forest and Woodland

Forest and woodland areas can be found primarily in the western portion the state. These forests are almost exclusively evergreen and concentrated in the Rocky Mountains and Continental Divide[120] areas (Figure 11.1.7-1) (USGS, 2012d). Only one-third of forest and woodland areas throughout Montana are privately owned, with the remainder under federal[121] or state ownership

[120] Continental Divide: Meets the following criteria, "One, a continental divide separates major streams that ultimately flow in divergent paths and will not join each other before they enter an ocean or sea. Two, a continental divide separates surface waters that ultimately flow to different oceans, different seas, or different coastlines on different sides of a continent." (DMR, 2016)

[121] Federal woodlands may include the National Forests present in Montana are Beaverhead-Deerlodge, Bitterroot, Custer, Gallatin, Flathead, Helena, Kootenai, Lewis and Clark, and Lolo, as well as forest cover from federal forests as part of a national park or lands with other federal ownership.

(MDEQ, 2010). Section 11.1.6.3, Terrestrial Vegetation, presents additional information about terrestrial vegetation.

Forested Trust Land

Forested trust land accounts for 1,219 square miles of state land, typically one-square-mile parcels arranged in a checkerboard fashion in the western part of the state. The Montana Department of Natural Resources and Conservation's (MT DNRC) Forest Management Bureau oversees these lands to gain long-term revenue while encouraging forest health and diversity. (MT DNRC, 2015d)

Private Forest and Woodland

Private landowners own approximately one-third of Montana's total forestland (MDEQ, 2010). Private forestlands are scattered in small patches on the western side of the state (Figure 11.1.7-1). For additional information regarding forest and woodland, see Section 11.1.6, Biological Resources, and Section 11.1.8, Visual Resources.

Agricultural Land

Agricultural land exists in the central and eastern regions of the state, with the largest concentrations across the north-central and northeastern portions (Figure 11.1.7-1). Only one-sixth of Montana's total land area is classified as agricultural land (approximately 16 percent, or 23,433 square miles). In 2012, there were 28,008 farms in Montana, with an average farm size of more than 2,100 acres (USDA, 2012). Some of the state's largest agricultural uses include cattle ranching, and wheat and barley production (USDA, 2012). The USDA Census of Agriculture contains detailed information by county at: http://www.agcensus.usda.gov/Publications/2012/Full_Report/Census_by_State/Montana/.

Developed Land

Developed land in Montana tends to be concentrated in a few main regional cities and surrounding towns in the south and western portions of the state (Figure 11.1.7-1). Although only one percent of Montana land is developed, these areas are utilized for residential, commercial, industrial, recreational, and government purposes. Table 11.1.7-2 lists the top five developed areas within the state and their associated population estimates, and Figure 11.1.7-1 displays these areas under the Developed category.

Table 11.1.7-2: Top Five Developed Metropolitan Areas (2014 estimate)

Metropolitan Area	Population Estimate
Billings	116,908
Missoula	84,266
Great Falls	65,652
Bozeman	43,887
Butte-Silver Bow	30,748
Total Estimated Population of Metropolitan Areas	**341,461**
Total State Estimated Population	**1,023,579**

Source: (U.S. Census Bureau, 2012a)

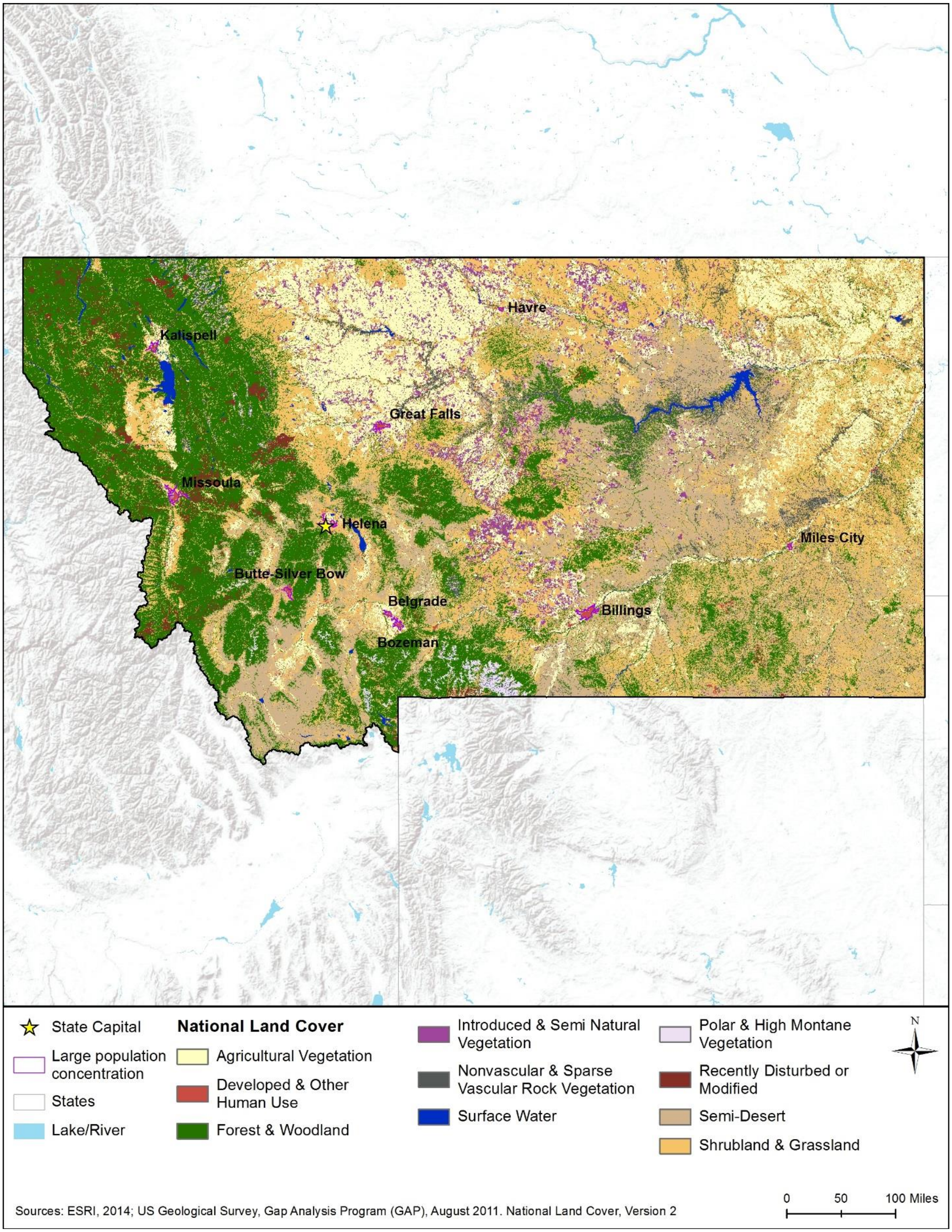


Figure 11.1.7-1: Major Land Use Distribution by Coverage Type

Land Ownership

Land ownership within Montana has been classified into four main categories: private, federal, state, and tribal (Figure 11.1.7-2).[122]

Private Land

Over 52 percent of land in Montana is privately owned, with most of this land falling under the land use categories of agricultural, forest and woodland, and developed (Figure 11.1.7-2). Developed, urban areas quickly 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.[123]

Federal Land

The U.S. federal government manages 47,197 square miles (32 percent) of Montana land with a variety of land types and uses, including national parks, monuments, battlefields, recreation areas and historic sites, military bases, wildlife refuges, national forests, dams, and lakes (Figure 11.1.7-2). Seven federal agencies manage the majority of federal lands throughout the state (Table 11.1.7-3). There may be other federal lands, but they are not shown on the map due to their small size relative to the entire state.

Table 11.1.7-3: Federal Land in Montana

Agency[a]	Square Miles	Representative Type
Department of Defense	20	Military Bases
USFWS	4,130	Wildlife Refuges
NPS	1,894	Parks, Monuments, Battlefields, Recreation Areas, Historic Sites, Wilderness Areas
Bureau of Reclamation	468	Dams and Reservoirs
United States Forest Service (USFS)	32,175	National Forests, Wilderness Areas
USACE	108	Dams and Lakes
Bureau of Land Management (BLM)	12,457	Wilderness Areas, Recreation Areas, Oil and Gas Leasing, Mineral Leasing
Total	**47,197**	**NA**

Sources: (USGS, 2014l)

[a] Table identifies land wholly managed by the Agency; additional properties may be managed by or affiliated with the Agency.
[b] Additional trails and corridors pass through Montana that are part of the National Park System.

[122] Land ownership data were retrieved from the Protected Areas Database of the United States (PAD-US), produced by USGS (http://gapanalysis.usgs.gov/padus/). This dataset categorizes lands across the U.S. by conservation, land management, planning, recreation, and ownership, as well as other uses. It is an extensive data set that contains large quantities of information relevant to the Proposed Action. The data was queried to show Owner and used USGS' PAD-US ownership symbolization for consistency. The PADUS 1.3 geodatabase was downloaded in the summer of 2015, and used consistently throughout all these maps for each state and D.C.
[123] Total acreage of private land could not be obtained for Montana.

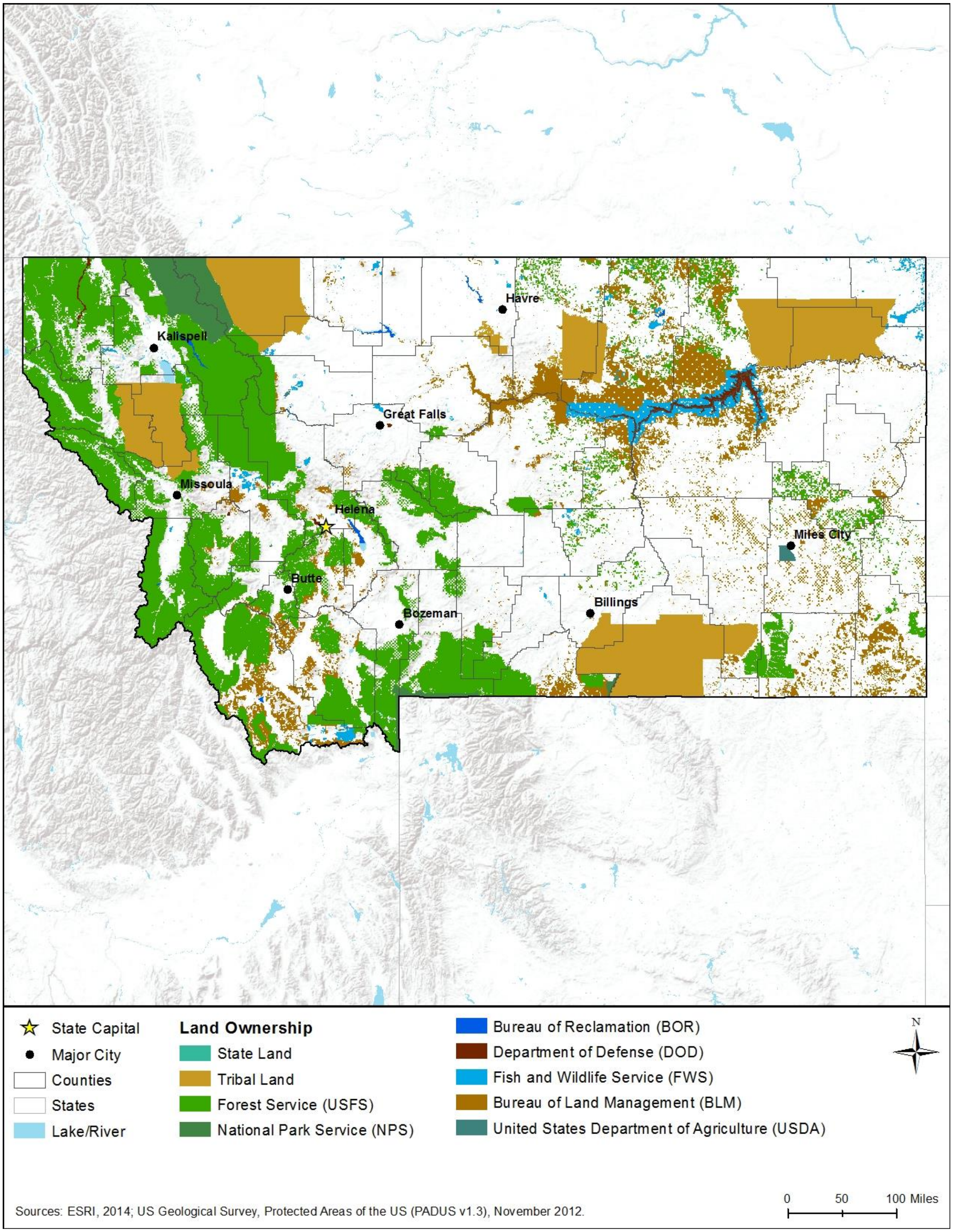


Figure 11.1.7-2: Land Ownership Distribution

- The Department of Defense owns and manages 20 square miles used for military bases;
- The USFWS owns and manages 4,130 square miles consisting of 24 NWRs in Montana, located across the state (USFWS, 2015f);
- The National Park Service (NPS) has eight NPS units in the state – most notably Glacier National Park in the state's northwest corner along the Canadian border – with other parks, monuments, battlefields, recreations areas, and historic sites located across the state (NPS, 2015d);
- The Bureau of Reclamation manages 14 lakes and reservoirs (over 468 square miles) in Montana, mostly in the central and northern portions of the state (Bureau of Reclamation, 2015a);
- The U.S. Forest Service (USFS) manages 32,175 square miles in nine national forest units located almost exclusively around the Rocky Mountains in the western portion of the state (USFS, 2014a) (USFS, 2015a) (USFS, 2016) (Montana Wilderness Association, 2017);
- Army Corps of Engineers manages a number of Missouri River dam and lake projects, including one in Montana, the Fort Peck Dam on the Missouri (USACE, 2015b); and
- BLM manages over 12,400 square miles, mostly in the eastern and northern portions of the state, including the Upper Missouri Wild and Scenic River, two national monuments, and one wilderness area (BLM, 2014a) (BLM, 2009).

State Land[124]

The Montana state government owns nearly 9,000 square miles of land comprised of forests and woodlands, grasslands, state parks, historic sites, and recreation areas (Figure 11.1.7-2). Two main state agencies, the MT DNRC and the Department of Fish, Wildlife and Parks, manage 99 percent of state lands (Table 11.1.7-4).

Table 11.1.7-4: State Land in Montana[a]

Agency	Square Miles	Type
Department of Natural Resources and Conservation	11,918	Trust Lands
Department of Fish, Wildlife & Parks	735	State Parks, Wildlife Management Areas
Department of Corrections	36	Correctional Facilities
Other	116	University System, State Agencies

Sources: (Montana Natural Heritage Program, 2015b) (Montana State Library, 2016)

[a] Acres are not additive due to overlapping boundaries of the State Forests, State Parks and Recreation Areas, and Wildlife Management Areas.

[124] State land use data for tables and narrative text were derived from specific state sources and may not correspond directly with USGS data that was used for developing maps and figures.

- Trust lands, under the MT DNRC, are managed for sustainable forestry, agriculture, grazing, and mineral leasing to generate revenue for the state's public education system. The majority of these lands are under the agricultural and grazing management program. Trust lands are typically arranged in one square mile blocks in alternating fashion across the state (Figure 11.1.7-2). (MT DNRC, 2015d)
- State Wildlife Management Areas are lands owned by Montana that are managed primarily for the conservation of fish and wildlife. The state's 83 Wilderness Management Areas are managed by the Department of Fish, Wildlife and Parks and are typically located near rivers throughout the state, though these sites are more heavily concentrated in the Rocky Mountains (MFWP, 2015c).
- State Parks contain natural, historic, cultural, and/or recreational resources of significance to Montana residents and visitors. The 55 state parks under the MT DNRC comprise 73 square miles across the state (Montana State Parks, 2014) (Figure 11.1.7-2).

Tribal Land

Tribal land is held in trust by the federal government on behalf of an American Indian tribe or tribes as permanent tribal homelands. Montana has seven federally recognized tribes currently located in the state. The Bureau of Indian Affairs, along with individual tribes, manages over 13,000 square miles of land within Montana.[125] These lands are composed of seven Indian Reservations located throughout the state (Figure 11.1.7-2 and Table 11.1.7-5). For additional information on the historic presence of American Indian tribes in Montana, see Section 11.1.11, Cultural Resources.

Table 11.1.7-5: Indian Reservations in Montana

Reservation Name	Square Miles
Blackfeet	2,398
Fort Peck	3,291
Rocky Boy's	174
Fort Belknap	969
Northern Cheyenne	695
Crow	3,580
Flathead	2,056
Total	13,163

Source: (Montana Natural Heritage Program, 2015b)

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

11.1.7.4. Recreation

Montana is one of the largest states in land area, and contains a very low population density. It contains over 57,000 square miles of public lands, most of which are open for recreational activities (MFWP, 2015f). On the community level, Montana is mainly comprised of rural towns and wide-open spaces. Towns, cities, and counties provide an assortment of indoor and outdoor recreational facilities, including recreation centers and parks with playgrounds and picnic areas. Availability of these facilities is typically commensurate to the population's needs. For example, Billings, the largest city of Montana, contains city parks with tennis courts, swimming pools, golf courses, and athletic fields and courts, as well as museums, an indoor water park, and a zoo (Billings Montana, 2015).

Tourism is a leading industry in Montana; visitors seek out Montana's outdoor activities and communities have nurtured businesses and industries that cater to tourism. In 2014, 11 million non-Montana residents visited the state, spending $3.98 billion on amenities including outdoor outfitters and guides, licenses and park entrance fees, camping and RV parks, and farmer's markets (Montana Department of Commerce, 2015).

This section discusses recreational opportunities available at various locations throughout Montana.[126] Montana has been divided into seven regions that are discussed in the sub sections that follow. For information on visual aspects, see Section 11.1.8, Visual Resources, and for information on the historical significance of locations, see Section 11.1.11, Cultural Resources.

Region 1

Region 1 is the northwest corner of the state, bordered by Idaho to the west, Canada to the north, and the Lolo National Forest to the south. This region is known for the Rocky Mountains and the lakes and rivers found within. It contains two-thirds of waters used for recreation; boating and fishing are important recreational activities in this region (MFWP, 2015g).

The Kootenai and Flathead National Forests are in Region 1. Located in the northern Rocky Mountains, the forests contain reservoirs, rivers, waterfalls, and glacial lakes; year-round recreational activities in the forest capitalize on the presence of both a mountainous landscape and navigable waters. Available activities range from mountain climbing areas; trails for hiking, horseback riding, and off-road vehicles; water sports including boating, swimming, and tubing; and winter sports including downhill skiing, snowmobiling, cross-country skiing, snowshoeing, and dog sledding. Several types of fishing are available: ice fishing, lake and pond fishing, and river and stream fishing. The forest has seasonal hunting for big game, upland game birds, and waterfowl (USFS, 2015b) (USFS, 2015c).

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

The Flathead Lake Marine Trail is a water trail connecting access points, stopovers, and campsites located around Flathead Lake, the largest freshwater lake west of the Mississippi. The trail is widely used by kayakers and other non-motorized boats. It connects six state parks, popular fishing locations, lakeside towns, and the Flathead Indian Reservation (MFWP, 2015h). Activities within the state parks include wildlife viewing, fishing, kayaking, hiking, and swimming (Montana State Parks, 2015b).

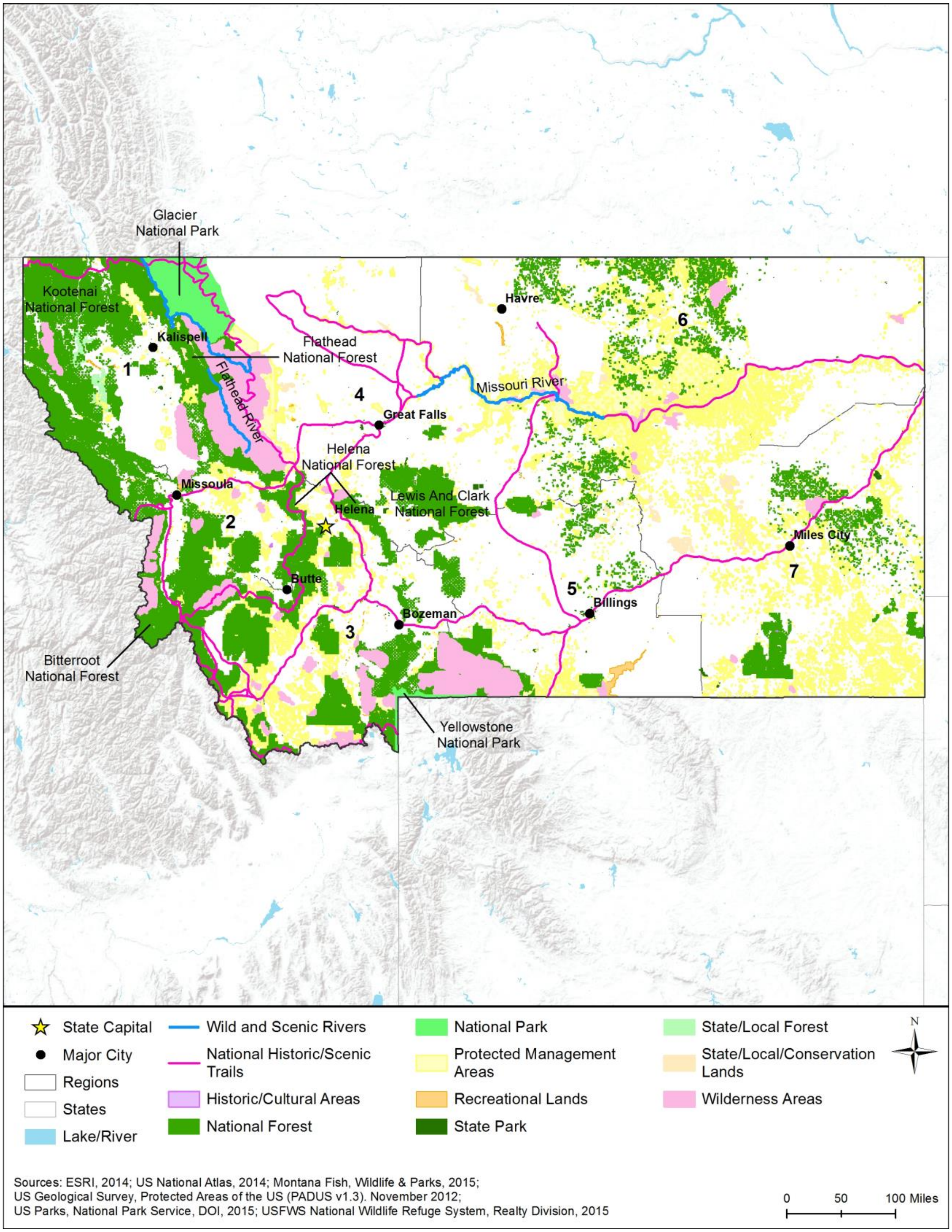


Figure 11.1.7-3: Montana Recreation Resources

Region 2

Region 2, just south of Region 1, is a mountainous region. It includes the Bitterroot Mountains to the west, the Coeur D'Alene Mountains to the north, the Elkhorn Mountains to the east, and the Anaconda Range to the south. Public lands make up over 62 percent of the land in Region 2 (MFWP, 2015i).

The Lolo, Bitterroot, and portions of the Beaverhead-Deerlodge and Helena National Forests are in Region 2. Recreational activities within the forests include hiking, mountain biking, horseback riding, camping, and picnicking. The mountainous terrain is ideal for winter sports such as downhill and cross-country skiing, and water sports such as swimming and boating in the rivers and lakes that cut through the landscape. Licensed fishing and seasonally permitted hunting are available in specific areas of the forests. Some areas are open for mineral collection and prospecting, including panning and sluicing for gold (USFS, 2015d) (USFS, 2014b) (USFS, 2015e) (USFS, 2015f).

Region 2 contains popular historic destinations, with state parks and a national historic site providing glimpses into Montana's past. The Granite Ghost Town State Park is an abandoned 1890s silver prospecting town where visitors can see preserved homes and Union Hall and the ruins of the workers homes (MFWP, 2015j). Travelers' Rest State Park, an often-used campsite and trail junction by American Indians and the only archaeologically verified campsite of the Lewis and Clark Expedition, has interpretive programs showcasing the history and archeology of the site as well as outdoor activities such as fishing and hiking (MFWP, 2015k). The Grant-Kohrs Ranch is a National Historic Site and a working cattle ranch (NPS, 2015e).

Region 3

Region 3 is located in the southwest corner of Montana, and about 60 percent is comprised of public lands. Region 3 is composed of prairie, forests, foothills of the Rocky Mountains, and mountain ranges reaching an elevation of 11,000 feet (MFWP, 2015l).

Region 3 is known for its remote wilderness settings, and is visited by those seeking solitude, independence, and striking natural scenery. Beaverhead-Deerlodge and Gallatin National Forests are located in the mountainous areas of Region 3, and include the Castle and Capitol Rock Natural Landmarks, several wilderness areas, and historic ranger stations and visitors centers. Trails and roads within the forests are used for hiking, bicycling, horseback riding, off-road vehicle use, and auto touring. The Gallatin National Forest is a popular destination for mountain climbing and ice climbing on frozen waterfalls. Both forests are ideal locations for winter sports including skiing, snowboarding, cross-country skiing, and snowshoeing. Licensed, seasonally permitted hunting are available in specific areas; the forests offer diverse types of licensed fishing, including fly-fishing and ice-fishing (USFS, 2015g) (USFS, 2015e). Red Rock Lakes NWR, located in southwest Montana near Yellowstone National Park, is one of the only Wetland Wilderness Areas and a National Natural Landmark. Activities within the refuge include hiking, bicycling, wildlife viewing, photography, camping, boating, licensed fishing, and seasonal licensed hunting (USFWS, 2015g). Lewis and Clark Caverns State Park include the often-visited limestone caverns available by guided tours only, as well as recreational trails, campsites, seasonal and licensed fishing and hunting, and canoeing (MFWP, 2015m). West Yellowstone, Montana, is a small town that serves as Yellowstone National Park's busiest gateway and a mecca for year-round outdoor recreation enthusiasts. Summer recreation includes fly fishing, river rafting, mountain biking, trail rides and hiking while winter activities include cross-country skiing, snowmobiling and touring snowcoaches. (NPS, 2016b)

Region 3 also contains locations visited for their historical significance. Part of the multi-state Nez Perce National Historical Park, Big Hole National Battlefield has a museum, visitor's center, ceremonial and commemorative activities, and an observation deck (NPS, 2015f). Bannack State Park was the site of Montana's first major gold discovery, and is now a ghost town with "Old West" displays and re-enactments, as well as activities including camping, ice skating, and fishing (MFWP, 2015n).

Region 4

Region 4 consists of the north central area in the state. It is rich in flora and fauna, known for both fishing and wildlife areas. Fishing areas include over 100 lakes and reservoirs, 3,700 miles of rivers and streams, and recreation corridors managed at the Smith River and the Missouri River. The MT DNRC manages populations of 10 big game animals and many fish species (MFWP, 2015o).

Glacier National Park is famous for its stunning landscape, concentration of glaciers and lakes, and Going-to-the-Sun Road, a National Historic Civil Engineering Landmark consisting of 50 miles of scenic roadway. Most areas of the park are open for seasonal, licensed fishing; fishing of all types, including ice fishing, is available. Other activities within the park include multi-use trails, camping, and boating (NPS, 2015g). The majority of the Lewis and Clark National Forest is within Region 4, with lake, pond, river, and stream fishing, and hunting for big game, small game, game birds, and waterfowl, as well as hiking, horseback riding, boating, swimming, and winter sports that include skiing, cross-country skiing, and dog sledding (USFS, 2015h).

The Smith River State Park is a renowned location for fishing, camping, and swimming; permits awarded by lottery are required to raft down the river as it has become a popular destination (MFWP, 2015p). Regions 4 and 6 share the Upper Missouri River Breaks National Monument, a Wild and Scenic River with fishing, rafting, non-motorized boating, camping, hiking, and seasonal licensed hunting (BLM, 2015c).

Region 5

Region 5 is bordered to the south by the Beartooth and Crazy Mountains, and continues eastward into prairies. It contains areas notable for archeological significance, and rivers popular for fishing and whitewater rafting (MFWP, 2015q). To the south, a sliver of Yellowstone National Park crosses over into Montana from Wyoming: the North and Northeast Entrances are park access points in Montana, and the North Entrance is the only park entrance open to wheeled vehicles throughout the year (NPS, 2015h).

Region 5 is filled with opportunities to visit sites related to American Indian history and pre-history, the Lewis and Clark Expedition and other explorers, and early American settlers.

Pompeys Pillar National Monument includes American Indian pictographs and petroglyphs, an inscription Clark left in sandstone together with other "historic graffiti," and other gold rush, homestead, and railroad artifacts. The Monument has an interpretive center and guided hikes along a boardwalk to the mesa and through the surrounding grounds (BLM, 2015d). Visitors to the Acton Recreation Area hike, mountain bike, or horseback ride to view the Hoskins Basin Archaeological District, one of the few remaining locations with conical and cribbed aboriginal wooden dwellings (BLM, 2012a). The Pictograph Cave State Park preserves prehistoric artifacts and pictographs; visitors hike a ¼-mile loop through caves, interpretive displays, and a visitors center with archeological displays (MFWP, 2015r).

The Yellowstone, Stillwater, Bighorn, and Boulder rivers all flow through Region 5 and are highly popular for fly-fishing. Fish populations include several species of trout, bass, and catfish. River access is provided at a variety of locations, some of which include boat launches and campgrounds. Other river-based recreational opportunities including floating, boating, and white-water rafting. Stillwater River is a Class II whitewater rafting location, with a variety of outfitters providing amenities (MFWP, 2015q).

Region 6

Region 6 reaches along the northern border of Montana from the central prairies through the agricultural land along the Milk and Missouri rivers. Region 6 is Montana's least populated region, and is known for waterfowl and managed fish populations (MFWP, 2015s).

The Prairie Pothole region, located in northeastern Montana and stretching across several states, is a haven for migratory waterfowl. This area in Montana is third in the country for duck production; this area marks the northern end of the migration route for many ducks (Ducks Unlimited, 2015). Licensed waterfowl hunting is permitted at locations such as the UL Bend NWR (USFWS, 2015h).

The Fort Peck Reservoir has 27 discrete recreation areas located around the lake with road access and facilities, although recreational activities throughout the area include camping, boating, swimming, and multi-use trails. Seasonal licensed hunting for big game is permitted within the lake area and the adjacent Charles M. Russell NWR. The reservoir has received nationwide recognition as a site for walleye fishing, among other fish species (USACE, 2015a). Also known for fishing, the Nelson, Fresno, and Beaver Creek reservoirs have amenities including boat launches, campgrounds, and swimming (Bureau of Reclamation, 2015b).

Region 7

Prairies, buttes, and river drainages characterize region 7, in Montana's southeastern corner. In contrast to Montana's other regions, Region 7 is only 25 percent public lands. This region is frequently visited for paleontology, American Indian history, and early American settler history (MFWP, 2015t).

The Makoshika State Park consists of the "badlands," and is a verified dinosaur trail. Fossils for Tyrannosaurus and Triceratops have been discovered within the park, and the visitors center has dinosaur-themed exhibits complete with a Tyrannosaurus skull. Other activities within the park include camping, archery, multi-use trails, and deer hunting. (MFWP, 2015u)

The Little Bighorn National Monument includes often-visited sites of historic significance including: a visitors center and museum, the Indian Memorial, the site of Custer's Last Stand, Custer National Cemetery, and the Reno-Benteen Battlefield, the second stage of the Battle of Little Bighorn (NPS, 2015i).

The Bighorn Canyon Recreational Area, known for natural scenery, is also famous for its collection of maintained historic ranches; boating, camping, fishing, and hiking are also available (NPS, 2015j).

11.1.7.5. Airspace

The FAA uses the NAS to provide for aviation safety. The NAS includes Special Use Airspace (SUA) consisting of Restricted Areas, Warning Areas, and Military 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

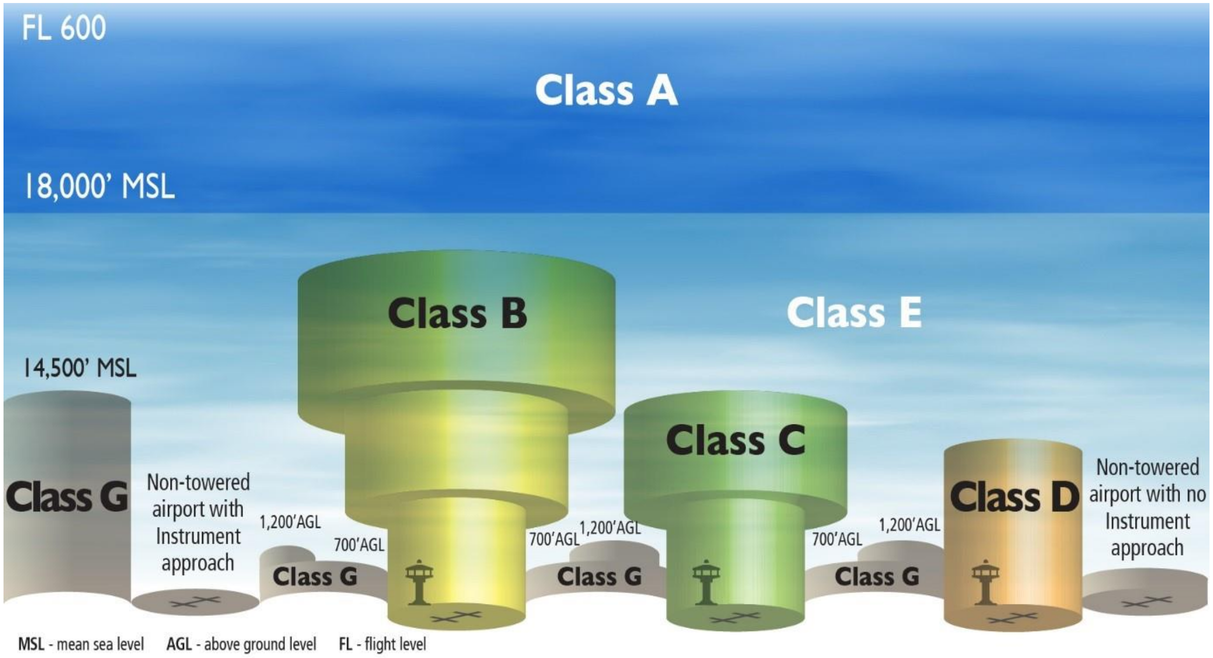
There are two categories of airspace or airspace areas.

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 11.1.7-4 depicts the different classifications and dimensions for controlled airspace. Air Traffic Control (ATC)[127] service is based on the airspace classification (FAA, 2008).

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



Source: Derived from (FAA, 2008)

Figure 11.1.7-4: National Air Space Classification Profile

Controlled Airspace

- **Class A**: Airspace from 18,000 feet to 60,000 feet Mean Sea Level (MSL)[128]. 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).[129]
- **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.

[128] MSL – The average level of for the surface of the ocean; "The height of the surface of the sea midway between the average high and low tides" (Merriam Webster Dictionary, 2016).
[129] IFR – Rules for the conduct of flights under instrument meteorological conditions (FAA, 2015d).

- **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.

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

Special Use Airspace (SUA) designates specific airspace that confines or imposes limitations on aircraft activities (See Table 11.1.7-6).

Table 11.1.7-6: SUA Designations

SUA Type	Definition
Prohibited Areas	"Airspace of defined dimensions identified by an area on the surface of the earth within which the flight of aircraft is prohibited. Such areas are established for security or other reasons associated with the national welfare. These areas are published in the Federal Register and are depicted on aeronautical charts."
Restricted Areas	"Airspace identified by an area on the surface of the earth within which the flight of aircraft, while not wholly prohibited, is subject to restrictions. Activities within these areas must be confined because of their nature or limitations imposed upon aircraft operations that are not a part of those activities or both. Restricted areas denote the existence of unusual, often invisible, hazards to aircraft such as artillery firing, aerial gunnery, or guided missiles. Penetration of restricted areas without authorization from the using or controlling agency may be extremely hazardous to the aircraft and its occupants. Restricted areas are published in the Federal Register and constitute 14 CFR Part 73."
Warning Areas	"Airspace of defined dimensions, extending from three NM from the United States 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."

SUA Type	Definition
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, 2015a) (FAA, 2008)

Other Airspace Areas

Other airspace areas, explained in Table 11.1.7-7, include Airport Advisory, Military Training Routes (MTRs), Temporary Flight Restrictions (TFRs), Parachute Jump Aircraft Operations, published Visual Flight Rules (VFR) and IFRs, and Terminal Radar Service Areas.

Table 11.1.7-7: Other Airspace Designations

Type	Definition
Airport Advisory	There are 3 types: • Local Airport Advisory - Operated within 10 statute miles (5,280 feet/mile) 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 United States 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 Final 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 United States parachute jump areas are contained in the regional Airport/Facility Directory.

Type	Definition
Published VFRs and IRs	These are established routes for moving around and through complex airspace, like Class B airspace. VFRs are procedures used to conduct flights under visual conditions. IFRs are procedures used to conduct flights with instruments and meteorological conditions.
Terminal Radar Service Areas	Airspace areas that are not one of the established U.S. airspace classes. These areas provide additional radar services to pilots.

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

Aerial System Considerations

Unmanned Aerial Systems

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

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

Balloons

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

Obstructions to Airspace Considerations

The Airports Division of the FAA is responsible for determining obstructions to air navigation that may affect the safe and efficient use of navigable airspace and the operation of planned or existing air navigation and communication facilities. Such facilities include air navigation aids, communication equipment, airports, federal airways, instrument approach or departure procedures, and approved off-airway routes. An Obstruction Evaluation and Airport Airspace

Analysis (OE/AAA) is required when there is the potential for airport construction/alteration of a facility that may impinge upon the NAS. Per 14 CFR Part 77.9, the FAA is to be notified about construction or alterations when:

- "Any construction or alteration exceeding 200 ft above ground level;
- Any construction or alteration:
  - within 20,000 ft of a public use or military airport which exceeds a 100:1 surface from any point on the runway of each airport with its longest runway more than 3,200 ft;
  - within 10,000 ft of a public use or military airport which exceeds a 50:1 surface from any point on the runway of each airport with its longest runway no more than 3,200 ft; or
  - 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; or
- 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.

Montana Airspace

The MDT Aeronautics Division is responsible for providing and promoting a safe aviation system in the state, to include maintaining the airport infrastructure and visual/electronic navigation facilities (MDT, 2015d). The MDT Aeronautics Division is comprised of two bureaus, as follows, with distinct responsibilities for protecting aeronautical safety:

- Airport/Airways Bureau – "Oversees all aspects concerning state involvement in the public and private airport and airways system in Montana. The bureau owns, operates, and maintains 15 public use airports, 23 Non-directional Beacons (NDBs) for navigation, and 68 air-to-ground radios in the state…The Bureau owns and operates the Yellowstone Airport located at West Yellowstone" (State of Montana, 2015a).
- Safety and Education – Develops, promotes and administers the state's aviation safety and education programs" (State of Montana, 2015a).
- There is one FAA FSDO located in Helena, Montana (FAA, 2015b).

Montana 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 (NASAO, 2015). Figure 11.1.7-5 presents the different aviation airports/facilities[130] located in Montana, while Figure 11.1.7-6 and Figure 11.1.7-7 present the breakout by public and private airports/facilities. There are approximately 270 airports/facilities (public and private) within Montana as presented in Table 11.1.7-8 and Figure 11.1.7-5Figure 11.1.7-6 through Figure 11.1.7-7 (USDOT, 2015).

[130] Facilities associated with airports are for passengers and cargo and for landing, take-off, shelter, and maintenance of aircraft.

Table 11.1.7-8: Type and Number of Montana Airports/Facilities

Type of Airport or Facility	Public	Private
Airport	125	106
Heliport	2	34
Seaplane	1	1
Ultralight	0	1
Balloonport	0	0
Gliderport	0	0
Total	**128**	**142**

Sources: (USDOT, 2015) (FAA, 2015a)

There are Class C and D controlled airports for Montana as follows:

- One Class C –
  - Billings Logan International
- Five Class D –
  - Bozeman Yellowstone International;
  - Great Falls International;
  - Helena Regional;
  - Glacier Park International, Kalispell; and
  - Missoula International (FAA, 2014c).

There are no SUAs (i.e., prohibited, restricted, and warning) located in Montana. Figure 11.1.7-8 presents the SUAs in Montana. With regard to the Powder River MOA for Montana, the FAA issued a Record of Decision (ROD) on March 24, 2015 that documents the FAA's adoption of the U.S. Air Force's Final EIS for the Powder River Training Complex (PRTC) in Montana, Wyoming, South Dakota, and North Dakota Modification and establishment of new airspace for the PRTC based on Modified Alternative A in the FEIS (FAA, 2015f). These new MOAs (Powder River and Gap A-C are not presented in Figure 11.1.7-8 because the reference source, National Transportation Atlas Database, does not include the geographic data due to the recent decision regarding this airspace.

The Wyoming MOA, Powder River B (1,000 feet AGL to, but not including, FL 180. Except 1,500 feet AGL within a 3 NM radius of the following airport: Lanning Ranch Airport, MT), extends into the southeast corner of Montana (FAA, 2015a). There are no TFRs for Montana (FAA, 2014a). MTRs in Montana, presented in Figure 11.1.7-9, consist of seven Slow Routes.

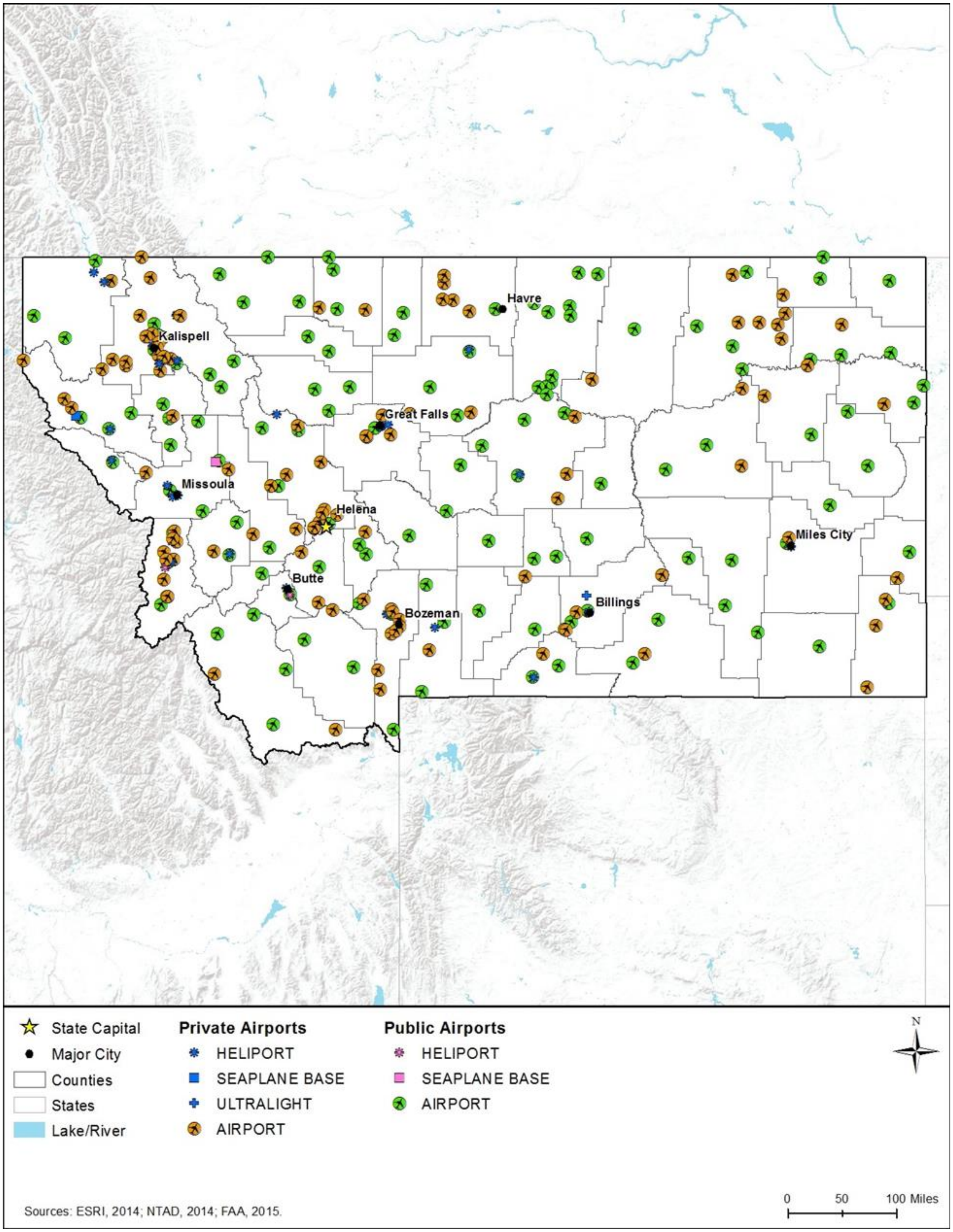


Figure 11.1.7-5: Public and Private Airports/Facilities in Montana

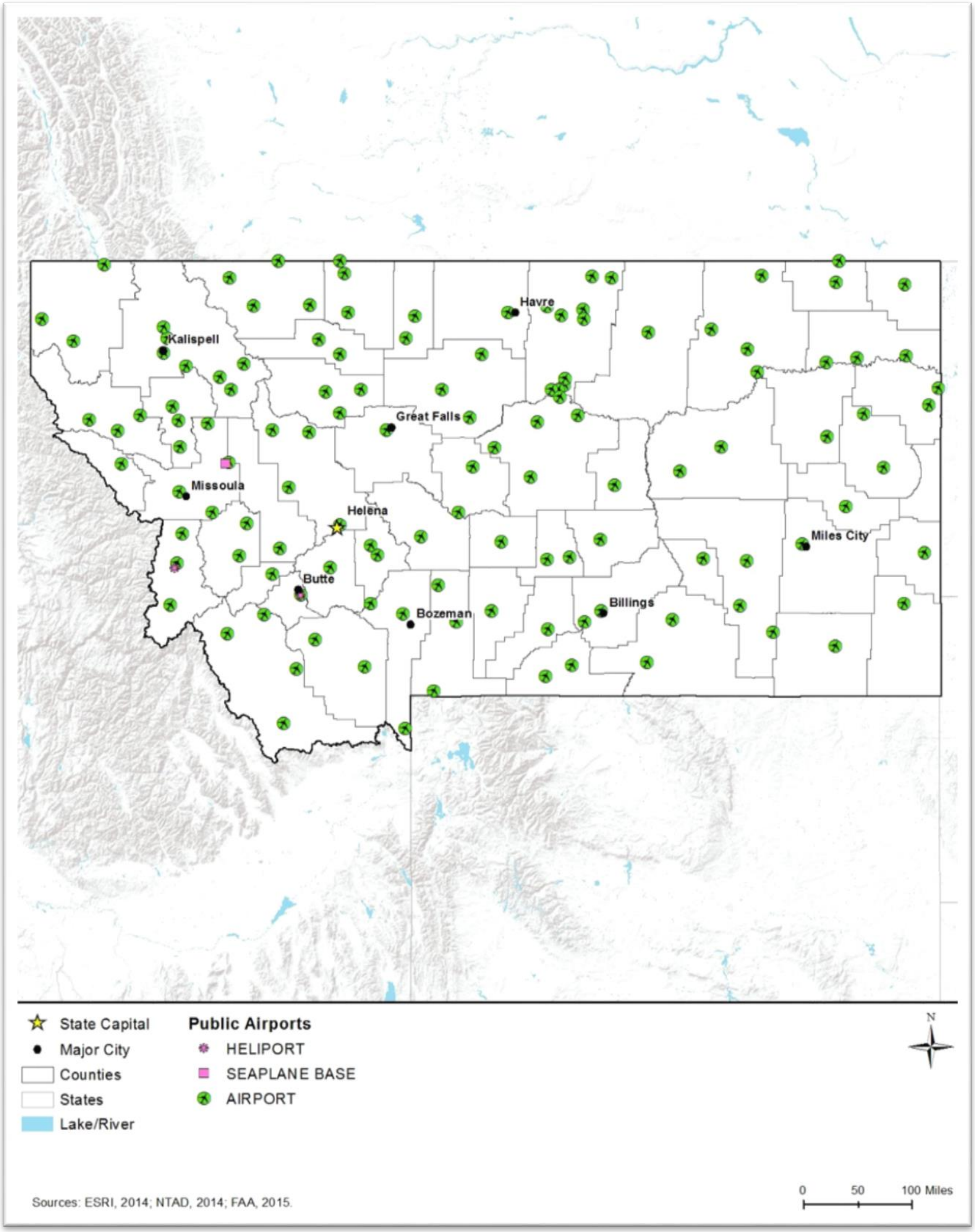


Figure 11.1.7-6: Public Montana Airports/Facilities

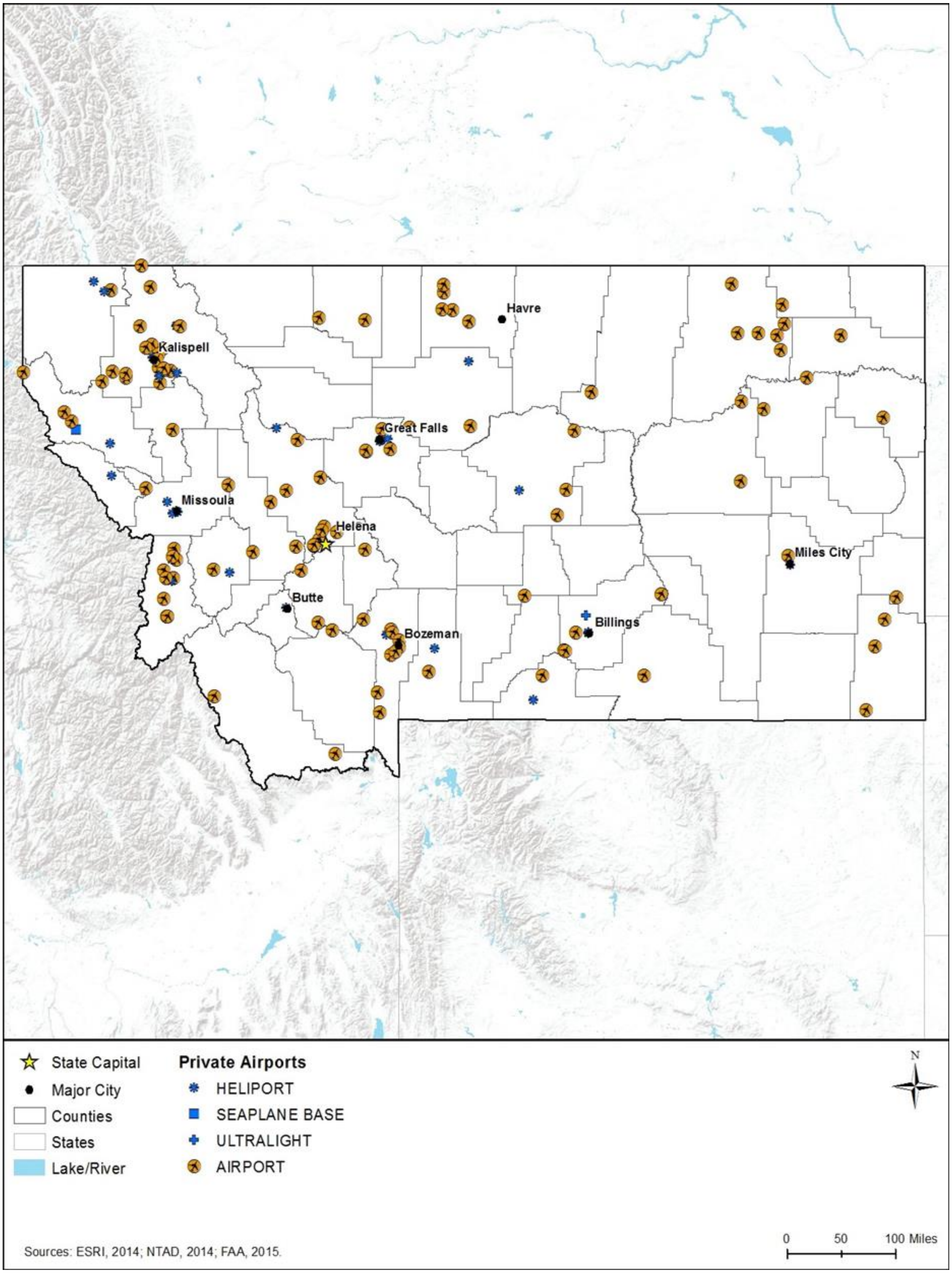


Figure 11.1.7-7: Private Montana Airports/Facilities

UAS Considerations

Montana State University was recently selected to join a team, led by Mississippi State University, related to a National Center of Excellence for Unmanned Aircraft Systems. The focus of this center of excellence is to conduct research and training necessary to support the safe use of UASs in the NAS (State of Montana, 2015b).

The NPS signed a policy memorandum on June 19, 2014 that "directs superintendents nationwide to prohibit launching, landing, or operating UA on lands or waters administered by the National Park Service" (NPS, 2014c). There are two national parks in Montana that have to comply with this agency directive (NPS, 2015d).

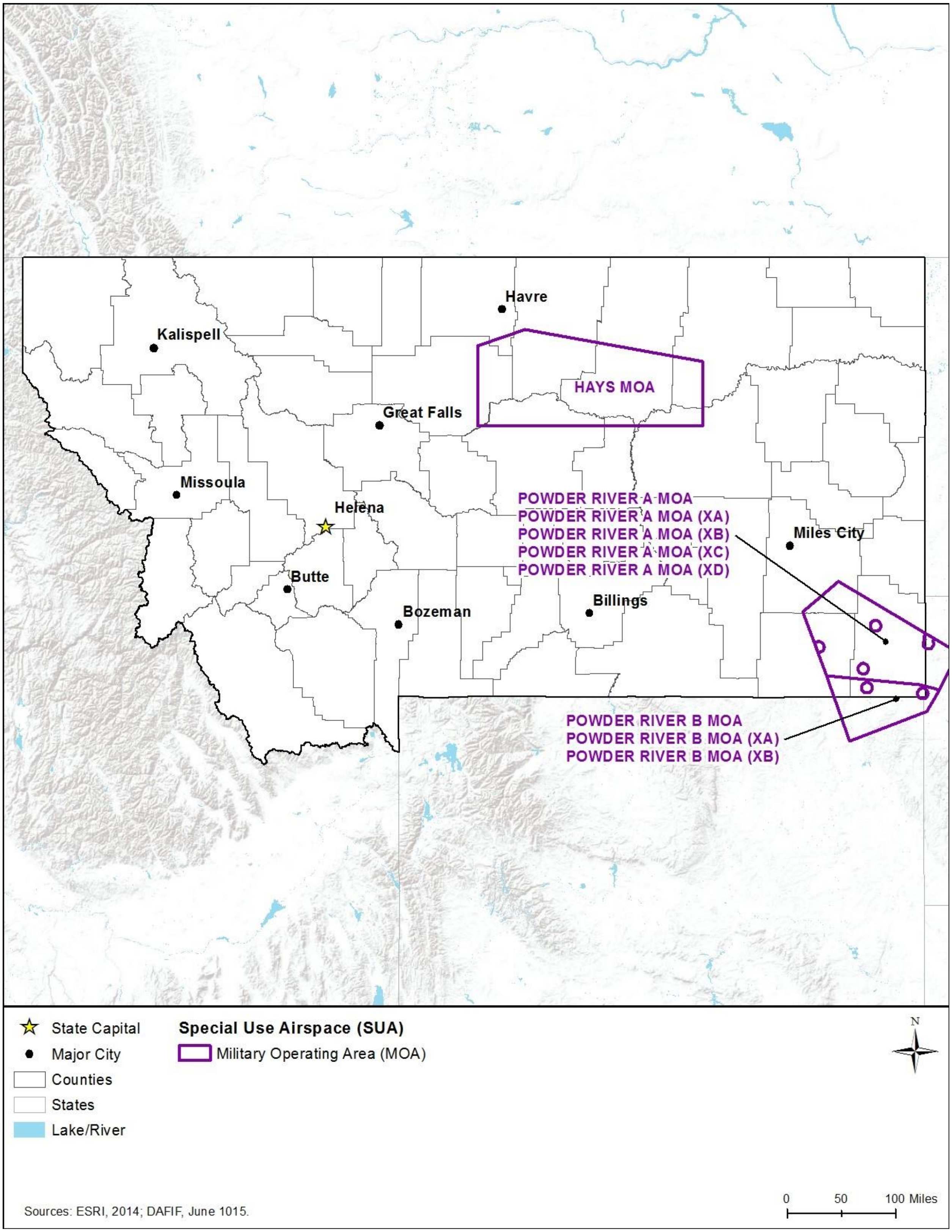


Figure 11.1.7-8: SUAs in Montana

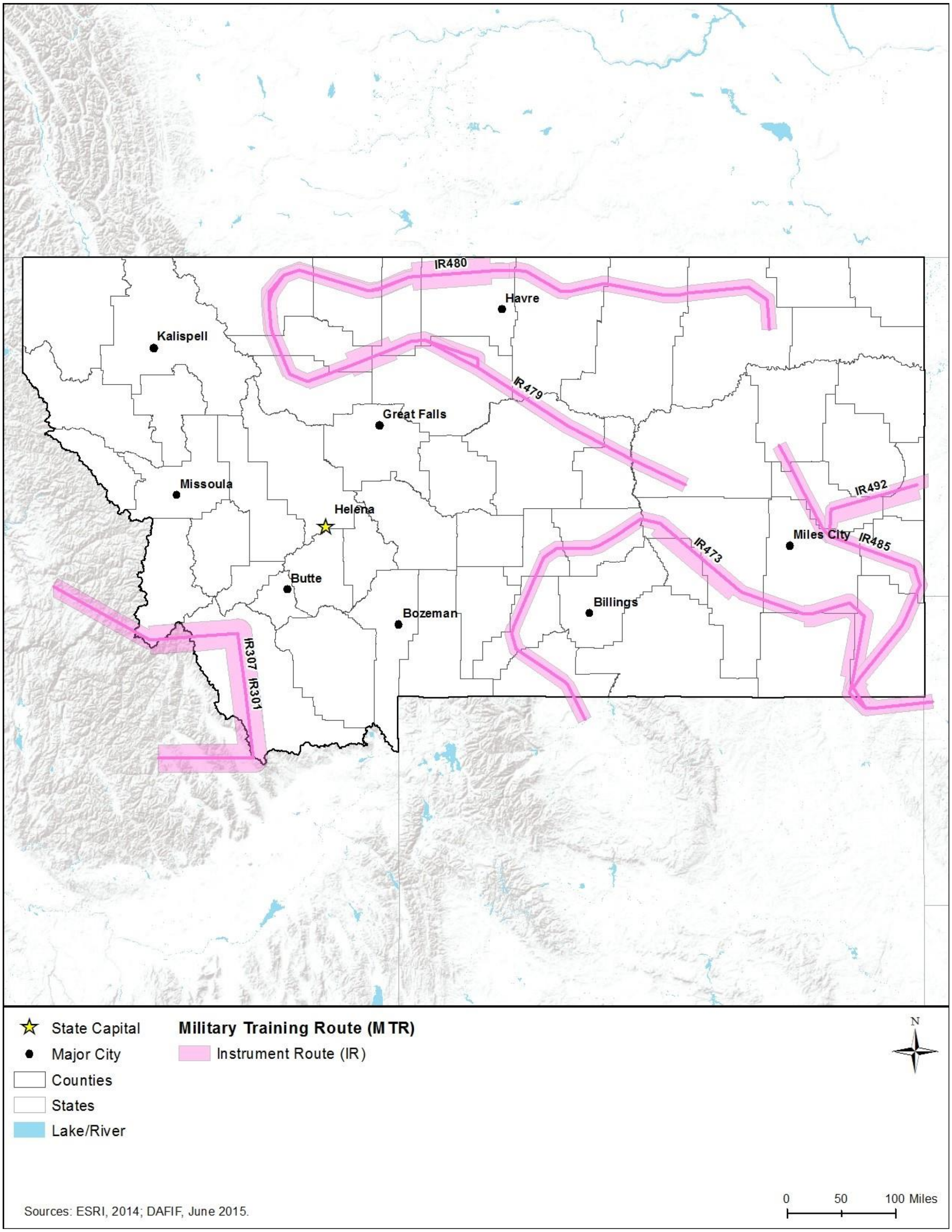


Figure 11.1.7-9: MTRs in Montana

11.1.8. Visual Resources

11.1.8.1. 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 (e.g., mountain ranges, city skylines, unique geological formations, rivers) and constructed landmarks (e.g., bridges, memorials, cultural resources, or statues) are considered visual resources. For some, cityscapes are valued visual resources, whereas others prefer natural areas. While many aspects of visual resources are subjective, evaluating potential impacts on the character and continuity of the landscape is a consideration when evaluating proposed actions for NEPA and NHPA compliance. The federal government does not have a definition of what constitutes a visual resource; therefore, this Final PEIS will use the general definition of visual resources used by the BLM, "the visible physical features on a landscape (e.g., land, water, vegetation, animals, structures, and other features)." (BLM, 1984).

11.1.8.2. Specific Regulatory Considerations

Table 11.1.8-1 presents state and local laws and regulations that relate to visual resources.

Table 11.1.8-1: Relevant Montana Visual Resources Laws and Regulations

State Law / Regulation	Regulatory Agency	Applicability
36.27.205: Master Plan	MT DNRC	"The master plan shall prescribe appropriate land management practices including, but not limited to, scenic and landscape management; vegetation and wildlife management; the elimination of public injury obstructions; the purposeful removal or introduction of objects…"
12.8.106: State Recreation Roads and Trails	Department of Fish, Wildlife and Parks	"To control the use and development of certain Montana roads and trails whose scenic and cultural attributes are of high recreational value warranting formal protection."
23-1-115: Montana Primitive Parks Act	Department of Fish, Wildlife and Parks	Limits development in primitive state parks, including the prohibition of electric lines or facilities, the development of new roads or paving of existing unimproved roads.
Montana Antiquities Act	State Historic Preservation Office	To appropriately protect "historic and prehistoric sites including buildings, structures, paleontological sites, or archaeological sites on state owned lands."

Source: (Linda McCulloch: Montana Secretary of State, 1975) (Linda McCulloch: Montana Secretary of State, 1977) (Montana Legislative Services, 2015a) (Montana State Historic Preservation Office, 2016)

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.

The MDT created an environmental manual that contains a chapter on visual resources and aesthetics. The manual requires a review of a project's impacts to visual resources and aesthetics and an analysis if impacts could take place. Mitigation or changes in design may be required if any impacts were determined to occur. (MDT, 2010a)

11.1.8.3. Character and Visual Quality of the Existing Landscape

The "Big Sky Country" of Montana encompasses wide-open plains to the east and the towering mountains of the Rockies in the west. Broad river valleys, glacial lakes, snow-capped peaks, expansive ranches, and old-west towns give this state unique and scenic characteristics (Figure 11.1.8-1). Montana is the fourth largest state and is ranked 44th in population numbers (State of Montana, 2015c). Due to the sparse population and expanses of open landscape, Montana is a vacation destination for local residents and visitors from across the U.S. and Canada for enjoying open spaces, viewing scenic lands and wildlife such as bison, a classic symbol of the west, moose, and grizzly bears. About 30 percent of the state consists of land open to the public and managed by the BLM, USFS, USFWS, BOR, USACE, and NPS (Montana Wilderness Association, 2015a). Nearly the entire state contains spectacular scenic resources, and due to the large amount of public lands, much of those resources are protected from loss or damage. DoD manages land within Montana not open to the public.

Source: (NPS, 2015k)

Figure 11.1.8-1: Glenns Lake, Glacier National Park

One aspect of importance for visual resources is to maintain the character of the area. For example, in a farm community, keeping the character of the town consistent with farm-style houses, barns, and silos would be key in maintaining the character of the community. In a more metropolitan area, there may be many different visual styles within each neighborhood, but keeping the character of the neighborhood is important to maintain if new development were to occur. Section 11.1.7, Land Use, Recreation, and Airspace, discusses land use and contains further descriptions of land cover within the state.

Montana has considered the management and protection of scenic resources in their natural areas and transportation planning (Table 11.1.8-1). Those policies allow for consideration and protection of visual resources in certain landscapes. 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 additional management, significance, or protection through state or federal policy, as well as being identified as visually significant areas.

11.1.8.4. Visually Important Historic Properties and Cultural Resources

Visual and aesthetic qualities of historic properties can contribute to the overall importance of a particular site. Such qualities relate to the integrity of the appearance and setting of these properties or resources. Viewsheds (the natural and manmade environment visible from one or more viewing points) can also contribute to the significance of historic properties or cultural resources (NASA, 2013). Viewsheds containing historic properties and cultural resources may be considered important because of their presence in the landscape. Figure 11.1.8-2 shows many of the historic and cultural resources that may be considered visually sensitive. In Montana, there are 1,139 National Register of Historic Places (NRHP) listed sites, which include 28 National Historic Landmarks, 2 National Historical Sites, 1 National Historical Park, and 1 National Monument. Some State Historic Sites, State Heritage Areas, and State Historic Districts may also be included in the NRHP, whereas others are not designated at this time.

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

The BLM issued a 1997 Memorandum of Understanding with the Advisory Council on Historic Preservation and the National Conference of State Historic Preservation Officers regarding the manner in which BLM will meet its responsibilities under the National Historic Preservation Act (BLM, 2004). In addition, BLM is required to manage scenic resources under the Federal Land Policy and Management Act of 1976 (FLPMA) and Manuals 8100 and 8140 protecting cultural resources. BLM conducts visual resource inventories for all of the public lands they manage during their land use planning process, about every 10-15 years.

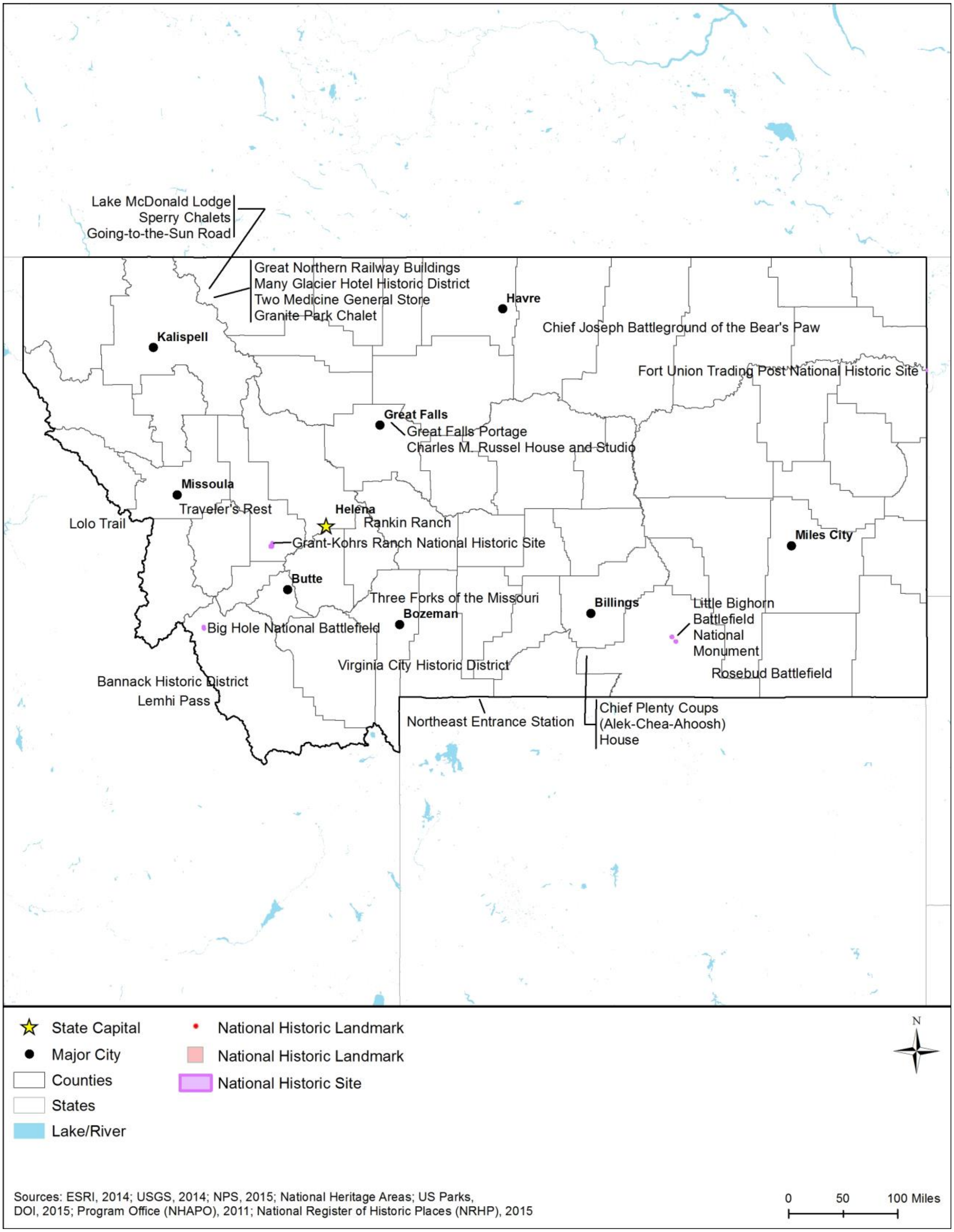


Figure 11.1.8-2: Representative Sample of Some Historic and Cultural Resources that May be Visually Sensitive

World Heritage Sites

Sites are designated World Heritage sites if they reflect "the world's cultural and natural diversity of outstanding universal value" (UNESCO, 2015). To be included on the World Heritage List, sites must meet 1 of 10 criteria reflecting cultural, natural, or artistic significance (UNESCO, 2015). World Heritage sites are diverse and range from archaeological remains, national parks, islands, buildings, city centers, and cities. The importance of World Heritage-designated properties can be attributed to cultural or natural qualities that may be considered visual resources or are visually sensitive at these sites. In Montana, Yellowstone National Park (only a small portion of the park is located in Montana) and Glacier National Park are designated natural World Heritage sites (Figure 11.1.8-2) (UNESCO, 2016). More information on these National Parks is presented in Section 11.1.8.5.

National Historic Landmarks

National Historic Landmarks (NHL) 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, 2015l). NHLs may include "historic buildings, sites, structures, objects, and districts" (NPS, 2016c). Other types of historic properties include battlefields, American Indian historic sacred sites, and travel routes. The importance of NHL-designated properties can be attributed to scenic or aesthetic qualities, among other attributes, that may be considered visual resources or visually sensitive at these sites. There are 28 NHLs in Montana, which include a variety of historic structures but also include historic stopovers along travel routes and natural areas. The NHLs in Montana are:

- Bannack Historic District
- Butte-Anaconda Historic District
- Camp Disappointment
- Chief Joseph Battleground of Bear's Paw
- Chief Plenty Coups (Alek-chea-ahoosh) Home
- Deer Medicine Rocks
- First Peoples Buffalo Jump
- Fort Benton Historic District
- For Union Trading Post
- Going-to-the-Sun Road
- Grant-Kohrs Ranch
- Great Falls Portage
- Great Northern Railway Buildings
- Hagen site
- Lake McDonald Lodge
- Lemhi Pass
- Lolo Trail
- Northeast Entrance Station
- Pictograph Cave
- Pompey's Pillar (Figure 11.1.8-3)
- Rankin Ranch
- Rosebud Battlefield / Where the Girl Saved her Brother
- Russell, Charles M. House and Studio
- Three Forks of the Missouri
- Travelers Rest
- Virginia City Historic District
- Wheeler, Burton K. House
- Wolf Mountains Battlefield / Where Big Crow Walked Back and Forth

By comparison, there are over 2,500 NHLs in the United States (NPS, 2015m). Figure 11.1.8-2 provides a representative sample of some of the historic and cultural resources that may be visually sensitive.

The scenic and visual resources of these landmarks and surrounding areas are managed for consistency with the historic resource and aesthetics of the landscape (NPS, 2015n).

Source: (BLM, 2015e)

Figure 11.1.8-3: Pompey's Pillar National Monument and National Historic Landmark

National Historic Sites

There are two National Historic Sites in Montana, Fort Union Trading Post and Grant-Kohrs Ranch. Fort Union Trading Post was built on the Missouri River, sharing the border with North Dakota. The landscape consists of the river valley, riparian forest, mixed-grass prairie, and the historic trading post (NPS, 2015o). Grant-Kohrs Ranch is a historic cattle ranch covering 1,600 acres of grassland, creeks, mountain views, and about 80 historic structures (NPS, 2015e). National Historic Sites are units of the NPS and are managed and protected through the NPS's historic program as well as the visual resources program (NPS, 2015p).

National Historical Parks and National Monuments

There is one National Historic Park, one National Battlefield, and one National Monument located in Montana (Figure 11.1.8-2). The Nez Perce National Historical Park consists of 38 sites in four states (Washington, Oregon, Idaho, and Montana). Three sites are within Montana and cover a range of scenery from high mountains to steep cliffs, rivers, and canyons. Each site contains the history of the Nez Perce Tribe in the northwest and their battles with the U.S. Army (NPS, 2015q). Big Hole National Battlefield is one of the three sites within Nez Perce Historical Park in Montana; this 665-acre battlefield contains the Big Hole River, and is surrounded by mountains, grasslands, and riparian forest (NPS, 2015r).

Little Bighorn Battlefield National Monument is located in the vast central plains and along Little Bighorn River Valley. Wide-open vistas surround the hilltops during the day, and pristine night skies are preserved for visitors after dark (NPS, 2015s).

National Historic Trails

Designated under Section 5 of the National Trails System Act (16 USC 1241-1251, as amended), National Trails 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).

The Lewis and Clark National Historic Trail is commemorative of several trails that the expedition followed along the Missouri River while crossing the entire state of Montana (Figure 11.1.8-2). The varied terrain from river valleys to the Rocky Mountains across Montana contains protected viewsheds along much of this historic trail (NPS, 2015t).

The Nez Perce (Nee-Me-Poo) National Historic Trail connects the 38 sites of the Nez Perce National Historical Park through four states, and traces the travel routes and history of the Nez Perce Tribe. The Nez Perce trail traverses some of the most scenic areas in Montana, crossing through the western mountains, through Yellowstone National Park, and up through the wide-open vistas of the central plains (USFS, 2015i).

The National Trails System Act authorized the designation of National Recreational Trails near urban areas (American Trails, 2015). There are over 1,100 National Recreation Trails across the nation administered by the USFS, USACE, USFWS, local or state governments, and non-profit organizations (National Recreation Trails, 2015).

11.1.8.5. Parks and Recreation Areas

Parks and recreation areas include state parks, National Recreation Areas, 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 11.1.8-4). Figure 11.1.7-1 in Section 11.1.7, Land Use, Recreation, and Airspace, identifies parks and recreational resources in Montana. Figure 11.1.8-4 displays natural areas that may be visually sensitive, including park and recreation areas.[131]

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

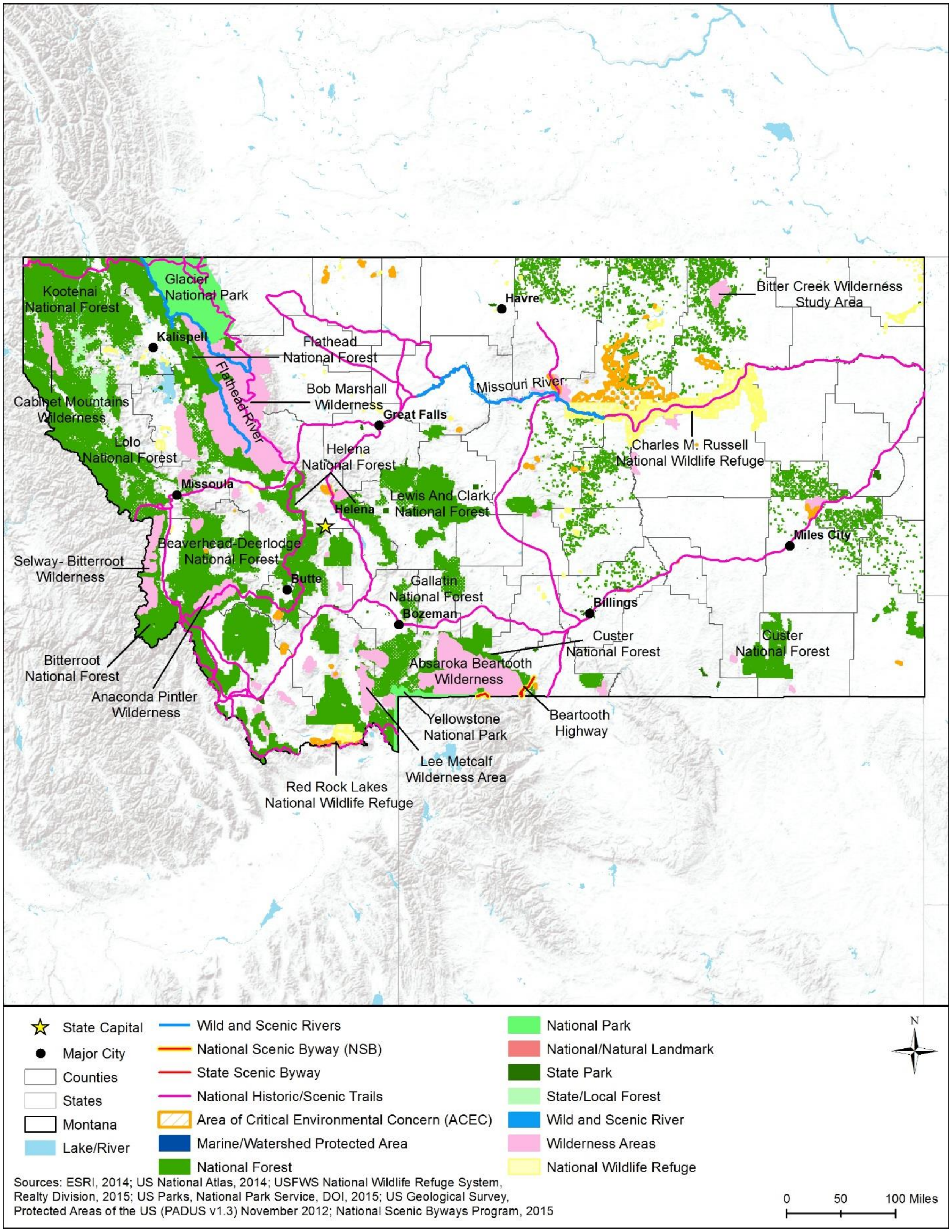


Figure 11.1.8-4: Natural Areas that May be Visually Sensitive

National Parks and National Recreation Areas

There are two National Parks and one National Recreation Area in Montana (Figure 11.1.8-4). The scenic resources of Yellowstone and Glacier National Parks are world-renowned. As identified in Section 11.1.8.4, these National Parks are designated natural World Heritage Sites and are considered natural treasures with universal value (NPS, 2015u). Although much of Yellowstone National Park is within Wyoming, the bordering lands within Montana also contain pristine visual resources within the park boundary (about 3 percent of the total area of 2,219,791 acres). The Yellowstone and Gallatin rivers flow from the northern Gallatin Mountains creating stunning views of the river valleys and surrounding peaks. The landscape is also federally designated wilderness (see Section 11.1.8.6), which further maintains the pristine visual and scenic resources of the park (NPS, 1972).

Glacier National Park shares a border with Canada in the high peaks of the Northern Rocky Mountains, encompassing over 1 million acres (NPS, 2015v). The scenery is unique due to the incising of glaciers into the bedrock, which created carved deep valleys, and steep, banded mountain tops (Figure 11.1.8-1). The namesake glaciers are one of the many scenic resources; others include waterfalls, riparian forests, alpine lakes and meadows, and unique geologic formations (NPS, 2015w). About 95 percent of the park is suitable for wilderness designation but has not been formally designated; however, it is still managed as wilderness to preserve the character and visual resources within (NPS, 1999).

Bighorn Canyon National Recreation Area (Figure 11.1.8-5) within Montana and Wyoming covers a total of 120,000 acres of spectacular views, including steep cliffs carved by the Bighorn River, roaming bighorn sheep, wide prairies, forested mountains, lakes, and wetlands (NPS, 2015x).

Source: (NPS, 2015y)

Figure 11.1.8-5: Steep Cliffs of the Bighorn Canyon National Recreation Area

National Forests

There are 9 National Forests in Montana (Table 11.1.8-2), most are within the mountainous western portion of the state covering over 17 million acres (USFS, 2013). The USFS conducts inventories of the forestlands and assigns scenic resource categories from which they manage for scenic and visual resources (USFS, 1995). The scenic inventories are conducted during their land and resource management planning process about every 10 to 15 years and used to manage the forest landscape and to protect areas of high scenic integrity (USFS, 1995).

Table 11.1.8-2: National Forests in Montana

National Forest Name	Acres (million)	Scenic Resources
Beaverhead-Deerlodge	3.32	Steep mountain peaks, streams, lakes, forest, meadows, alpine landscape, valleys, wetlands
Bitterroot	1.6	Mountains, valleys, streams, grassland, forests, lakes
Custer	1.1	Mountains, valleys, forest, caves, grassland, plains, plateau, alpine lakes
Gallatin	1.8	High mountain peaks, plateaus, lakes, forest, plains, meadows, rivers, valleys
Flathead	2.3	High mountain peaks, rivers, lakes, forest, meadows
Helena	0.97	Limestone mountain peaks, forest, meadows, river, canyons
Kootenai	2.2	Steep mountain peaks, high mountain vistas, forest, lakes
Lewis and Clark	1.8	Mountains, rivers, valleys, forest
Lolo	2.0	Mountain peaks, forest, streams
Total	**17**[a]	

Source: (USFS, 2013) (Montana Wilderness Association, 2017) (USDA, 2013)

[a] Acreage listed encompasses some areas within the boundaries of the National Forests that are not woodland or forested acres. As noted in the table above, some forests include lakes, streams, grasslands, plains, wetlands. Acreage does not incldue portions of the Kaniksu National Forest that extends into Montana from another state or other USFS owned land that includes facilities that support agency operations, such as Aerial Fire Depots, Auto Repair facilities, or the Missoula Eq. Center.

Bureau of Land Management

The BLM manages 8.3 million acres throughout Montana (BLM, 2015f). These lands are managed under a multiple use mandate (FLPMA) meaning that BLM must allow many uses of the lands, from recreation, to livestock grazing, forestry, wildlife habitat, and energy development (BLM, 2015g). The BLM uses their visual resources management system to "identify and evaluate scenic values to determine the appropriate levels of management." Lands that are classified with high scenic values are assigned management that prevents or reduces impacts to the visual resources, protecting the scenic landscape (BLM, 2012b). BLM lands with high scenic values are less likely to be developed or have the visual resources disturbed. Management varies among uses and resources; some areas, like lands adjacent to wild and scenic rivers are managed for high quality visual resources. Other areas, such as where energy development is occurring, may be managed for lower quality visual resources.

Army Corps of Engineers Recreation Areas

There are two U.S. Army Corps of Engineers (USACE) recreation and flood risk management areas within the state, Fort Peck Project in the northeast, and Libby Dam and Lake Koocanusa in the northwest (Figure 11.1.8-4) (USACE, 2015c). These reservoirs and recreation areas are specifically managed by the USACE for scenic and aesthetic qualities in their planning guidance in addition to managing risks for floods (USACE, 1997).

State Parks

The mission of the Montana's State Park is to "conserve the scenic, historic, archaeologic, scientific, and recreational resources of the state and provide for their use and enjoyment, thereby contributing to the cultural, recreational, and economic life of the people and their health" (Montana Codes Annotated 1997, 23-1-101). This mission applies to parks, trails, and other natural resources managed under the Montana Department of Fish, Wildlife, and Parks.

There are 55 state parks in Montana with over 75 percent of those parks within the western half of the state. Of the 55 state parks, 11 are highlighted as having "scenic wonders and opportunities to explore nature" (Montana State Parks, 2015c). Table 11.1.8-3 lists these 11 scenic parks and some of the visual resources within each park.

Table 11.1.8-3: Montana State Parks with Scenic Resources

Park Name	Acres	Visual Resources
Beavertail Hill	65	River views, mountain views, riparian forest
Fish Creek	5,603	Stream view, river valley, mountain views, riparian forest
Giant Springs	4,500 [a]	Freshwater springs, unique river, river views, riparian forest, mountain views
Greycliff Prairie Dog Town	98	Prairie, grassland, wildlife viewing, river and mountain views
Lewis and Clark Caverns	3,000	River views, mountain views, and riparian forest
Lone Pine	186	Mountaintop viewpoint, river and mountain views, wildflowers, view of Glacier National Park
Lost Creek	502	Limestone cliffs, geologic formations, waterfall, forests, meadows, mountain views
Makoshika	11,538	Geologic formations, badlands,
Medicine Rocks	330	Geologic formations, badlands,
Sluice Boxes	1,450 [b]	Limestone canyon, cliffs, historic sites, mountain stream, forest, riparian forest
Wild Horse Island	2,160	Forest, lake, island, grassland

Source: (Montana State Parks, 2015c)

[a] (Montana Office of Tourism, 2015)
[b] (Erickson, 2006)

Federal and State Trails

The Continental Divide Scenic Trail is an ongoing project to connect Mexico and the Canadian border (Figure 11.1.8-4). The 3,100 miles trail traverses Montana (750 miles), Idaho (180 miles), Wyoming (610 miles), Colorado (770 miles), and New Mexico (790 miles). The trail crosses through some of the most rugged and breathtaking terrain in Montana, such as Glacier National Park and the Bitteroot Mountains. The trail is designated under the National Trails System Act (16 USC 1241-1251, as amended), and is protected under those provisions (Montana Wilderness Association, 2015b).

Montana boasts over 2,300 public trails throughout the state that cover about 15,000 miles. Most of these trails are on federal land, but the number of "urban" trails are increasing, allowing for more outdoor access for city dwellers to enjoy the beautiful vistas that Montana has to offer (MFWP, 2004).

State Forests

There are seven state forests in Montana, which are managed for both timber production as well as for watershed cover (Montana Legislative Services, 2015b). Table 11.1.8-4 displays a list of the state-designated forests. Each forest contains scenic landscapes of mountains, evergreen forests, and broad vistas.

Table 11.1.8-4: State Forests in Montana

State Forest Name	Acres
Clearwater	18,076
Coal Creek	15,000
Lincoln	8,245
Stillwater	93,000
Sula	13,000
Swan River	40,000
Thompson River	14,648
Total	**201,969**

Source: (Montana Legislative Services, 2015b)

11.1.8.6. Natural Areas

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

Rivers Designated as National or State Wild, Scenic or Recreational

Montana has 368 miles of rivers designated as wild and scenic on the Flathead and Missouri rivers (Figure 11.1.8-4) (National Wild and Scenic Rivers System, 2015c). The 219 miles of designated sections of the North, Middle, and South forks of the Flathead River contain all three classifications of wild (97.9 miles), scenic (40.7 miles), and recreational (80.4 miles) (National Wild and Scenic Rivers System, 2015a). The Missouri River has 149 total miles of designated waters: 64 miles of wild, 26 miles of recreational, and 59 miles of scenic (National Wild and Scenic Rivers System, 2015b).

National Wildlife Refuges and State Wildlife Management Areas

The following are the 24 NWRs and 5 Wetland Management Districts in Montana (Figure 11.1.8-4):

- Benton Lake NWR
- Benton Lake Wetland Management District
- Black Coulee NWR
- Blackfoot NWR
- Bowdoin NWR
- Bowdoin Wetland Management District
- Charles M. Russell NWR
- Charles M. Russell Wetland Management District
- Creedman Coulee NWR
- Hailstone NWR
- Hewitt Lake NWR
- Halfbreed Lake NWR
- Lake Mason NWR
- Lake Thibadeau NWR
- Lamesteer NWR
- Lee Metcalf NWR
- Lost Trail NWR
- Medicine Lake NWR
- National Bison Range NWR
- Ninepipe NWR
- Pablo NWR
- Northeast Montana Wetland Management District
- Northwest Montana Wetland Management District
- Red Rock Lakes NWR
- Rocky Mountain Front NWR
- Swan River NWR
- Swan Valley NWR
- UL Bend NWR
- War Horse NWR

Many of these refuges encompass lakes, rivers, or wetlands and surrounding habitat; however other areas are within native prairie, such as the National Bison Range. These refuges protect over a million acres of habitat and the visual resources within and surrounding the refuges (USFWS, 2016).

There are 83 Wildlife Management Areas managed by the MFWP to protect and conserve wildlife habitat. These areas contain protected habitat for plants and animals without disturbance from development and habitat loss (State of Montana, 2015d).

National Natural Landmarks

There are 10 National Natural Landmarks (NNL) in Montana. 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, 2014d). These landmarks may be considered visual resources or visually sensitive. The 10 NNLs in Montana cover over 100,000 acres owned by USFS, BLM, and USFWS, along with tribes and private landowners.

Table 11.1.8-5 displays a list of NNLs, their size, and some of the scenic resources protected within these areas (NPS, 2012b).

Table 11.1.8-5: National Natural Landmarks with Scenic Resources

National Natural Landmarks	Acres	Visual Resources
Bridger Fossil Area	161	Geologic, paleontological
Bug Creek Fossil Area	805	Stream view, badlands
Capitol Rock	244	Geological feature, grassland
Cloverly Formation Site	1,130	Prairie, grassland, geologic, paleontological
Glacial Lake Missoula	635	Geologic features, mountain views, grassland
Hell Creek Fossil Area	34,435	Geologic, paleontological
Medicine Lake Site	21,611	Geologic features, grassland, lake
Middle Fork Canyon	960	Geologic formations, canyon walls, riparian forest
Red Rock Lake National Wildlife Refuge	39,384	Lake, wetlands, mountains
Square Butte	2,261	Geologic feature, prairie grassland

Source: (NPS, 2012b)

National Wilderness Areas

There are 15 congressionally designated wilderness areas and one tribal wilderness area covering about 3.5 million acres throughout the state; most are within the National Parks and National Forests (Figure 11.1.8-4) (Montana Wilderness Association, 2015c):

- Absaroka-Beartooth Wilderness
- Anaconda Pintler Wilderness
- Bob Marshall Wilderness
- Gates of the Mountains Wilderness
- Great Bear Wilderness
- Lee Metcalf Wilderness
- Medicine Lake Wilderness
- Mission Mountains Wilderness
- Mission Mountains Tribal Wilderness
- Rattlesnake Wilderness
- Red Rock Lakes Wilderness
- Scapegoat Wilderness
- Selway-Bitterroot Wilderness
- UL Bend Wilderness
- Welcome Creek Wilderness.

In 1964, Congress enacted the Wilderness Act of 1964 as "an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain." A designation as a National Wilderness Area is the highest level of conservation protection given by Congress to federal lands. This Act defined wilderness as land untouched by man and primarily affected only by the "forces of nature" and as that which "may also contain ecological, geological, or other features of scientific, education, scenic, or historical value" (NPS, 2015z). Over 106 million acres of federal public lands in the U.S. have been designated as wilderness areas. Twenty-five percent of these federal lands are located in 47 national parks (44 million acres) and are part of National Park System. In Montana, Absaroka-Beartooth Wilderness is one such designated area (Figure 11.1.8-6). Federally designated wilderness areas are managed across the country by USFS, BLM, USFWS, and NPS (NPS, 2015z).

Source: (USFS, 2015j)

Figure 11.1.8-6: Absaroka-Beartooth Wilderness

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 National Scenic Byways Program is managed by the U.S. Department of Transportation, Federal Highway Administration (FHWA, 2015d). There is one National Scenic Byway in Montana, the 68.7 mile Beartooth Highway, an access route into Yellowstone National Park (Figure 11.1.8-4). The road winds through the Beartooth Mountain Range and contains magnificent scenic views of mountains, rivers, and alpine meadows in Montana and Wyoming (FHWA, 2015e). However, some national scenic trails, such as the Lewis and Clark National Historic Trail have components of them that are roadways. Four of the National Forest Service Scenic Byways in Montana are on MDT owned and maintained highways (MDT, 2016).

11.1.9. Socioeconomics

11.1.9.1. 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 (BLM, 2005). When applicable, it includes qualitative factors such as community cohesion. Socioeconomics provides important context for analysis of FirstNet projects, and in addition, FirstNet 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 may 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, Overview of Relevant Federal Laws and Executive Orders). This Final PEIS addresses environmental justice in a separate Chapter (Section 11.1.10). This Final PEIS also addresses the following topics, sometimes included within socioeconomics, in separate Chapters: Land Use, Recreation, and Airspace (Section 11.1.7), Infrastructure (Section 11.1.1), and Visual (Section 11.1.8).

Wherever possible, this section draws on nationwide datasets from federal sources such as the U.S. Census Bureau[132] (Census Bureau) and U.S. Bureau of Labor Statistics (BLS). This ensures

[132] For U.S. Census Bureau sources, a URL (see references section) that begins with "http://factfinder.census.gov" indicates that the American Fact Finder (AFF) interactive tool can be used to retrieve the original source data via the following procedure. If the reference's URL begins with "http://dataferrett.census.gov," significant socioeconomic expertise is required to navigate this interactive tool to the specific data. However, the data can usually be found using AFF. As of May 24, 2016, the AFF procedure is as follows: 1) Go to http://factfinder.census.gov. 2) Select "Advanced Search," then "Show Me All." 3) Select from "Topics" choices, select "Dataset," then select the dataset indicated in the reference; e.g. "American Community Survey, 2013 1-Year Estimates" or "2012 Census of Governments." Click "Close." Note: ACS is the abbreviation in the AFF for the American Community Survey. SF is the abbreviation used with the 2000 and 2010 "Summary Files." For references to the "2009-2013 5-Year Summary File," choose "2013 ACS 5-year estimates" in the AFF. 4) Click the "Geographies" box. Under "Select a geographic type," choose the appropriate type; e.g. "United States – 010" or "State – 040" or "..... County – 050" then select the desired area or areas of interest. Click "Add to Your Selections," then "Close." For Population Concentration data, select "Urban Area - 400" as the geographic type, then select 2010 under "Select a version" and then choose the desired area or areas. Alternatively, do not choose a version, and select "All Urban Areas within United States." Regional values cannot be viewed in the AFF because the regions for this Final PEIS do not match Census Bureau regions. All regional values were developed by downloading state data and using the most mathematically appropriate calculations (e.g., sums of state values, weighted averages, etc.) for the specific data. 5) In "Refine your search results," type the table number indicated in the reference; e.g. "DP04" or "LGF001." The dialogue box should auto-populate with the name of the table(s) to allow the user to select the

consistency of data and analyses across the states examined in this Final 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 Final 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.

11.1.9.2. 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 Final PEIS.

11.1.9.3. Communities and Populations

This section discusses the population and major communities of Montana, and includes the following topics:

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

Statewide Population and Population Growth

Table 11.1.9-1 presents the 2014 estimated population estimate and population density of Montana in comparison to the Central region[133] and the nation. The estimated population of Montana in 2014 was 1,023,579 (U.S. Census Bureau, 2014). The population density was 7 persons per square mile (sq. mi.), which was considerably lower than the population density of both the region (66 persons/sq. mi.) and the nation (90 persons/sq. mi.). In 2014, Montana was the 44th largest state by estimated population among the 50 states and the District of Columbia,

table number/name. Click "Go." 6) In the resulting window, click the desired table under "Table, File, or Document Title" to view the results. If multiple geographies were selected, it is often easiest to view the data by clicking the "Download" button above the on-screen data table. Choose the desired comma-delimited format or presentation-ready format (includes a Microsoft Excel option). In some cases, the structure of the resulting file may be easier to work with under one format or another. Note that in most cases, the on-screen or downloaded data contains additional parameters besides those used in the FirstNet PEIS report table. Readers must locate the FirstNet PEIS-specific data within the Census Bureau tables. In many cases, the FirstNet PEIS report tables contain data from multiple Census Bureau tables and sometimes incorporate other sources.

[133] The Central region is comprised of the states of Colorado, Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Montana, Nebraska, North Dakota, Ohio, South Dakota, Utah, Wisconsin, and Wyoming. Throughout the socioeconomics section, figures for the Central region represent the sum of the values for all states in the region, or an average for the region based on summing the component parameters. For instance, the population density of the Central region is the sum of the populations of all its states, divided by the sum of the land areas of all its states.

fourth largest by land area, and had the third lowest population density (U.S. Census Bureau, 2015c) (U.S. Census Bureau, 2015d).

Table 11.1.9-1: Land Area, Estimated Population, and Population Density of Montana

Geography	Land Area (sq. mi.)	Estimated Population 2014	Population Density 2014 (persons/sq. mi.)
Montana	145,546	1,023,579	7
Central Region	1,178,973	77,651,608	66
United States	3,531,905	318,857,056	90

Sources: (U.S. Census Bureau, 2015d) (U.S. Census Bureau, 2015c)

Estimated population growth is an important subject for this Final PEIS given FirstNet's mission. Table 11.1.9-2 presents the population growth trends of Montana from 2000 to 2014 in comparison to the Central region and the nation. The state's annual growth rate slowed slightly in the 2010 to 2014 period compared to 2000 to 2010, declining from 0.93 percent to 0.85 percent. The growth rate of Montana in the latter period was twice the rate of the region (0.45 percent) and slightly higher than the growth rate of the nation, at 0.81 percent.

Table 11.1.9-2: Recent Population Growth of Montana

Geography	Estimated Population			Numerical Estimated Population Change		Rate of Estimated Population Change (AARC)a	
	2000	2010	2014	2000 to 2010	2010 to 2014	2000 to 2010	2010 to 2014
Montana	902,195	989,415	1,023,579	87,220	34,164	0.93%	0.85%
Central Region	72,323,183	76,273,123	77,651,608	3,949,940	1,378,485	0.53%	0.45%
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, 2015e) (U.S. Census Bureau, 2015d)

AARC = Average Annual Rate of Change (compound growth rate)

Demographers prepare future estimated population projections using various population growth modeling methodologies. For this nationwide PEIS, it is important to use estimated 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 11.1.9-3 presents projections of the 2030 population from two sources that are national in scope and use different methodologies: the University of Virginia's Weldon Cooper Center for Public Service and ProximityOne, a private sector demographic and economic data and analysis service (ProximityOne, 2015) (University of Virginia Weldon Cooper Center, 2015). The table provides figures for numerical change, percentage change, and annual growth rate based on averaging the projections from the two sources. The average projection indicates Montana's estimated population will increase by approximately 101,689 people, or 9.9 percent, from 2014 to 2030. This reflects an average annual projected growth rate of 0.59 percent, which is slightly lower than the historical growth rate from 2010 to 2014 of 0.85 percent. The projected growth rate of the state is similar to that of the region (0.60 percent) and less than the projected growth rate of the nation (0.80 percent).

Table 11.1.9-3: Projected Estimated Population Growth of Montana

Geography	Estimated Population 2014	Projected 2030 Estimated 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
Montana	1,023,579	1,116,625	1,133,910	1,125,268	101,689	9.9%	0.59%
Central Region	77,651,608	83,545,838	87,372,952	85,459,395	7,807,787	10.1%	0.60%
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, 2015d) (ProximityOne, 2015) (University of Virginia Weldon Cooper Center, 2015)

AARC = Average Annual Rate of Change (compound growth rate)

Population Distribution and Communities

Figure 11.1.9-1 presents the distribution and relative density of the estimated population of Montana. 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, 2015f).

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, 2012b) (U.S. Census Bureau, 2015g). 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. The eastern half of the state is the least populated region, excepting the few identified population concentrations (Havre, Billings, and Miles City). Some areas in the Rocky Mountains on the western side of Montana are also very sparsely populated.

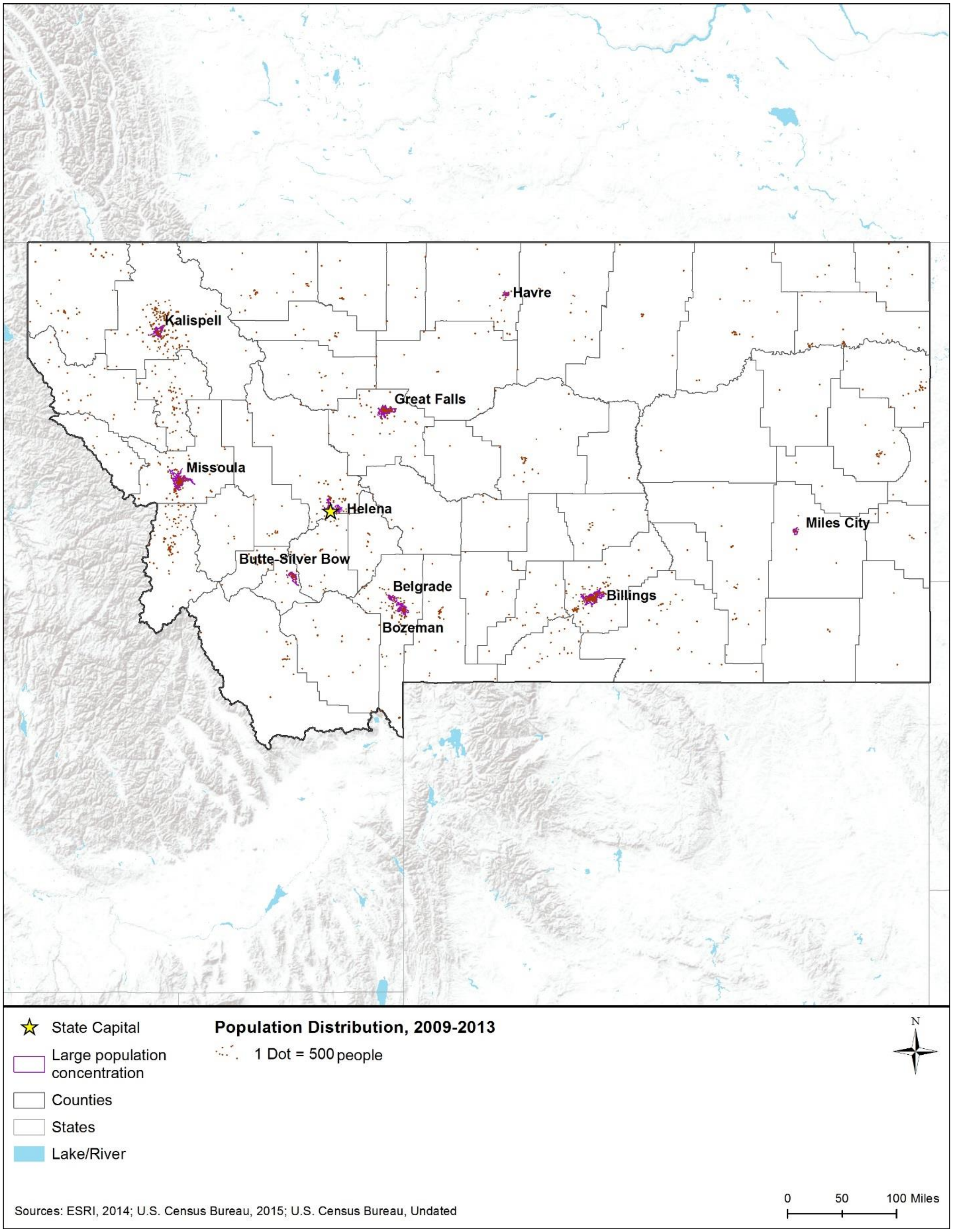


Figure 11.1.9-1: Estimated Population Distribution in Montana, 2009–2013

Table 11.1.9-4 provides the populations of the 10 largest population concentrations in Montana, based on the 2010 census. It also shows the changes in population for these areas between the 2000 and 2010 censuses.[134] In 2010, the largest population concentration was the Billings area, which had 114,773 people. The state had no other population concentrations over 100,000. The smallest of these 10 population concentrations was the Miles City area, with a 2010 population of 9,604. The fastest growing area, by average annual rate of change from 2000 to 2010, was the Belgrade area, with an annual growth rate of 7.19 percent. However, this large population increase reflects a change in the area definition, from 7.2 sq. mi. in 2000 to 10 sq. mi. in 2010. The Bozeman area experienced the second fastest growth during this period (3.17 percent). Three of the population concentrations (Butte-Silver Bow area, Havre area, and Miles City area) experienced population declines during this period.

Table 11.1.9-4 also shows that the top 10 population concentrations in Montana accounted for 45.0 percent of the state's population in 2010. Further, population growth in the 10 areas from 2000 to 2010 amounted to 66.8 percent of the entire state's growth.

Table 11.1.9-4: Population of the 10 Largest Population Concentrations in Montana

Area	Population				Population Change 2000 to 2010	
	2000	2010	2009–2013	Rank in 2010	Numerical Change	Rate (AARC)
Belgrade*	6,893	13,797	14,111	8	6,904	7.19%
Billings	100,317	114,773	116,908	1	14,456	1.36%
Bozeman	31,591	43,164	43,887	5	11,573	3.17%
Butte-Silver Bow	30,615	30,287	30,748	7	(328)	-0.11%
Great Falls	64,387	65,207	65,652	3	820	0.13%
Havre	10,413	9,657	9,630	9	(756)	-0.75%
Helena	38,451	45,055	45,543	4	6,604	1.60%
Kalispell	25,336	31,785	31,868	6	6,449	2.29%
Miles City	9,720	9,604	9,677	10	(116)	-0.12%
Missoula	69,491	82,157	84,266	2	12,666	1.69%
Total for Top 10 Population Concentrations	**387,214**	**445,486**	**452,290**	**NA**	**58,272**	**1.41%**
Montana (statewide)	**902,195**	**989,415**	**998,554**	**NA**	**87,220**	**0.93%**
Top 10 Total as Percentage of State	**42.9%**	**45.0%**	**45.3%**	**NA**	**66.8%**	**NA**

Sources: (U.S. Census Bureau, 2012b) (U.S. Census Bureau, 2015h) (U.S. Census Bureau, 2015i)

AARC = Average Annual Rate of Change (compound growth rate)
*The large population increase from 2000 to 2010 reflects a relatively modest change in the area definition for the Belgrade urban cluster, from 7.2 sq. mi. in 2000 to 10 sq. mi. in 2010.

[134] 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.

11.1.9.4. 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 Final PEIS addresses public services in Section 11.1.1, Infrastructure. Project-level NEPA analyses may need to examine other institutions, depending on specific locations and specific types of actions.

Economic Activity

Table 11.1.9-5 compares several economic indicators for Montana to the Central region and the nation. The table presents two indicators of income[135] – 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 11.1.9-5, the per capita income in Montana in 2013 ($26,054) was $1,474 lower than that of the region ($27,528), and $2,130 lower 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 11.1.9-5 shows that in 2013, the MHI in Montana ($46,893) was $5,152 lower than that of the region ($52,045), and $5,357 lower than that of the nation ($52,250).

Employment status is a key socioeconomic parameter because employment is essential to the income of a large portion of the adult population. The federal government calculates the unemployment rate as the number of unemployed individuals who are looking for work divided by the total number of individuals in the labor force. Table 11.1.9-5 compares the

[135] 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, 2015j).

unemployment rate in Montana to the Central region and the nation. In 2014, Montana's statewide unemployment rate of 4.7 percent was lower than the rate for the region (5.7 percent) and the rate for the nation (6.2 percent).[136]

Table 11.1.9-5: Selected Economic Indicators for Montana

Geography	Per Capita Income 2013	Median Household Income 2013	Average Annual Unemployment Rate 2014
Montana	$26,054	$46,893	4.7%
Central Region	$27,528	$52,045	5.7%
United States	$28,184	$52,250	6.2%

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

Figure 11.1.9-2 and Figure 11.1.9-3 show how MHI in 2013 (U.S. Census Bureau, 2015k) and unemployment in 2014 (BLS, 2015b) varied by county across the state. These maps also incorporate the same population concentration data as Figure 11.1.9-1 (U.S. Census Bureau, 2012b) (U.S. Census Bureau, 2015g). Following these two maps, Table 11.1.9-6 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 Montana.

Figure 11.1.9-2 shows that the majority of counties in Montana have a MHI below the national median, with a few exceptions (three counties located in the southeastern portions of the state and two in the eastern region of the state). Table 11.1.9-6 shows that MHI in the 10 largest population concentrations in Montana ranged from $37,396 in the Butte-Silver Bow area to $52,629 in the Helena area, which is consistent with the state average of $46,230.

Figure 11.1.9-3 presents variations in the 2014 unemployment rate across the state, by county. It shows that the majority of counties had unemployment rates below the national average (that is, better employment performance). Only a few counties in the northwestern portion of the state, and one county near the Billings area had unemployment rates above the national average. Table 11.1.9-6 is consistent with this observation. When comparing unemployment in the population concentrations to the state average, most areas had a 2009–2013 unemployment rate that was similar or lower than the state average (7.3 percent). Only two areas, Kalispell and Missoula, had unemployment rates considerably higher (more than 2 percentage points) than the state average.

Detailed employment data provide useful insights into the nature of a local, state, or national economy. Table 11.1.9-7 provides figures on employment percentages by type of worker and by industry based on surveys conducted in 2013 by the Census Bureau. By class of worker (type of worker: private industry, government, self-employed, etc.), the percentage of private wage and salary workers was considerably lower in Montana than in the Central region and the nation.

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

The percentage of government workers was higher in the state than in the region and nation. Self-employed workers were a somewhat higher percentage in the state than in the region or nation.

By industry, Montana has a mixed economic base and some notable figures in the table are as follows. Montana in 2013 had a considerably higher percentage of persons working in "agriculture, forestry, fishing and hunting, and mining" than did the region or the nation. It had a considerably lower percentage of persons working in "manufacturing" than the region or nation. It also had somewhat higher percentages in "construction" and "public administration," than the region, and a somewhat lower percentage in "professional, scientific, management, administrative, and waste management services" than the nation. Employment shares for all other industries in Montana were generally within two percentage points of the regional and national figures.

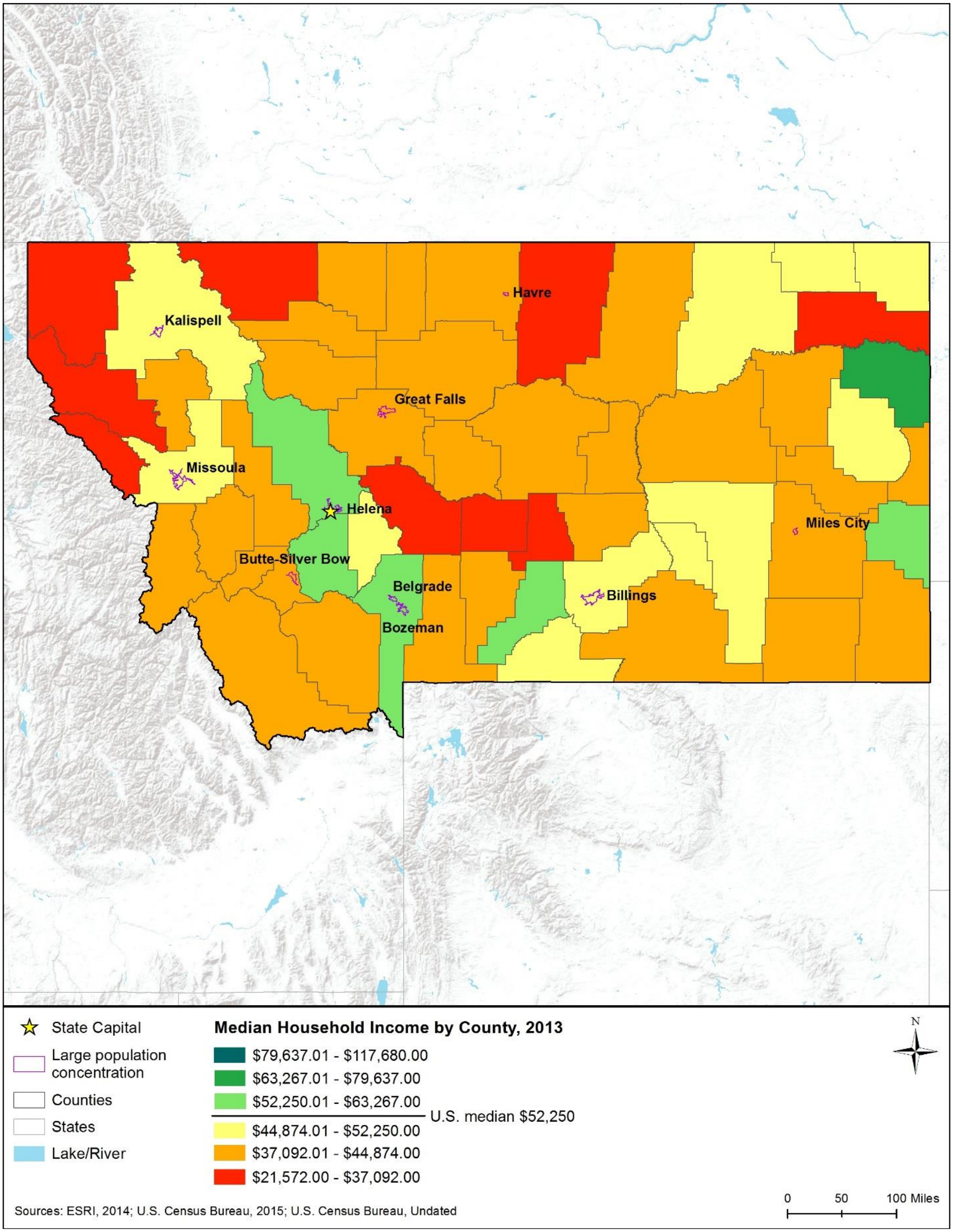


Figure 11.1.9-2: Median Household Income in Montana, by County, 2013

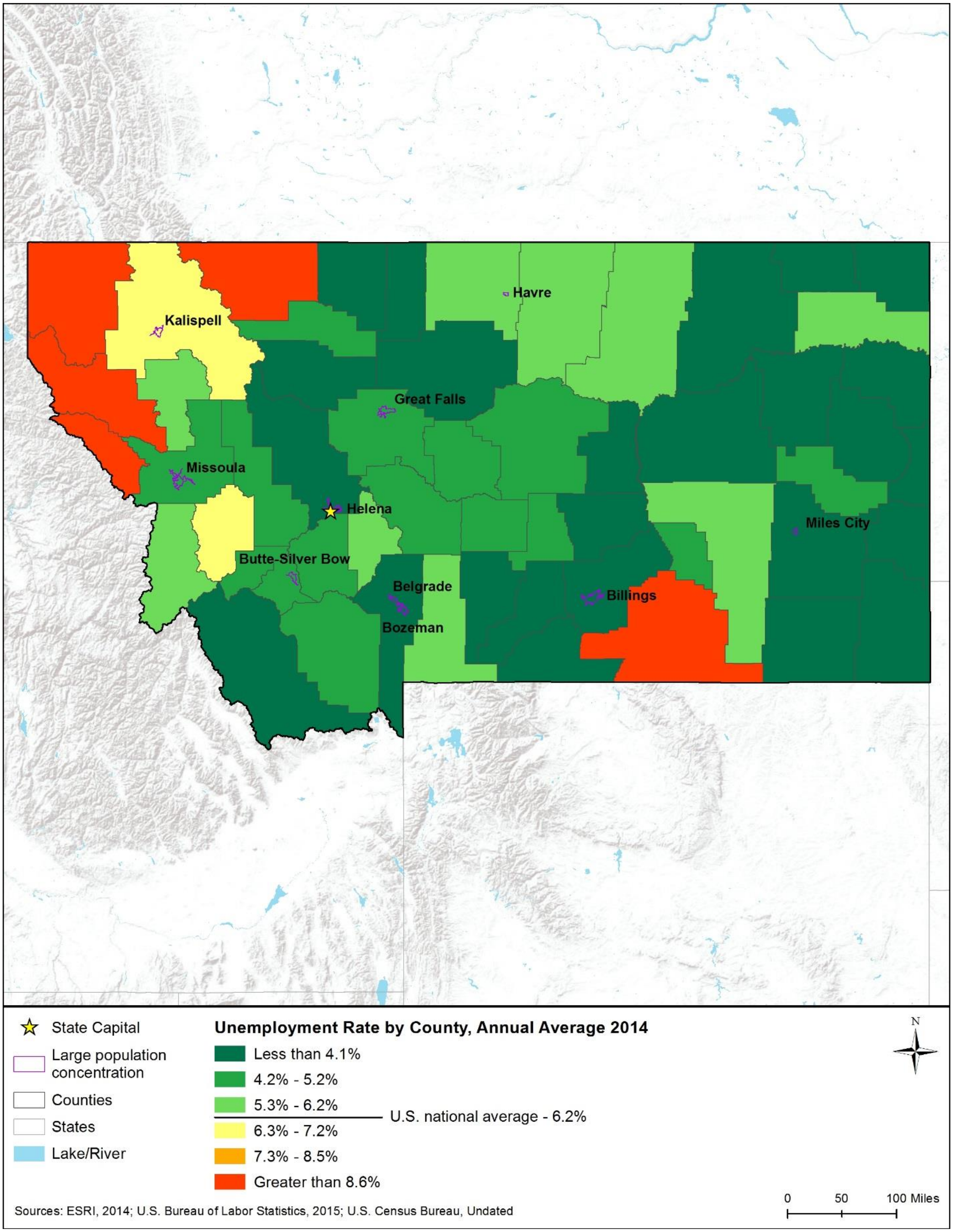


Figure 11.1.9-3: Unemployment Rates in Montana, by County, 2014

Table 11.1.9-6: Selected Economic Indicators for the 10 Largest Population Concentrations in Montana, 2009–2013

Area	Median Household Income	Average Annual Unemployment Rate
Belgrade	$48,588	4.8%
Billings	$48,610	5.5%
Bozeman	$46,995	7.6%
Butte-Silver Bow	$37,396	7.3%
Great Falls	$43,424	6.2%
Havre	$42,510	4.2%
Helena	$52,629	5.9%
Kalispell	$41,207	9.7%
Miles City	$42,546	4.7%
Missoula	$42,260	10.0%
Montana (statewide)	$46,230	7.3%

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

Table 11.1.9-7: Employment by Class of Worker and by Industry, 2013

Class of Worker and Industry	Montana	Central Region	United States
Civilian Employed Population 16 Years and Over	482,603	36,789,905	145,128,676
Percentage by Class of Worker			
Private wage and salary workers	72.6%	81.7%	79.7%
Government workers	18.6%	12.8%	14.1%
Self-employed in own not incorporated business workers	8.4%	5.3%	6.0%
Unpaid family workers	0.4%	0.2%	0.2%
Percentage by Industry			
Agriculture, forestry, fishing and hunting, and mining	7.5%	2.2%	2.0%
Construction	7.7%	5.6%	6.2%
Manufacturing	4.6%	14.0%	10.5%
Wholesale trade	2.3%	2.7%	2.7%
Retail trade	12.2%	11.5%	11.6%
Transportation and warehousing, and utilities	5.1%	4.9%	4.9%
Information	1.7%	1.9%	2.1%
Finance and insurance, and real estate and rental and leasing	5.9%	6.5%	6.6%
Professional, scientific, management, administrative, and waste management services	8.3%	9.7%	11.1%
Educational services, and health care and social assistance	22.9%	23.4%	23.0%
Arts, entertainment, and recreation, and accommodation and food services	11.0%	9.1%	9.7%
Other services, except public administration	4.5%	4.6%	5.0%
Public administration	6.4%	3.9%	4.7%

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

Table 11.1.9-8 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 11.1.9-7 for 2013.

Table 11.1.9-8: Employment by Selected Industries for the 10 Largest Population Concentrations in Montana, 2009–2013

Area	Construction	Transportation and Warehousing, and Utilities	Information	Professional, Scientific, Management, Administrative and Waste Management Services
Belgrade	9.6%	4.0%	2.3%	12.1%
Billings	7.7%	5.1%	1.8%	9.3%
Bozeman	6.4%	2.2%	1.4%	12.9%
Butte-Silver Bow	5.1%	7.0%	1.6%	8.6%
Great Falls	7.9%	4.8%	1.9%	8.3%
Havre	6.8%	10.3%	2.5%	3.7%
Helena	5.2%	2.8%	1.4%	10.4%
Kalispell	6.6%	3.4%	1.4%	8.8%
Miles City	8.8%	4.1%	2.3%	4.1%
Missoula	5.6%	3.1%	4.3%	10.2%
Montana (statewide)	7.9%	4.9%	1.8%	8.3%

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

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 11.1.9-9 compares Montana to the Central region and nation on several common housing indicators.

As shown in Table 11.1.9-9, in 2013 Montana had a lower percentage of housing units that were occupied (83.6 percent) than the region (88.4 percent) or nation (87.6 percent). Of the occupied units, Montana had a somewhat lower percentage of owner-occupied units (66.9 percent) than the region (67.6 percent) and a slightly higher percentage than the nation (63.5 percent). The percentage of detached single-unit housing (also known as single-family homes) in Montana in 2013 was 69.1 percent, higher than both the region (67.7 percent) and nation (61.5 percent). The homeowner vacancy rate in Montana (2.5 percent) was slightly higher than both the rate for the region (1.8 percent) and the nation (1.9 percent). This rate reflects, "vacant units that are 'for sale only'" (U.S. Census Bureau, 2015h). The vacancy rate among rental units was lower in Montana (5.5 percent) than in the region (6.0 percent) and nation (6.5 percent).

Table 11.1.9-9: Selected Housing Indicators for Montana, 2013

Geography	Total Housing Units	Housing Occupancy & Tenure				Units in Structure
		Occupied Housing	Owner-Occupied	Homeowner Vacancy Rate	Rental Vacancy Rate	1-Unit, Detached
Montana	485,767	83.6%	66.9%	2.5%	5.5%	69.1%
Central Region	33,580,411	88.4%	67.6%	1.8%	6.0%	67.7%
United States	132,808,137	87.6%	63.5%	1.9%	6.5%	61.5%

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

Table 11.1.9-10 provides housing indicators 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 present variation in these indicators for population concentrations across the state and compared to the state average for the 2009 to 2013 period. Table 11.1.9-10 shows that during this period, the percentage of occupied housing units exceeded the state average of 83.9 percent in all areas, ranging between 87.8 in the Havre area to 95.4 percent in the Billings area.

Table 11.1.9-10: Selected Housing Indicators for the 10 Largest Population Concentrations in Montana, 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
Belgrade	5,721	92.7%	65.4%	3.0%	3.4%	61.4%
Billings	50,625	95.4%	64.8%	0.5%	3.8%	61.7%
Bozeman	19,702	91.0%	51.1%	3.0%	4.2%	44.0%
Butte-Silver Bow	15,125	89.8%	63.0%	2.5%	5.8%	70.2%
Great Falls	29,475	92.1%	60.9%	1.5%	7.4%	61.2%
Havre	4,537	87.8%	66.2%	2.1%	5.6%	63.0%
Helena	20,660	93.6%	66.2%	1.6%	6.3%	59.6%
Kalispell	14,380	90.2%	64.5%	1.7%	8.0%	62.8%
Miles City	4,589	89.8%	68.5%	3.7%	4.6%	71.6%
Missoula	37,829	93.8%	51.4%	1.1%	4.6%	53.6%
Montana (statewide)	**483,303**	**83.9%**	**68.3%**	**2.1%**	**6.4%**	**69.1%**

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

Property Values

Property values have important relationships to both the wealth and affordability of communities. Table 11.1.9-11 provides indicators of residential property values for Montana and compares these values to values for the Central region and nation.

Table 11.1.9-11: Residential Property Values in Montana, 2013

Geography	Median Value of Owner-Occupied Units
Montana	$190,100
Central Region	$151,200
United States	$173,900

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

Table 11.1.9-12 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. The median property value in the top 10 population concentrations ranged from $102,000 (Miles City area) to $257,100 (Bozeman area), which is consistent with the state value of $184,200.

Table 11.1.9-12: Residential Property Values for the 10 Largest Population Concentrations in Montana, 2009–2013

Area	Median Value of Owner-Occupied Units
Belgrade	$195,900
Billings	$178,400
Bozeman	$257,100
Butte-Silver Bow	$111,600
Great Falls	$156,100
Havre	$130,300
Helena	$190,200
Kalispell	$185,400
Miles City	$102,000
Missoula	$229,100
Montana (statewide)	$184,200

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

Government Revenues

State and local governments obtain revenues from many sources. FirstNet projects may affect flows of revenue sources between different levels of government due to program financing and intergovernmental agreements for system development and operation. Public utility taxes[137] are a subcategory of selective sales taxes that includes taxes on providers of land and mobile telephone, telegraph, cable, and internet services (U.S. Census Bureau, 2006). These service providers may obtain new taxable revenues from operation of components of the public safety broadband network. These revenue streams are typically highly localized and therefore are best considered in the deployment phase of FirstNet.

Table 11.1.9-13 presents total and selected state and local government revenue sources as reported by the Census Bureau's 2012 Census of Governments. It provides both total dollar figures (in millions of dollars) and figures per capita (in dollars), based on total population for each geography. The per capita figures are particularly useful in comparing the importance of certain revenue sources in the state relative to other states in the region and the nation. State and local governments may obtain some additional revenues related to telecommunications infrastructure. General and selective sales taxes may change, reflecting expenditures during system development and maintenance.

Table 11.1.9-13 shows that the state government in Montana received more total revenue in 2012 on a per capita basis than counterpart governments in the region and nation. Local governments in Montana received more than their counterparts in the region and less than their counterparts in the nation. Additionally, Montana state and local governments had higher levels of intergovernmental revenues[138] from the federal government. The state government in Montana obtained higher levels of property taxes per capita than its counterparts in the region and nation. Local governments in Montana obtained higher levels of property taxes per capita than local governments in the region and slightly lower levels than their counterparts in the nation. Montana did not report any revenue from general sales taxes. The Montana state government reported higher revenue from selective sales taxes and public utility taxes specifically, on a per capita basis than its counterparts in the region and nation. Local governments in Montana reported minimal selective sales tax and no public utility tax revenues. The Montana state government reported levels of individual and corporate income tax revenues, on a per capita basis, which were similar to the levels reported for its counterparts in the region and nation. Local governments in Montana did not report any individual or corporate income tax revenues.

[137] 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, 2006)
[138] Intergovernmental revenues are those revenues received from the federal government or other government entities such as shared taxes, grants, or loans and advances. (U.S. Census Bureau, 2006)

Table 11.1.9-13: State and Local Government Revenues, Selected Sources, 2012

Type of Revenue		Montana		Region		United States	
		State Govt. Amount	Local Govt. Amount	State Govt. Amount	Local Govt. Amount	State Govt. Amount	Local Govt. Amount
Total Revenue	($M)	$7,653	$3,611	$463,192	$231,980	$1,907,027	$1,615,194
	Per capita	$7,614	$3,593	$6,020	$3,015	$6,075	$5,145
Intergovernmental from Federal	($M)	$2,202	$268	$125,394	$9,383	$514,139	$70,360
	Per capita	$2,191	$266	$1,630	$122	$1,638	$224
Intergovernmental from State	($M)	$0	$1,239	$0	$76,288	$0	$469,147
	Per capita	$0	$1,233	$0	$992	$0	$1,495
Intergovernmental from Local	($M)	$4	$0	$2,721	$0	$19,518	$0
	Per capita	$4	$0	$35	$0	$62	$0
Property Taxes	($M)	$257	$1,122	$3,626	$61,015	$13,111	$432,989
	Per capita	$256	$1,116	$47	$793	$42	$1,379
General Sales Taxes	($M)	$0	$0	$58,236	$6,920	$245,446	$69,350
	Per capita	$0	$0	$757	$90	$782	$221
Selective Sales Taxes	($M)	$545	$8	$33,313	$2,191	$133,098	$28,553
	Per capita	$542	$8	$433	$28	$424	$91
Public Utilities Taxes	($M)	$50	$0	$3,627	$1,153	$14,564	$14,105
	Per capita	$49	$0	$47	$15	$46	$45
Individual Income Taxes	($M)	$900	$0	$72,545	$5,148	$280,693	$26,642
	Per capita	$896	$0	$943	$67	$894	$85
Corporate Income Taxes	($M)	$132	$0	$9,649	$310	$41,821	$7,210
	Per capita	$132	$0	$125	$4	$133	$23

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

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

11.1.10. Environmental Justice

11.1.10.1. Definition of the Resource

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, issued in 1994, sets out principles of environmental justice and requirements that federal agencies should follow to comply with the EO (*see* Section 1.8.12, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations). The fundamental principle of environmental justice is, "fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies" (USEPA, 2016c). Under the EO, each federal agency must "make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations" (Executive Office of the President, 1994). In response to the EO, the Department of Commerce 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 (CEQ, 1997). Additionally, the USEPA Office of Environmental Justice (USEPA, 2015i) offers guidance on Environmental Justice issues and provides an "environmental justice screening and mapping tool," EJSCREEN (USEPA, 2015j).

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

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

11.1.10.2. Specific Regulatory Considerations

Montana does not have a formal policy to address environmental justice. However, the MDT developed an Environmental Manual in 2010 incorporating federal laws, regulations, and definitions by reference. This Manual, specifically Chapter 24 (Environmental Justice), provides general guidance, definitions, and information to address environmental justice principles in accordance with Title VI provisions of the 1964 Civil Rights Act; Executive Order 12898; 23 United States Code (USC) 139, "*Efficient Environmental Reviews for Project Decision-Making*;" U.S. Department of Transportation (DOT) Order 5610.2, "*Department of Transportation Actions to Address Environmental Justice in Minority Populations and Low-Income Populations,*" and other associated implementing directives. The MDT Environmental Manual also includes guidance and procedures to help identify minority and low-income communities that may potentially be affected by state-sponsored projects. (MDT, 2010b)

11.1.10.3. Environmental Setting: Minority and Low-Income Populations

Table 11.1.10-1 presents 2013 data on the composition of Montana's estimated population by race and by Hispanic origin. The state's estimated population has considerably lower percentages of individuals who identify as Black / African American (0.3 percent), Asian (0.6 percent), or Some Other Race (0.5 percent) than the estimated populations of the Central region and the nation. Those percentages are, for Black / African American, 9.3 percent for the Central region and 12.6 percent for the nation; for Asian, 2.8 percent and 5.1 percent respectively; and for Some Other Race, 2.4 percent and 4.7 percent respectively. The state's estimated population of persons identifying as White (89.1 percent) is larger than that of the Central region (82.2 percent) or the nation (73.7 percent).

The percentage of the estimated population in Montana that identifies as Hispanic (3.3 percent) is considerably smaller than in the Central region (8.5 percent) and in 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. Montana's All Minorities estimated population percentage (13.0 percent) is considerably lower than both the region and the nation, nearly half when compared to the population in the Central region (23.3 percent) and about a third when compared to the nation's value (37.6 percent).

Table 11.1.10-2 presents the percentage of the estimated population living in poverty in 2013, for the state, region, and nation. The figure for Montana (16.5 percent) is higher than that for the Central region (14.7 percent) and slightly higher than the figure for the nation (15.8 percent).

Table 11.1.10-1: Estimated Population by Race and Hispanic Status, 2013

Geography	Total Estimated Population	Race							Hispanic	All Minorities
		White	Black/ African Am	Am. Indian/ Alaska Native	Asian	Native Hawaiian /Pacific Islander	Some Other Race	Two or More Races		
Montana	1,015,165	89.1%	0.3%	6.8%	0.6%	0.0%	0.5%	2.6%	3.3%	13.0%
Central Region	77,314,952	82.2%	9.3%	0.7%	2.8%	0.1%	2.4%	2.5%	8.5%	23.3%
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, 2015t)

"All Minorities" is defined as all persons who consider themselves Hispanic or 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 Hispanic and non-White races.

Table 11.1.10-2: Percentage of Estimated Population (Individuals) in Poverty, 2013

Geography	Percent Below Poverty Level
Montana	16.5%
Central Region	14.7%
United States	15.8%

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

11.1.10.4. Environmental Justice Screening Results

Analysis of environmental justice in a NEPA document typically begins by identifying potential environmental justice populations in the project area. Appendix D, Environmental Justice Methodology, presents the methodology used in this Final 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 11.1.10-1 visually portrays the results of the environmental justice population screening analysis for Montana. The analysis used block group data from the Census Bureau's American Community Survey 2009-2013 5-Year Estimates (U.S. Census Bureau, 2015f) (U.S. Census Bureau, 2015v) (U.S. Census Bureau, 2015w) (U.S. Census Bureau, 2015x) and Census Bureau urban classification data (U.S. Census Bureau, 2012b) (U.S. Census Bureau, 2015g).

Figure 11.1.10-1 shows that Montana has many areas with high potential for environmental justice populations. The distribution of these high potential areas is fairly even across the state, and occurs both within and outside of the 10 largest population concentrations. This includes some of the state's most sparsely populated areas, such as the northeastern region north of Miles City, the central region east and south of Havre, and the area north and east of Kalispell. The distribution of areas with moderate potential for environmental justice populations is also fairly even across the state.

It is important to understand how the data behind Figure 11.1.10-1 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 may 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 11.1.10-1 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 Final 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 significance criteria), and "appreciably exceeds or is likely to appreciably exceed the risk or rate to the general population or other appropriate comparison group" (CEQ, 1997). The Environmental Consequences (Section 11.2) addresses the potential for disproportionately high and adverse environmental or human health impacts on environmental justice populations.

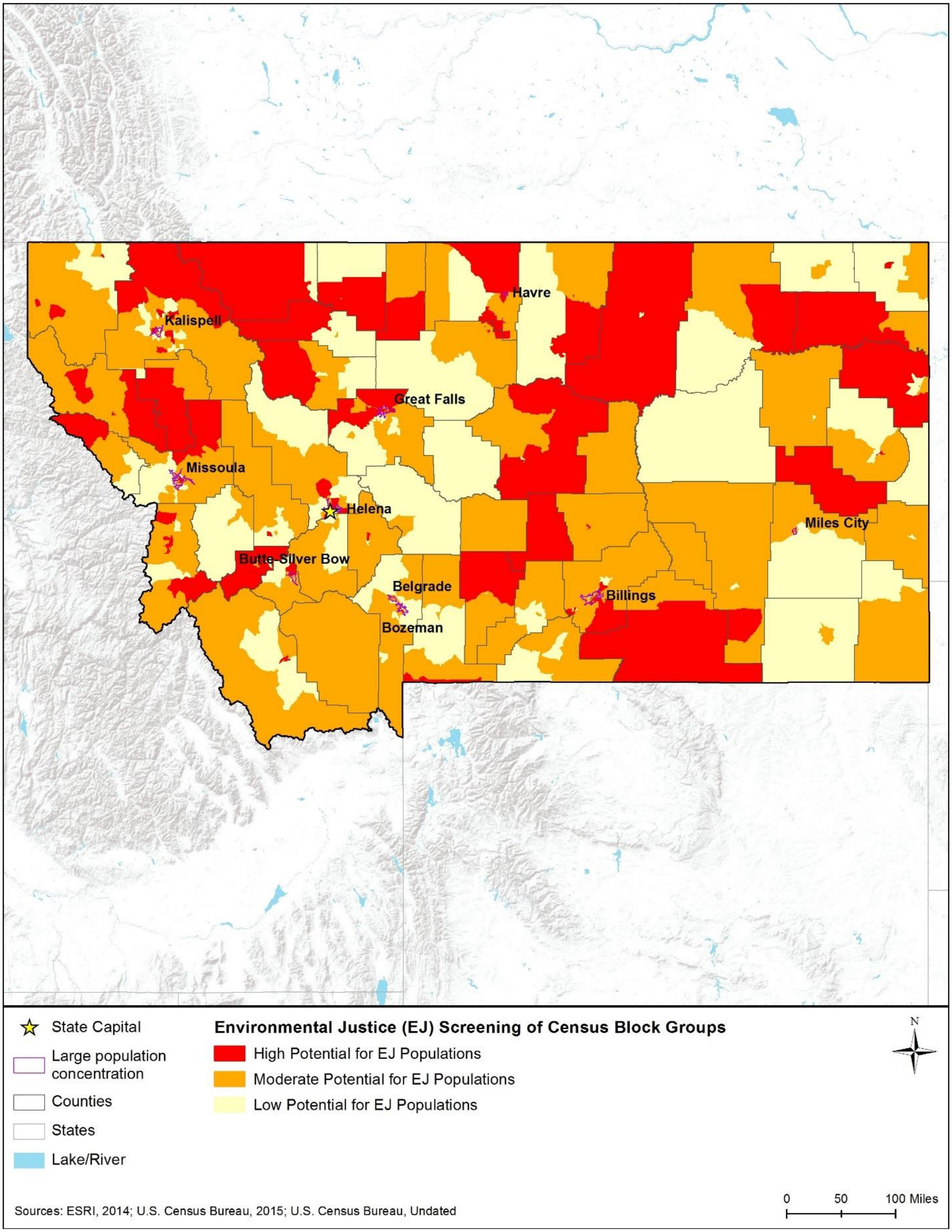


Figure 11.1.10-1: Potential for Environmental Justice Populations in Montana, 2009 - 2013

11.1.11. Cultural Resources

11.1.11.1. Definition of Resource

For the purposes of this Final 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 NHPA, formerly 16 U.S.C. 470a(d)(6)(A) (now 54 U.S.C. 306131(b)) and 36 CFR 800.16(l)(1);
- Statutory language and Implementing regulations for the Archaeological Resources Protection Act of 1979 (ARPA), 16 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 U.S.C. 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 archeological resources (NPS, 2015aa); 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).

11.1.11.2. 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 Cultural Resources include the NHPA (detailed in Section 1.8, Overview of Relevant Federal Laws and Executive Orders), the American Indian Religious Freedom Act, ARPA, and NAGPRA. Appendix C, Environmental Laws and Regulations, summarizes these pertinent federal laws.

Montana has a state regulation that parallels the NHPA (refer to Table 11.1.11-1). However, federal regulations supersede this regulation. 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 11.1.11-1: Relevant Montana Cultural Resources Laws and Regulations

State Law / Regulation	Regulatory Agency	Applicability
Montana State Antiquities Act (MCA 22-3-421 to 22-3-442)	Montana State Historic Preservation Office (SHPO)	This Act mirrors the NHPA for state actions, requiring agencies to consult with SHPO regarding potential impacts to "heritage" (historic) properties.
Montana State Burial Site Statute (Montana Code Ann. 22-3-801-811)	SHPO and local law enforcement	This law prohibits the physical abuse or mistreatment of human remains, burials, grave markers, and associated objects. If a burial is uncovered during development or construction, work must stop immediately in the area and local law enforcement should be notified. Following determination that the site does not constitute a crime scene and the remains are a prehistoric or historic human burial, the SHPO may assist the project proponent, developer, and/or landowner in contacting appropriate parties, considering options to avoid the burial(s), and advising on the legal process for potentially moving the remains.

Source: (Montana Legislature, 2017a) (Montana Legislature, 2017b)

11.1.11.3. Cultural Setting

Human beings have inhabited the state of Montana for some 15,000 years (Haynes, Johnson, & Stafford, 1999; Pauketat, 2012; Davis, 2010). The majority of Montana'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 34 archaeological site listed on the NRHP: 15 are historic; 12 are prehistoric; and, 7 have both historical and prehistoric provenance (NPS, 2015ab).

Archaeologists typically divide large study areas into regions. As shown in Figure 11.1.3-1, Montana occupies two physiographic regions: Interior Plains and Rocky Mountain System. The Rocky Mountain region is further divided into two provinces. The Middle Rocky Mountains province is in the south central part of the state. The Central Rocky Mountains province spans the full length of the western part of the state between Canada to the north, Idaho to the west and southwest, and to the northwest corner of Wyoming. The Great Plains is the largest physiographic province of Montana covering the entire boundary of the Interior Plains region.

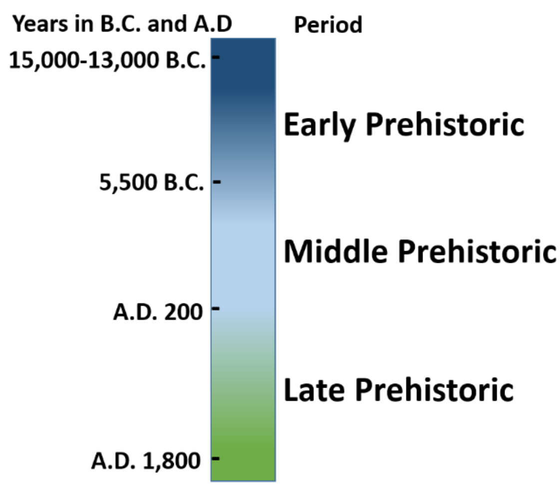
Evidence at most archeological sites in Montana are in relatively shallow deposits that are located either on the surface or within one to two feet of the surface. However, in some cases, natural factors have buried sites beneath multiple layers of sediment or organic materials, such as in floodplain deposits found along streams and rivers or peat deposits in wetlands. These deposits can range between 1 and 10 feet below the current surface, with older sites in the deeper sediments. Disturbed ground, including urban areas, may contain archaeological resources in deeper or shallower strata than undisturbed areas (Harris, 1979).

The following sections provide additional detail about Montana's prehistoric periods (approximately 13,000 B.C. – A.D. 1800) and the historic period since European exploration in the 1700s. Section 11.1.11.4 presents an overview of the initial human habitation in Montana and the cultural development that occurred before European contact. Section 11.1.11.5 discusses the federally recognized American Indian tribes with a cultural affiliation to the state. Section 11.1.11.6 provides a current list of significant archaeological sites in Montana and tools that the state has developed to ensure their preservation. Section 11.1.11.7 documents the historic context of the state since European contact, and Section 11.1.11.8 summarizes the architectural context of the state during the historic period.

11.1.11.4. Prehistoric Setting

Archaeologists divide Montana's prehistoric past into three periods: The Early Prehistoric Period (13,000 B.C. – 5,500 B.C.), Middle Prehistoric Period (5,500 B.C. – A.D. 200), and Late Prehistoric Period (A.D. 200 – 1800) (Davis, 2010). Figure 11.1.11-1 shows a timeline representing these periods of early human habitation of present day Montana.

Montana is part of the Great Plains archaeological culture of North America (Davis, 2010). It is important to note that there is potential for undiscovered archaeological remains representing every prehistoric period throughout the state. Evidence of human occupation is prevalent in each of Montana's physiographic regions. Due to advancements in techniques and associating artifacts discovered with similar ones previously assigned to a particular range of the archaeological record, the periods associated with a particular time in North American human development continue to become increasingly accurate (Pauketat, 2012; Haynes, Donahue, Jull, & Zabel, 1984; Haynes, Johnson, & Stafford, 1999).



Source: (Institute of Maritime History, 2015)

Figure 11.1.11-1: Timeline of Prehistoric Human Occupation in Montana

Early Prehistoric (13,000 – 5,500 B.C.)

The Prehistoric Period represents the earliest human habitation Montana. The earliest people to occupy the state were small groups of nomadic hunters and gatherers that used chipped-stone tools, including the "fluted javelin head" arrow and spear points, also referred to as the Clovis fluted point. Studies show that that such technology was prevalent in northeastern Asia, the

Arabian Peninsula, and Spain prior to human arrival into North America (Charpentier & Inizan, 2002).

Most of the oldest known evidence of human settlement in Montana comes from the discovery of fluted points found in surface and shallow deposits throughout the state. Archaeologists hypothesize that the people of this period ranged across the state in small bands that followed migratory game animals. Giant bison was the predominant large species that was hunted, as opposed to mammoth as in other parts of North America. Early Prehistoric settlers used the Clovis fluted point technology to hunt this large game (Heidenreich, 1985). These bands established seasonal camps, some of which likely became permanent settlements. It is assumed that they were related to people who migrated to North America via a land bridge at the Bring Strait during the latter part of the last ice age (Late Pleistocene epoch). (Davis, 2010)

Around 10,000 – 7,000 years ago (8,000 – 5,000 B.C.), there was gradual warming trend in this region, and the Folsom people replaced the Clovis people. The Folsom people had more advanced methods for hunting bison, which lead to overhunting in the region. As hypothesized, the sophisticated hunting methods along with the climatological changes that were occurring at the time may have led to the distinction of the gradual extinction of the giant bison, mammoth and other large animals. (Heidenreich, 1985)

Cave sites in the Yellowstone region of Montana represent a people known as the Plano culture. Sites such as the Pictograph Cave near Billings, MT, the Myers-Hindman site near Livingston, MT, several Bighorn Canyon sites, and the rock-shelters in the Pryor Mountains show indications of a more advanced culture was developing by the end of the early prehistoric period. Artwork at these cave sites, known as pictographs, and leaf-shaped projectile points indicates that the Plano culture was more advanced than Clovis culture. (Heidenreich, 1985)

Middle Prehistoric (5,500 B.C. – A.D. 200)

During the beginning of Montana's Middle Prehistoric period, the climate changed to a desert-like condition. The climate change forced Middle Prehistoric people to diversify their subsistence activities. With 'big game" species in decline, subsistence shifted to foraging for plants and hunting small game. Antelope, deer, and bison were hunted when available, but archaeologists hypothesized that the scarcer resources necessitated development of new, more efficient hunting practices, including communal bison hunts, where large groups of people worked together to run herds of bison over a cliff to kill them (Heidenreich, 1985). More grinding slabs and plant processing tools are attributed to this period than in the ones that preceded. Indications of fabricated shelters have been discovered by the identification of "tipi rings" that were used to keep these portable dwellings in place (Heidenreich, 1985).

Late Prehistoric (A.D. 200 – 1800)

There are several documented Late Prehistoric archaeological sites in Montana, including the Highwalker site in Pine Parklands region of southeastern part of the state. The Highwalker site dates from about A.D. 1000, and was used as a locale for butchering and processing bison. Ceramics found at the Highwalker site "represent the earliest known representatives of the localized Powder River Basin pottery tradition which appears to be related to Extended Middle Missouri Tradition ceramics" (Keyser & Davis, 1982). This culture may be the precursor to the Crow society, which may have moved into the area from North Dakota (Keyser & Davis, 1982).

Another Late Prehistoric site is the Risley Bison Kill site in west-central Montana, fifty miles west of Great Falls, MT. The site was vandalized and partly destroyed by land subdivision before it was properly documented and protected. The site has yielded numerous tools and other evidence that butchering and processing of bison occurred many time during the Late Prehistoric period. (Keyser & Knight, The Risley Bison Kill: West-Central Montana, 1977)

The DesRosier site is a small rock-shelter along the Smith River in central Montana, just east of the Continental Divide. This site contains pictographs dates to between 200 – 400 years old. The manmade rock-shelter has three small contiguous oval walls, and the overall site is surrounded by large pine forests. The distinctive pictographs at this site are faded red figures consisting of 12 distinct motifs, including a stick figure anthromorph, a sunburst, a chevron, a pair of ribbed figures, and eight groups of tally marks (Keyser, James D, 1981).

11.1.11.5. Federally Recognized Tribes of Montana

According to the Bureau of Indian Affairs and the National Conference of State Legislators, there are seven federally recognized Tribes in Montana: the Assiniboine and Sioux Tribes of the Fort Peck Indian Reservation, the Blackfeet Tribe of the Blackfeet Indian Reservation of Montana, Chippewa-Cree Indians of the Rocky Boy's Reservation, the Confederated Salish and Kootenai Tribes of the Flathead Reservation, the Crow Tribe of Montana, Fort Belknap Indian Community of the Fort Belknap Reservation of Montana, and the Northern Cheyenne Tribe of the Northern Cheyenne Indian Reservation (National Conference of State Legislators, 2015) (U.S. Government Publishing Office, 2015). The general location of the tribes are shown in Figure 11.1.11-2. Additionally, the figure depicts the general historic location of officially federally recognized tribes that were known to exist in this region of the United States, but may no longer be present in the state.

11.1.11.6. Significant Archaeological Sites of Montana

As previously mentioned in Section 11.1.14.3, there are 34 archaeological sites in Montana that are listed on the NRHP. Table 11.1.11-2 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 are listed at http://www.nps.gov/nr/ (NPS, 2014e).

Montana State Cultural Resources Database and Tools

Montana Historical Society (MHS)

The Montana Historical Society acts as the State Historic Preservation Office (SHPO) for Montana. The society's website (http://mhs.mt.gov/) has online resources, including digital document collections, GIS Maps, a historical wiki, and search aids. The MHS maintains the Montana Antiquities Database, which serves as an inventory of state cultural resources, and a link to a publicly accessible version of the database can be found on the site. Additionally, MHS publishes a quarterly magazine, *Montana: The Magazine of Western History*, which highlights people, places, and events that have shaped the history of the region. (Montana Historical Society, 2015)

Montana Archaeological Society (MAS)

The Montana Archaeological Society is an organization open to all members of the public interested in archaeology. MAS goals are to encourage archaeological research, public awareness, and collaboration between professionals and non-professionals in Montana Archaeology. MAS publishes a bi-annual journal called *Archaeology in Montana* and its website (http://www.mtarchaeologicalsociety.org/index2.html) provides links to archaeological preservation projects, job opportunities, and events. (Montana Archaeological Society, 2009)

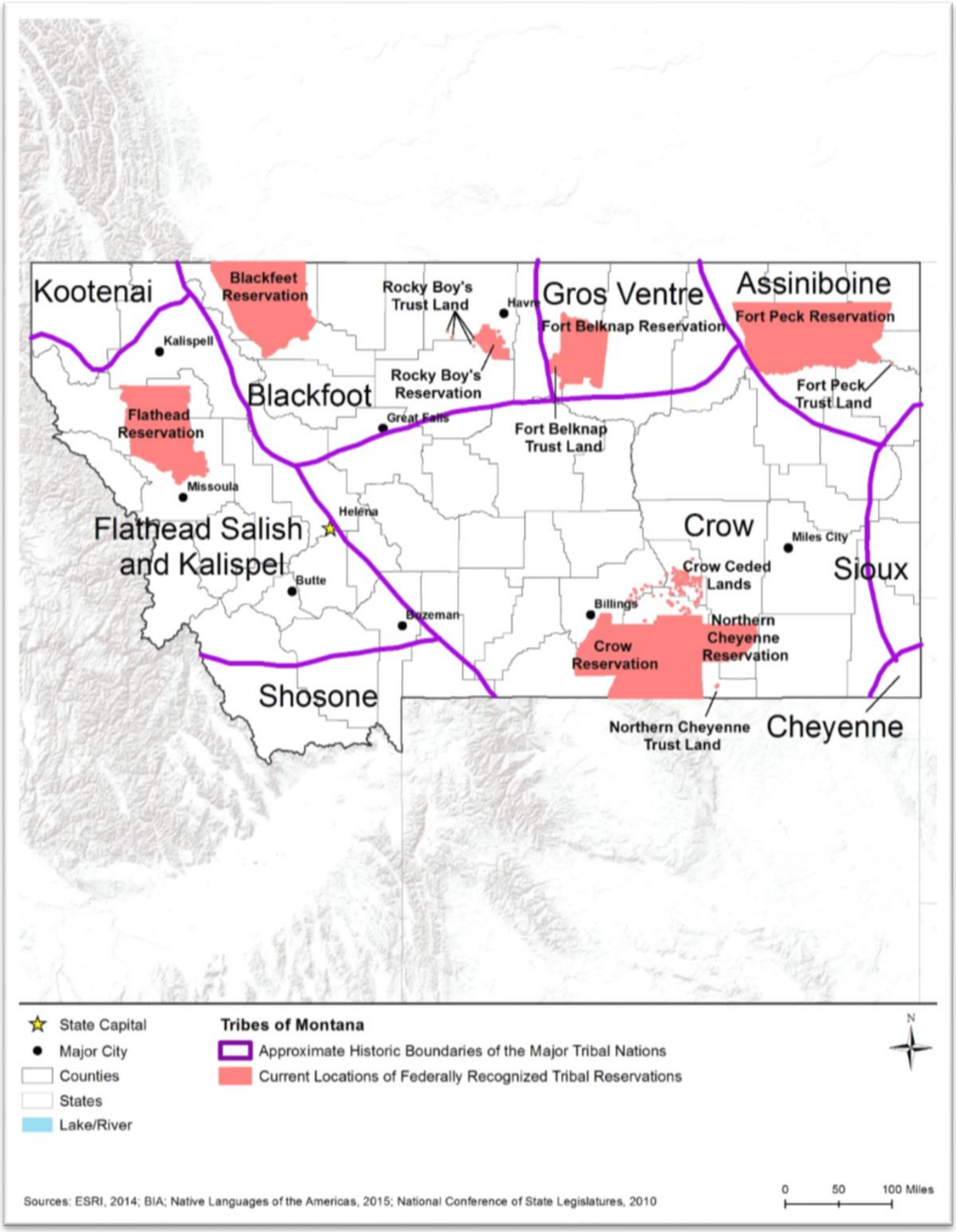


Figure 11.1.11-2: Approximate Historic Boundaries of Tribes in Montana[139]

[139] Figure 11.1.11-2 is provided for context and is not intended to be exact as the various sources that were consulted contain varying ancestral territory boundaries. Instead, this figure and corresponding ancestral territory boundaries are provided to show that the historic ancestral territories and the current ancestral interests of a given tribe within a given state are often times complex as ancestral territory boundaries shifted and overlapped over time.

Table 11.1.11-2: Archaeological Sites on the NRHP in Montana

Closest City	Site Name	Type of Site
Anaconda	California Creek Quarry	Prehistoric
Billings	Hoskins Basin Archeological District	Historical - Aboriginal, Prehistoric
Billings	Pictograph Cave	Prehistoric
Birney	Wolf Mountains Battlefield--Where Big Crow walked Back and Forth	Historic - Military
Bridger	Demijohn Flat Archeological District	Prehistoric
Browning	Two Medicine Fight Site	Historic - Aboriginal
Chinook	Chief Joseph Battleground of the Bear's Paw	Historic - Military
Conrad	Froggie's Stopping Place on the Whoop-Up Trail	Historic
Deer Lodge	Grant-Kohrs Ranch National Historic Site	Historic
Dillon	LaMarche Game Trap	Historic - Aboriginal
Fort Smith	Annashisee Iisaxpuatahcheeaashisee-Medicine Wheel on Bighorn River	Prehistoric
Glendive	Hagen Site	Prehistoric
Hardin	Pretty Creek Archeological Site	Historical - Aboriginal, Prehistoric
Havre	Too Close For Comfort Site (24HL101)	Historical - Aboriginal, Prehistoric
Helena	Eagle's Site	Prehistoric
Judith	Judith Landing Historic District (Boundary Increase)	Historic, Military, Historic - Aboriginal, Prehistoric
Kevin	Rocky Springs Segment of the Whoop-Up Trail	Historic
Kirby	Rosebud Battlefield-Where the Girl Saved Her Brother	Historic - Military
Lima	Sheep Creek Wickiup Cave	Historic - Aboriginal
Lincoln	Alice Creek Historic District	Prehistoric
Logan	Madison Buffalo Jump State Monument	Historical - Aboriginal, Prehistoric
Lolo	Fort Fizzle Site	Historic - Military
Lolo	Traveler's Rest	Historic
Medicine Lake	Tipi Hills	Prehistoric
Montana City	MacHaffie Site (24JF4)	Prehistoric
Post Creek	Fort Connah Site	Historic
Roberts	Kero Farmstead Historic District	Historic
Stevensville	Big Creek Lake Site	Prehistoric
Ulm	Ulm Pishkun	Prehistoric
Virginia City	Union City	Historic
Warren	Bad Pass Trail	Historic, Historic - Aboriginal, Prehistoric
Warren	Petroglyph Canyon	Prehistoric
Winifred	Judith Landing Historic District	Historic, Military, Historic - Aboriginal, Prehistoric
Wisdom	Big Hole National Battlefield	Historic - Military

Source: (NPS, 2015ac)

11.1.11.7. Historic Context

The land that comprises the majority of present day Montana was acquired by the United States in 1803 as a part of the Louisiana Purchase. Exploration commenced soon afterwards, most famously by the Lewis and Clark's Corps of Discovery Expedition. The Lewis and Clark expedition was followed by fur trappers seeking to exploit the newly available lands; with the help of indigenous guides, they were able explore much of what is now Montana.[140] It should be noted that a French-Canadian military officer and explorer, Pierre Gaultier de Varennes, Sieur de La Verendrye, and (later) two of his sons made expeditions into what is now Montana in 1738 and then 1742-43, before Lewis and Clark (Smith, 1951). During the early 19th century, missionaries began to arrive, sometimes at the request of the native population who had become interested in Christianity (Malone & Roeder, 1976).

The discovery of gold in the middle of the 19th century attracted both prospectors and permanent settlers to Montana. Small mining towns would appear and last as long as ore was being extracted. When the mines ran out, towns would disappear as residents moved to new locations. Gold was commonly mined first, followed by silver, and ultimately copper. Virginia City, in southwestern Montana, grew into one of the territory's largest cities with the discovery of gold at Alder-Gulch (Malone & Roeder, 1976). Virginia City is now a largely defunct ghost town, and has been designated a NHL (Virginia City, Montana Chamber of Commerce, 2015). As mining boomed, transportation became increasingly important. Improved roads were built first, followed by railroads in the 19th century (Malone & Roeder, 1976).

While Montana was not directly involved in the Civil War, the conflict affected political decisions in the territory.[141] Montana was central in the Indian removal policies of the 19th century, during which American Indians were killed or forced off native lands as a result of continuing westward settlement by white settlers. The Battle of Little Bighorn (also known by the Lakota and others as the Battle of the Greasy Grass) and General George A. Custer's death, in June of 1876, is one of the few Indian victories during this time. On November 8, 1889, Montana was admitted to Union as the 41st state (Malone & Roeder, 1976).

During the late 19th and early 20th centuries, ranchers moved into Montana, attracted by vast unclaimed grasslands to support large herds of livestock. The passage of the 1909 Enlarged Homestead Act continued this trend.[142] Mining, for silver and copper, continued to grow in the 1870s. Butte is an example of a town that began as a gold mining town, transitioned to silver, and eventually to copper, to grow into a booming mining town (Malone & Roeder, 1976).

During World War I (WWI), "nearly forty thousand men – almost 10 percent of the population – went to war, a rate of contribution that no other state even approached" (Malone & Roeder, 1976). WWI also sparked a boom in Montana's copper mines and lumber industry. Montana suffered during the Great Depression, but the economy picked up again during World War II (WWII) as mining, timber, and agricultural production rose to meet wartime demands (Malone

[140] French Canadian trappers may have ventured into the Montana area in the 18th century.

[141] Montana became a territory in 1864 in the midst of the Civil War.

[142] The Enlarged Homestead Act of 1909 increased the acreage available to settlers in more arid western lands as an incentive to increase settlement in these remote and less hospitable areas of the country.

& Roeder, 1976). During the second half of the 20th century, oil and coal extraction has risen, while tourism related to visual resources such as Glacier National Park has continued. Historic railroad development dating to the 19th century was largely responsible for the establishment of many of these attractions (Montana State Historic Preservation Office, 2013).

Montana has 1,139 NRHP listed sites, as well as 28 NHLs (NPS, 2014f). Montana contains no National Heritage Areas (NPS, 2015ad). Figure 11.1.11-5 shows the NRHP sites within Montana.[143]

11.1.11.8. Architectural Context

Early evidence of European activity in Montana includes remnants of early 19th century roads and trails used by American Indian tribes, fur trappers, and settlers. American Indian dwelling types included structures such as the Mandan earth lodge (constructed of timber frames and covered in soil and sod) and the tipi (wood poles with sewn bison hide exterior). Resources associated with early ranching activities remain as well, such as the Grant-Kohrs Ranch in Deer Lodge, which dates to the late 1850s. Forts were common, as ongoing conflicts with Indians posed a threat to settlers (Montana State Historic Preservation Office, 2013). Early structures would have been constructed primarily of logs, as processed materials were difficult to acquire. Stone or earth were used as building materials as well (Martens & Ramsay, 2015).

After gold was discovered in Montana, mining settlements began to appear quickly, bringing with them "false-front architecture." False-front structures were hastily constructed buildings comprised of logs (or even tents), that featured a flat, wood-framed façade meant to give the appearance of an urban dwelling and provide room for signage. Depending on the success of the settlement, the building itself would eventually be upgraded or replaced. If the settlement failed, buildings were abandoned. Examples of false-front architecture can be seen today, both in ghost towns such as Virginia City and Bannack, as well as in example that exist in thriving cities.[144] Ghost towns are a common and significant resource as well (Heath, 1989).

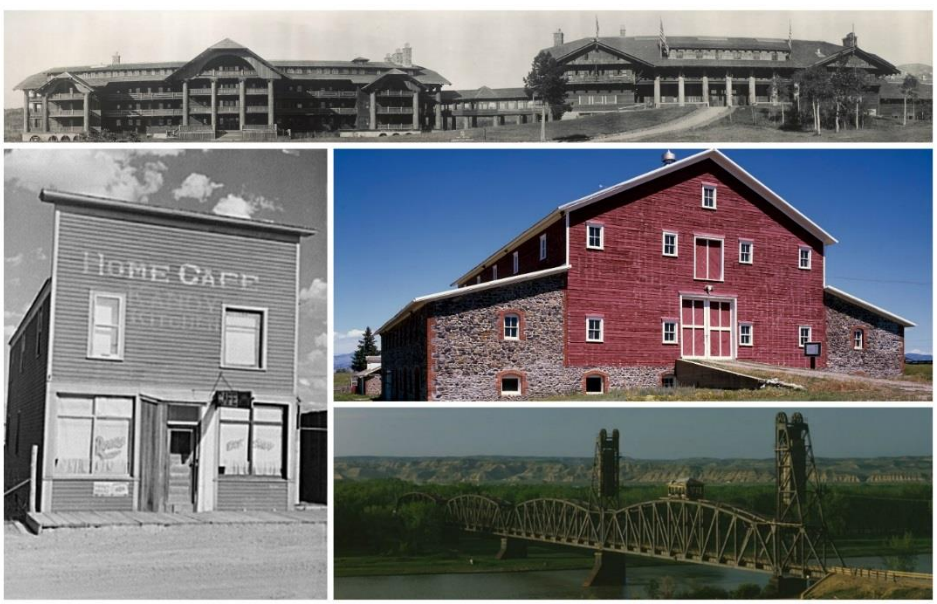
As Montana progressed from territory to statehood, civic architecture was seen as important. In such a remote environment, institutions like schools, courthouses, and jails were viewed as the physical manifestation of progress. "U.S. Postal Service offices, federal courthouses, and other federal institutions were built during the second half of the 19th and first half of the 20th centuries, including the Old Territorial Prison at Deer Lodge and the Rocky Mountain Laboratory in Hamilton" (Montana State Historic Preservation Office, 2013). A specific school type worthy of mention are Indian reservation schools where indigenous children were sent to learn and live in European building as a way to trying to acculturate them into western society. These were built in a variety of late 19th century styles and were constructed of wood, brick, or stone. Examples still exist today; however, many were torn down or left to decay by tribal groups that wished to distance themselves from this history (West, 1987).

[143] See Section 11.1.7 for a more in-depth discussion of additional historic resources as they relate to recreational resources.
[144] Virginia City and Bannack are both early capitals that have been designated as NHLs.

Transportation resources are important to Montana, as they allowed people to more easily move westward, and facilitated extraction and marketing of the state's vast natural resource. The Great Northern Railway is an example of a railroad that sparked development and helped grow the tourism industry, taking tourists to sites such as Glacier National Park. Many Glacier Hotel (1915) is an example of a lodge that was built as a result of this development. Agricultural and industrial resources remain on the landscape as well, such as mining structures, grain elevators, and oil derricks (Montana State Historic Preservation Office, 2013).

Montana contains many resources that resulted from New Deal programs. These include roads, bridges, and larger projects such as the Fort Peck Dam (1933 to 1940). "Indian New Deal" architecture exists as well, often in the form of community buildings constructed with an American Indian motif. There are also several 20th century military installations in Montana, including missile defense silos associated with the Cold War (Montana State Historic Preservation Office, 2013).

Residential and commercial structures in Montana include late 19th century Victorian Era styles and early 20th century revival styles. The Western Commercial style was popular, which consisted of a one to three story building, and included storefront space on the ground floor and either office or living space on the upper floors (NRHP, 2009). Montana has a collection of Modern architecture ranging from Art Deco and Art Moderne, to later styles such as International and New Formalism. Many of Montana's civic and institutional buildings, such as collegiate facilities, exhibit these modern styles and are associated with growth following WWII (Painter Preservation & Planning, 2010).



Top – Many Glacier Hotel (Glacier National Park, MT) – (Kiser Photo Company, 1921)
Bottom Left – False-front Building in Ghost Town (Judith Basin, MT) – (Wolcott, 1941)
Right Middle – Barn on Kleffner Ranch (East Helena, MT) – (Highsmith, 1980)
Bottom Right – Snowden Bridge (Nohly, MT) – (Historic American Engineering Record, 1968)

Figure 11.1.11-3: Representative Architectural Styles of Montana

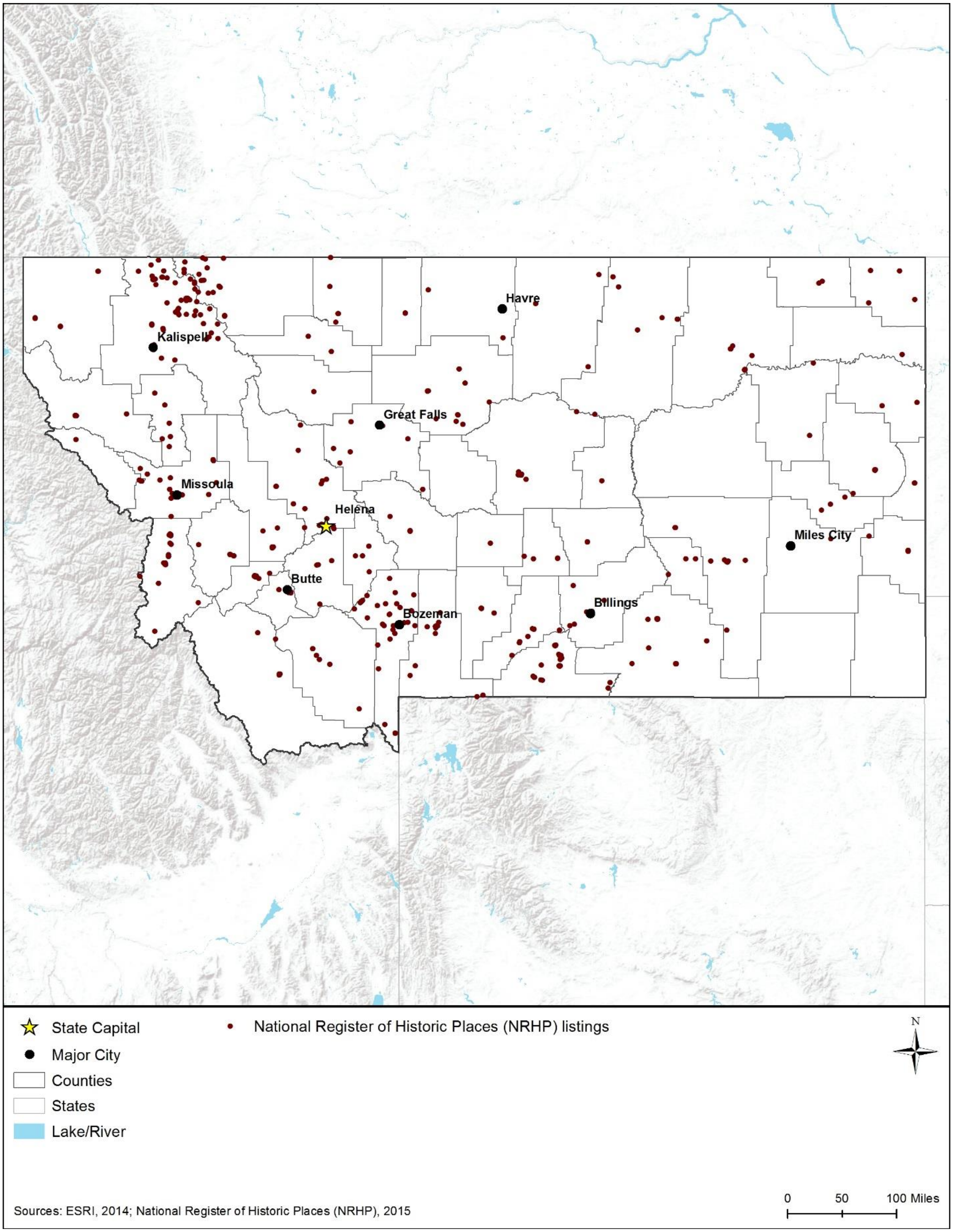


Figure 11.1.11-4: National Register of Historic Places (NRHP) Sites in Montana

11.1.12. Air Quality

11.1.12.1. Definition of the Resource

The type and amount of pollutants determines air quality in a geographic area pollutants emitted into the atmosphere, the size and topography[145] 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)[146] or micrograms per cubic meter ($\mu g/m^3$) determined over various periods of time (averaging time).[147] This section discusses the existing air quality in Montana. USEPA designates areas within the United States as attainment,[148] nonattainment,[149] maintenance,[150] or unclassifiable[151] depending on the concentration of air pollution relative to ambient air quality standards. Information is presented regarding national and state ambient air quality standards and nonattainment areas that would be potentially more sensitive to impacts from implementation of the Proposed Action or alternatives.

11.1.12.2. 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[152] or secondary,[153] for each pollutant with varying averaging times. Standards with short averaging times (e.g., 1-hour, 8-hour, and 24-hour) were developed to prevent the acute health effects from short-term exposure at high concentrations. Longer averaging periods (e.g., 3 months or annual) are intended to prevent chronic health effects from long-term exposure. A description of the NAAQS is presented in Appendix E.

In addition to the NAAQS, there are standards for hazardous air pollutants (HAP), which are those typically associated with specific industrial processes such as chromium electroplating (hexavalent chromium), dry cleaning (perchloroethylene), and solvent degreasing (halogenated solvents) (USEPA, 2016d). HAPs can have severe adverse impacts on human health and the

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

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

[147] 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, 2015k).

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

[149] 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, 2015l).

[150] 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, 2015l).

[151] 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, 2015l).

[152] 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, 2014a).

[153] 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, 2014a).

environment, including increased risk of cancer, reproductive issues, or birth defects. HAPs are federally regulated under the CAA via the National Emission Standards for Hazardous Air Pollutants (NESHAPs). USEPA developed the NESHAPs for sources and source categories emitting HAPs that pose a risk to human health. Appendix E, Air Quality, presents a list of federally regulated HAPs.

In conjunction with the federal NAAQS, Montana maintains its own air quality standards referred to as the Montana Ambient Air Quality Standards (MAAQS). Table 11.1.12-1 presents an overview of the MAAQS as defined by the MDEQ.

Table 11.1.12-1: Montana Ambient Air Quality Standards (MAAQS)

Pollutant	Averaging Time	Standard	Notes
CO	1-hour	23 ppm	Not to be exceeded more than once per year.
	8-hour	9 ppm	
Lead	90-day	1.5 µg/m3	Not to be exceeded.
NO2	1-hour	0.30 ppm	Not to be exceeded more than once per year.
	Annual	0.05 ppm	Not to be exceeded.
Particulate Matter	30-day	10 gm/m2	Not to be exceeded.
PM10	24-hour	150 µg/m3	No more than one expected exceedance per calendar year.
	Annual	50 µg/m3	Not to be exceeded.
PM2.5	24-hour	35 µg/m3	98th percentile, averaged over 3 years.
	Annual	12 µg/m3	Annual mean, averaged over 3 years.
O3	1-hour	0.10 ppm	Not to be exceeded more than once per year.
SO2	1-hour	0.50 ppm	Not to be exceeded more than 18 times in 12 consecutive months.
	24-hour	0.10 ppm	Not to be exceeded more than once per year.
	Annual	0.02 ppm	Not to be exceeded.
Fluoride in Forage	Monthly	50 µg/g	Not to be exceeded.
	Grazing Season	35 µg/g	
Visibility	Annual	3x10-5/m	Not to be exceeded. Only applicable to Class I areas.
H2S	1-hour	0.05 ppm	Not to be exceeded more than once per year.

Sources: (MDEQ, 2009h) (MDEQ, 2015m)

Title V Operating Permits/State Operating Permits

Montana has authorization to issue CAA Title V operating permits on behalf of the USEPA, as outlined in 40 CFR 70. The Title V program refers to Title V of the CAA that governs permitting requirements for major industrial air pollution sources and consolidates all CAA requirements for the facility into one permit (USEPA, 2015m). The overall goal of the Title V program is to "reduce violations of air pollution laws and improve enforcement of those laws" (USEPA, 2015m). The Administrative Rules of the State of Montana (ARM) 17.8.1204 [Air Quality Operating Permit Program Applicability] describes the applicability of Title V operating permits (MDEQ, 2009i). Montana 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 11.1.12-2). The permit issued to a facility contains both state and federal portions and incorporates a reporting schedule (USEPA, 2014b).

Table 11.1.12-2: Major Air Pollutant Source Thresholds

Any Pollutant	100 Tons per Year
Single HAP	10 Tons per Year
Total/Cumulative HAPs	25 Tons per Year

Source: (USEPA, 2014b)

A major stationary source can avoid obtaining a Title V operating permit by limiting its potential emissions to below the thresholds shown in Table 11.1.12-2. To limit potential emissions, a facility could agree to use alternative equipment or accept hourly limits on pollution-emitting aspects of its operation. These sources would obtain a Montana minor source air quality permit[154] containing the limits/operating restrictions instead of a Title V operating permit.

Exempt Activities

Select activities, as defined by ARM 17.8.744 [Montana Air Quality Permits - General Exclusions], are exempt from the registration and permitting provisions of ARM 17.8.743 [Montana Air Quality Permits - When Required] for Montana air quality permits. The following activities are exempt from preconstruction permitting requirements:

- "…Mobile emitting units, including motor vehicles, trains, aircraft, and other such self-propelled vehicles…;
- Emergency equipment installed in hospitals or other public institutions or buildings for use when the usual sources of heat, power, or lighting are temporarily unobtainable or unavailable; and
- Emergency equipment installed in industrial or commercial facilities for use when the usual sources of heat, power, or lighting are temporarily unobtainable or unavailable and when the loss of heat, power, or lighting causes, or is likely to cause, as adverse effect on public health

[154] Montana air quality permit: "A preconstruction permit issued under ARM 17.8.7 that may include requirements for the construction and subsequent operation of an emitting unit(s) or facility." (MDEQ, 2009j)

or facility safety. Emergency equipment use extends only to those uses that alleviate such adverse effects on public health or facility safety…" (MDEQ, 2009c)

Select activities are exempt from the registration and permitting provisions of ARM 17.8.743 [Montana Air Quality Permits - When Required] for *de minimis*[155] changes. Under ARM 17.8.745 [Montana Air Quality Permits - Exclusion for De Minimis Changes], *de minimis* changes include construction or changes to operations that do not increase a facility's potential to emit by more than five tons per year of any pollutant unless the changes would:

- Violate any existing permit condition for the facility;
- Qualify as a major modification of a major stationary source; or
- Affect the rise of any plume or dispersion characteristics of emissions that would impact AAQS (MDEQ, 2009c).

Temporary Emission Sources Permits

The Montana DEQ allows temporary air quality operating permits under ARM 17.8.1223 [Temporary Air Quality Operating Permits]. Montana can issue temporary permits for emissions from similar operations by the same source owner or operator at multiple temporary locations. ARM 17.8.1223 states, "the operation must be temporary and involve at least one change of location during the term of the permit. No affected source[156] may be permitted as a temporary source" (MDEQ, 2009i).

State Preconstruction Permits

The Montana DEQ requires air quality permits under regulation ARM 17.8.743 [Montana Air Quality Permits - When Required] and ARM 17.8.1004 [When Montana Air Quality Permit Required] for any new or stationary minor source or major modification located in an area designated as attainment or unclassified for an NAAQS under 40 CFR 81.327 and which contribute to the violation of an NAAQS (MDEQ, 2009k). Conversations with a Montana permitting specialist (Julie Merkel) indicate that the Montana air quality permit serves two purposes: (1) as a preconstruction permit for major sources requiring Title V operating permits, and (2) as a minor source construction and operation permit. These preconstruction permits do not terminate after construction is complete and remain in effect concurrently with Title V operating permits (MDEQ, 2009c) (Merkel, 2015).

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

[155] de minimis: "USEPA states that "40 CFR 93 § 153 defines de minimis levels, that is, the minimum threshold for which a conformity determination must be performed, for various criteria pollutants in various areas." (USEPA, 2016e)
[156] Affected source: "A source that includes one or more affected units that are subject to emission reduction requirements or limitations under Title IV [The Acid Rain Program] of the CAA." (MDEQ, 2009l)

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* levels. These values are the minimum thresholds for which a conformity determination must be performed (see Table 11.1.12-3).

Table 11.1.12-3: De Minimis Levels

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

Source: (U.S. Government Publishing Office, 2010)

If an action does not result in an emissions increase above the *de minimis* levels in Table 11.1.12-3, 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 11.1.12-3 that the action would meet all SIP control requirements and that any new emissions would not cause a new violation of the NAAQS. To demonstrate conformity[157], 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;

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

- 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

The Montana SIP is composed of many related actions to ensure ambient air concentrations of the six criteria pollutants comply with the NAAQS. Montana's SIP is a conglomeration of separate actions taken for each of the pollutants. All of Montana's SIP actions are codified under 40 CFR Part 52 Subpart BB. A list of all SIP actions for all six criteria pollutants can be found on the USEPA website at https://yosemite.epa.gov/R8/R8Sips.nsf/Montana?OpenView&Count=100&Expand=1.

11.1.12.3. Environmental Setting: Ambient Air Quality

Nonattainment Area

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 11.1.12-1 and Table 11.1.12-4 present the nonattainment areas in Montana as of January 30, 2015. Table 11.1.12-4 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 dates when USEPA promulgated an ambient air quality standard for that pollutant; note that, for PM2.5 and SO_2, these standards listed are in effect. Unlike Table 11.1.12-4, Figure 11.1.12-1 does not differentiate between standards for the same pollutant. Additionally, given that particulate matter is the criteria pollutant of concern, PM_{10} and $PM_{2.5}$ merge in the figure to count as a single pollutant.

Table 11.1.12-4: Montana Nonattainment and Maintenance Areas by Pollutant Standard and County

County	Pollutant and Year USEPA Implemented Standard										
	CO	Lead		NO_2	PM_{10}	$PM_{2.5}$		O_3		SO_2	
	1971	1978	2008	1971	1987	1997	2006	1997	2008	1971	2010
Cascade	M										
Flathead					X-4						
Lake					X-4						
Lewis And Clark		X-6								X-6	
Lincoln					X-4	X-4					
Missoula	M				X-4						
Rosebud					X-4						
Sanders					X-4						
Silver Bow					X-4						
Yellowstone	M									X-6	X-6

Source: (USEPA, 2015n)

[a] The years under each pollutant represent the year that the specific national standard was implemented.
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

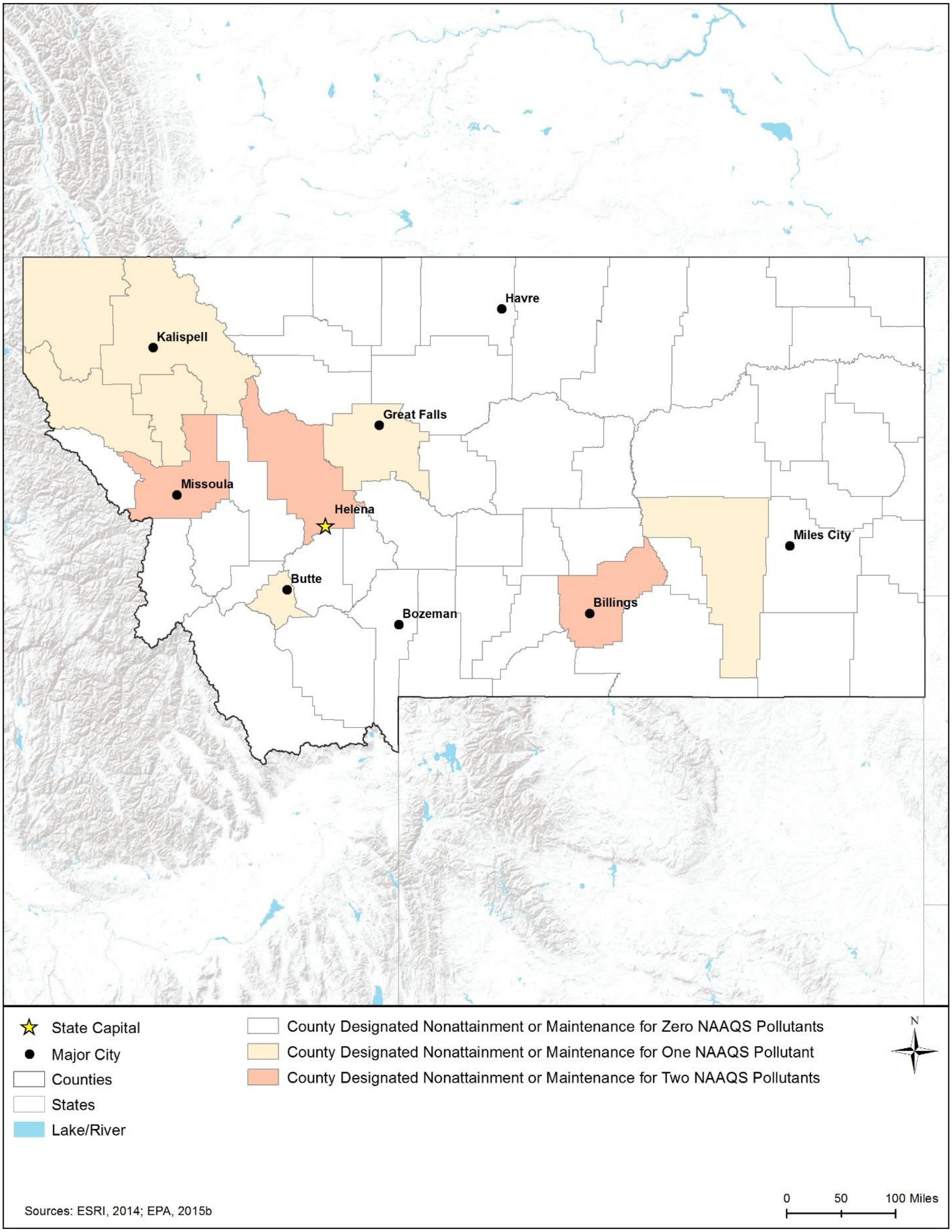


Figure 11.1.12-1: Nonattainment and Maintenance Counties in Montana

Air Quality Monitoring and Reporting

The Montana DEQ measures air pollutants at 22 sites across the state as part of the National Air Monitoring Stations Network and the State and Local Air Monitoring Stations Network (MDEQ, 2015n). The Montana DEQ Air Quality Monitoring Network Plan contains state ambient air quality data with pollutant data summarized by region (MDEQ, 2015o). Montana DEQ reports near real-time pollution levels of PM2.5, the main pollutant of concern in Montanan, on the Montana DEQ website at http://svc.mt.gov/deq/todaysair/ to inform the public. Throughout 2014, PM2.5 measurements exceeded the 24-hour federal standard of 35 $\mu g/m^3$ 14 times at sites across Montana in Broadus, Butte, Flathead Valley, Frenchtown, Great Falls, Hamilton, Helena-Rossiter, Lewistown, Libby, Malta, Missoula, Ncore, Seeley, and Sidney. The greatest exceedance occurred in Frenchtown with a maximum recorded concentration of 66.9 $\mu g/m^3$ (MDEQ, 2015o).

Air Quality Control Regions

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

In a 1979 USEPA memorandum, the Assistant Administrator for Air, Noise, and Radiation (USEPA, 1979) advised USEPA Regional Offices to provide notice to the Federal Land Manager (FLM) of any facility subject to the Prevention of Significant Deterioration (PSD) permit requirements and within 100 kilometers[158] of a Class I area. “The EPA’s policy is that FLMs should be notified by the Regional Office about any project that is within 100 kilometers of a Class I area. For sources having the capability to affect air quality at greater distances, notification should also be considered for Class I areas beyond 100 kilometers” (Page, 2012). The 2005 USEPA guidelines for air quality modeling do not provide a precise modeling range for Class I areas.

PSD applies to new major sources or major modifications at existing sources for pollutants where the source is in an attainment or unclassifiable area. An air quality analysis is required for sources subject to PSD requirements and generally consists of using a dispersion model to evaluate emission impacts to the area. “Historically, the USEPA guidance for modeling air quality impacts under the PSD program has tended to focus more on the requirements for a Class II modeling analysis. Such guidance has provided that applicants need not model beyond the point of significant impact or the source or 50 kilometers[159] (the normal useful range of EPA-approved Gaussian plume models” (Seitz, 1992).

158 The memorandum and associated guidance use kilometers. 100 kilometers is equal to about 62 miles.
159 The memorandum and associated guidance use kilometers. 50 kilometers is equal to about 31 miles.

Montana contains Federal Class I areas including national parks, national wilderness areas, and American Indian reservations (MDEQ, 2011c). 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). Idaho and Wyoming both have Class I areas where the 100-kilometer buffer intersects a few Montana counties. Any PSD-applicable action within these counties would require FLMs notification from the appropriate Regional Office. Figure 11.1.12-2 provides a map of Montana highlighting all relevant Class I areas and all areas within the 100-kilometer radiuses. The numbers next to each of the highlighted Class I areas in Figure 11.1.12-2 correspond to the numbers and Class I areas listed in Table 11.1.12-5.

Table 11.1.12-5: Relevant Federal Class I Areas

#[a]	Area	Acreage	State
1	Glacier National Park	1,012,599	MT
2	Scapegoat Wilderness Area	239,295	MT
3	Mission Mountains Wilderness Area	73,877	MT
4	Gates of the Mountains Wilderness Area	28,562	MT
5	Cabinet Mountains Wilderness Area	94,272	MT
6	Bob Marshall Wilderness Area	950,000	MT
7	Anaconda-Pintler Wilderness Area	157,803	MT
8	U. L. Bend Wilderness Area	20,890	MT
9	Red Rock Lakes Wilderness Area	32,350	MT
10	Medicine Lake Wilderness Area	11,366	MT
11	Selway-Bitterroot Wilderness Area	1,240,700[b]	MT/ID
12	Yellowstone National Park	2,219,737[c]	MT/ID/WY
13	Grand Teton National Park	305,504	WY
14	Washakie Wilderness Area	704,274	WY
15	Teton Wilderness Area	557,311	WY
16	North Absaroka Wilderness Area	351,104	WY
17	Theodore Roosevelt National Park	69,675	ND

Source: (USEPA, 2012c)

[a] The numbers correspond to the shaded regions in Figure 11.1.12-2.
[b] Contains 251,930 acres in Montana.
[c] Contains 167,624 acres in Montana.

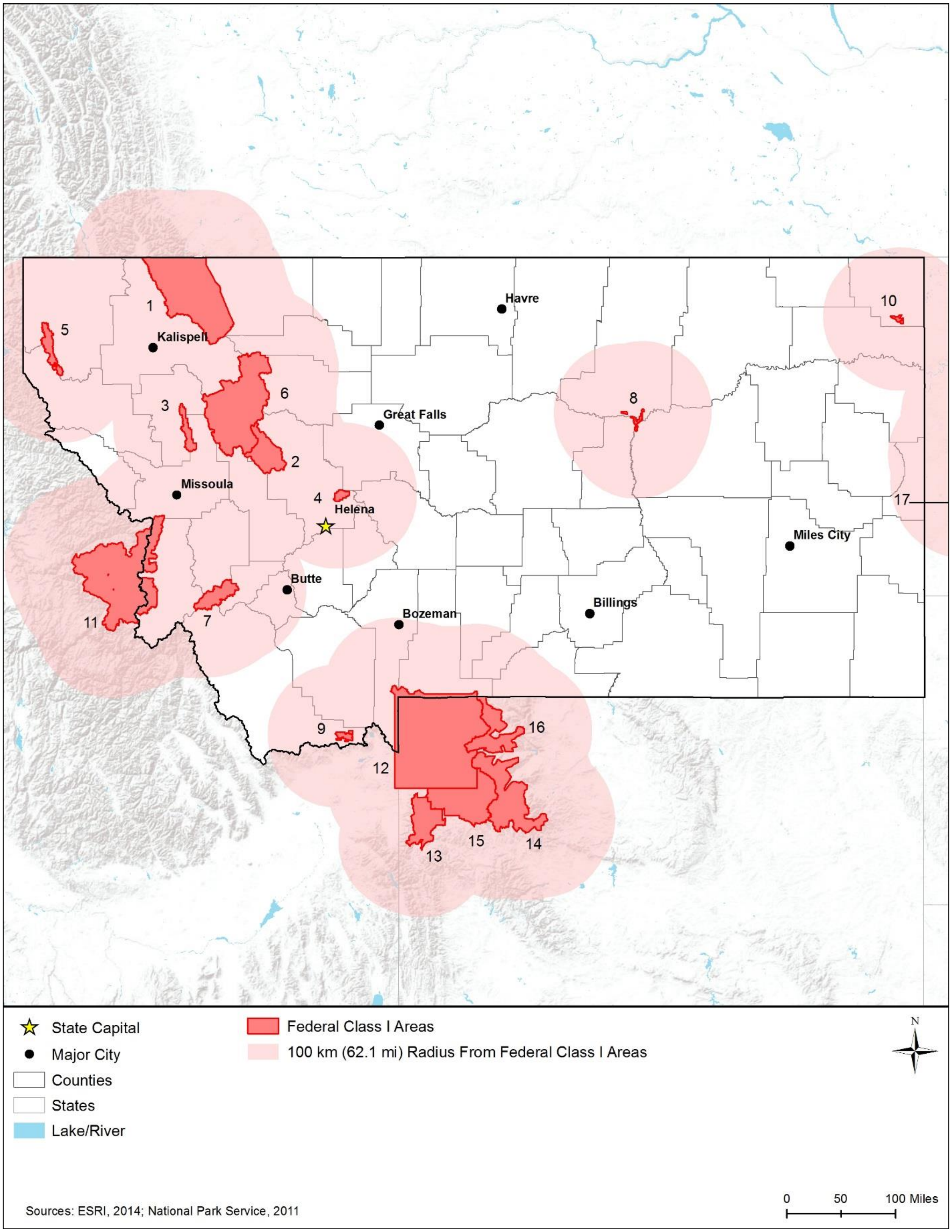


Figure 11.1.12-2: Federal Class I Areas with Implications for Montana

11.1.13. Noise and Vibration

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

11.1.13.1. Definition of the Resource

Noise is a form of sound caused by pressure variations that the human ear can detect and is often defined as unwanted sound (USEPA, 2012d). 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.

Ground-borne vibrations, which in many instances can be caused by tools or equipment that generate noise, can also result from roadway traffic, rail traffic, and industrial activities as well as from some construction-related activities such as blasting, pile-driving, vibratory compaction, demolition, and drilling. Unlike noise, most ground-borne vibrations are not typically experienced every day by most people because the existing environment does not include a significant number of perceptible ground-borne vibration events.

Fundamentals of Noise and Vibration

For environmental noise analyses, a noise metric refers to the unit that quantitatively measures the effect of noise on the environment. The unit used to describe the intensity of sound is the decibel (dB). Audible sounds range from 0 dB ("threshold of hearing") to about 140 dB ("threshold of pain") (OSHA, 2016a). The vibration frequency characteristics of the sound, measured as sound wave cycles per second [Hertz (Hz)], determines the pitch of the sound (FTA, 2006). The normal audible frequency range is approximately 20 Hz to 20 kHz (FAA, 2015g). 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, 2016a).

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

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

Figure 11.1.13-1 presents the sound levels of typical events that occur on a daily basis in the environment. For example, conversational speech is measured at about 55 to 60 dBA, whereas a band playing loud music may be as high as 120 dBA.

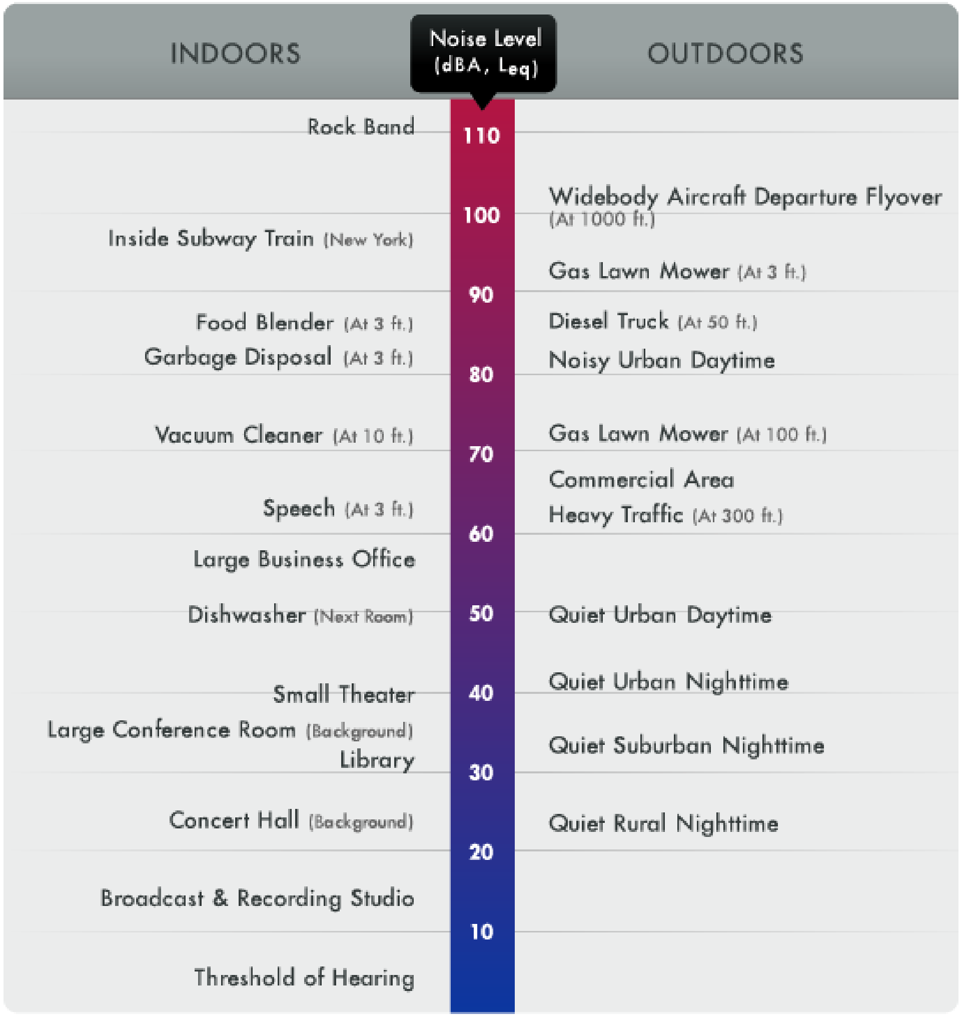


Figure 11.1.13-1: Sound Levels of Typical Sounds

Source: (Sacramento County Airport System, 2015)

Prepared by: Booz Allen Hamilton

Leq: Equivalent Continuous Sound Level

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

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

- A 3-dB change in sound level is considered a barely noticeable difference;
- A 5-dB change in sound level will typically result in a noticeable community response; and
- A 10-dB change, which is generally considered a doubling of the sound level, almost certainly causes 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 depending on whether the environment is urban, suburban, or rural.

Related to noise, vibration is a fluctuating motion described by displacement with respect to a reference point. Depending on the intensity, vibrations ma y create perceptible ground shaking and the displacement of nearby objects as well as rumbling sounds. Table 11.1.13-1 lists vibration source levels produced by typical construction machinery and activities at a distance of 25 feet in units of vibration decibels (VdB). The vibration thresholds for human perceptibility and potential building damage are 65 and 100 VdB, respectively (FTA, 2006).

Table 11.1.13-1: Vibration Source Levels for Select Construction Equipment (VdB)

Equipment[a]	VdB at 25 feet away
Pile Driver (impact type)	104-112
Pile Driver (sonic or vibratory type)	93-105
Vibratory Roller	94
Hoe Ram	87
Large Bulldozer	87
Caisson Drilling	87
Loaded Trucks	86
Jackhammer	79
Small Bulldozer	58

Source: (FTA, 2006)

VdB = vibration decibels
[a] The types of equipment listed in this table are included for reference purposes only. It is possible that not all equipment types listed here would be used in the deployment and operation of the Proposed Action.

11.1.13.2. Specific Regulatory Considerations

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

Montana has several statewide noise regulations written into its general and permanent law, which are compiled under the Montana Code Annotated (MCA). These regulations mainly apply to motor vehicle functions, such as engine running, braking, and horns. Table 11.1.13-2 provides a brief summary of these regulations.

Table 11.1.13-2: Relevant Montana Noise Laws and Regulations

State Law/ Regulation	Regulatory Agency	Applicability
MCA 61-9-403	Montana Legislature	Regulates excessive noise from motor vehicles on highways by mandating the use of a muffler in good working condition.
MCA 61-9-435	Montana Legislature	Limits motor vehicle exhaust noise to 95 decibels.
MCA 61-9-401	Montana Legislature	Bans the use of an unreasonably loud or harsh noise from motor vehicle horns operating on a highway.

Source: (Montana Legislature, 2015b)

Many cities and towns may have additional, local noise ordinances to further 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. Larger cities and towns, such as Billings, Bozeman, and Missoula, are likely to have different regulations than rural or suburban communities largely due to the population density and difference in ambient noise levels (FHWA, 2011).

11.1.13.3. Environmental Setting: Ambient Noise

The range and level of ambient noise in Montana varies widely based on the area and environment of the area. The population of Montana can choose to live and interact in areas that are large cities, rural or suburban communities, small towns, and national and state parks. Figure 11.1.13-1 illustrates noise values for typical community settings and events that are representative of what the population of Montana may experience on a day-to-day basis. These noise levels represent a wide range and are not specific to Montana. As such, this section describes the areas where the population of Montana 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 due to their populations are Billings and Missoula.
- **Airports**: Areas surrounding airports tend to have higher noise levels 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 is in proximity to urban communities resulting in noise exposures from aircraft operations (arrivals/departures) to surrounding areas at higher levels and 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 Montana, Bozeman Yellowstone International Airport (BZN), Billings Logan International Airport (BIL), and Missoula International Airport (MSO) have combined annual operations of more than 196,960 flights (FAA, 2015d). These operations result in increased ambient noise levels in the surrounding communities. See Section 11.1.7, Land Use, Recreation, and Airspace, and Table 11.1.7-8 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, 2015f). There are a number of major highways within the state that may contribute to higher ambient noise levels for residents living near those traffic corridors. 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, 2015f). See Section 11.1.1, Public Safety Infrastructure, and Figure 11.1.1-1 for more information about the major highways in the state.
- **Railways**: Like highways, railways tend to have higher than average ambient noise levels for residents living in close proximity (FTA, 2006). Railroad operations can produce noise ranging from 70 dBA for an idling locomotive to 115 dBA when the locomotive engineer rings the horn while approaching a crossing (FRA, 2015b). Montana has one major passenger rail corridor that runs east-west from Wolf Point to Libby (MDT, 2010c). See Section 11.1.1, Public Safety Infrastructure, and Figure 11.1.1-1 for more information about rail corridors in the state.
- **National and State Parks**: The majority of national and state parks are likely to have lower than average ambient noise levels given their size and location in wilderness areas. National and state parks, historic areas, and monuments are protected areas to preserve these areas in their natural environment. These areas typically have lower noise levels, as low as 30 to 40 dBA (NPS, 2014g). Yellowstone National Park and Glacier National Park are two ares in Montana where visitors expect lower ambient noise conditions than the surrounding urban areas. See Section 11.1.8, Visual Resources, and Section 11.1.8.6, Natural Areas, for more information about national and state parks for Montana.

11.1.13.4. 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, 2014b). Most cities, towns, and villages in Montana 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 throughout the state.

11.1.14. Climate Change

11.1.14.1. 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, 2012e). 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[160]), which equalizes for the different global warming potential of each type of GHG. Where this document references emissions of CO_2 only, the units are in million metric tons (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 Final PEIS (see Section 11.2.14, 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 / drought; and 3) severe weather events.

11.1.14.2. Specific Regulatory Considerations

The pertinent federal laws relevant to the protection and management of climate change are summarized in Appendix C, Environmental Laws and Regulations. Montana has established

[160] 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)

goals and regulations to reduce GHG emissions to combat climate change. As shown in Table 11.1.14-1, key state laws/regulations are the primary policy drivers on climate change preparedness and GHG emissions.

Table 11.1.14-1: Relevant Montana Climate Change Laws and Regulations

State Law / Regulation	Regulatory Agency	Applicability
Climate Change Advisory Committee and Climate Action Plan	State of Montana	In 2005, former Governor Brian Schweitzer charged the MDEQ Director with establishing a Climate Change Advisory Committee. The Committee was appointed to evaluate options and make recommendations on existing programs in Montana, policies to reduce GHG emissions, and the potential cost of those policies. These evaluations and recommendations were presented in the "Montana Climate Action Plan: Final Report of the Governor's Climate Change Advisory Committee." The Action Plan presents the 54 policies agreed upon by the Advisory Committee that will GHG emissions by 2020 to 1990 levels. Reductions would be reduced by the amounts for each section as follows: • Residential, commercial, industrial and institutional – 29 percent • Agriculture, forestry and waste – 26.9 percent • Transportation and land use – 9.6 percent • Energy supply – 34.5 percent

Source: (MDEQ, 2013e) (MDEQ, 2009l)

11.1.14.3. Montana Greenhouse Gas Emissions

Estimates of Montana's total GHG emissions vary. The Department of Energy's (DOE) Energy Information Agency (EIA) collects and disseminates national-level emissions data on other GHGs such as CH_4 and nitrous oxide (NO_x), but not at the state level (EIA, 2015d). The USEPA also collects and disseminates national-level GHG emissions data, but by economic sector, not by state (USEPA, 2015p). Individual states have developed their own GHG inventories, which are updated with different frequencies and trace GHG in a variety of ways.

For the purposes of this Final PEIS, the EIA data on CO_2 emissions are used as the baseline metric to ensure consistency and comparability across the 50 states. However, if additional data sources on GHG emissions are available for a given state, including other GHGs such as CH_4, they are described and cited.

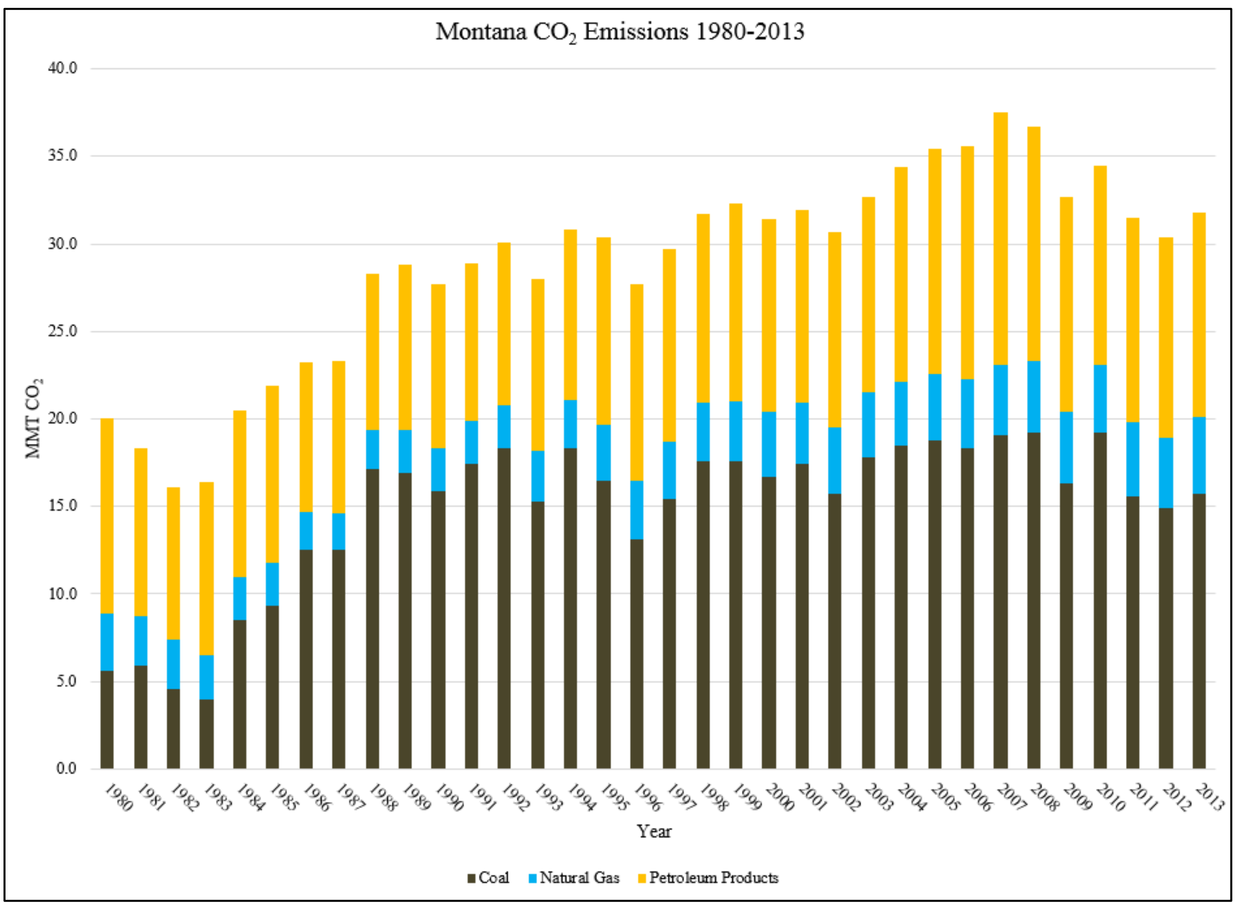
According to the EIA, Montana emitted a total of 32.3 MMT of CO2 in 2014 from fossil fuels, an increase of 1.8 MMT over 2012. Just over fifty percent of CO2 emissions come from the electric power sector, almost exclusively from coal with small amounts from natural gas and petroleum Table 11.1.14-1 (EIA, 2016). Annual emissions between 1980 and 2013 are presented in Figure 11.1.14-1. Montana's CO2 emissions decreased in the early 1980s before increasing sharply to a high of 37.6 MMT in 2007, then declining to their current levels (EIA, 2016). Both increases and declines were led by emissions from coal. Montana ranked 42nd in total CO2 emissions among the 50 states and the District of Columbia in 2013, and ranked 6th in per capita emissions (EIA, 2013a).

Table 11.1.14-2: Montana CO_2 Emissions from Fossil Fuels by FuelType and Sector, 2013

Fuel Type (MMT)		Source (MMT)	
Coal	16.6	Residential	1.6
Petroleum Products	11.6	Commercial	1.3
Natural Gas	4.2	Industrial	4.5
		Transportation	7.8
		Electric Power	17.1
TOTAL	**32.3**	**TOTAL**	**32.3**

Source: (EIA, 2016)

The majority of Montana's GHG emissions is CO_2. These emissions are the result of fossil fuel combustion for the purpose of producing energy, mostly petroleum products used in the transportation sector and for home heat, and a growing proportion of natural gas for heat and hot water in residential and commercial buildings. Other major GHGs emitted in Montana are CH_4, hydrofluorocarbons, NO_x, sulfur hexafluoride (SF_6) and perfluorocarbons.



Source: (EIA, 2015e)

Figure 11.1.14-1: Montana CO2 Emissions from Fossil Fuels by Fuel Type 1980-2013

Montana maintains its own GHG inventory, which was most recently updated in 2007. Total U.S. GHG greenhouse were 6,673 million metric tons (14.7 trillion pounds) in 2013. In 2013, Montana emitted 32 MMT of CO_2. Montana has lower per-capita energy-related GHG emissions than the U.S. average (EIA, 2015f). Emissions came from energy related activities across all sectors such residential (21.2 percent) commercial (19.2 percent) industrial (30.2 percent) transportation (29.4 percent). Overall, Montana's emissions are low compared to the national average, however the state emits roughly twice the amount of GHG than the average state. This is likely from Montana's large agricultural industry and the long distances commuter's travel (EIA, 2015f).

Montana is a net supplier of energy for the U.S., producing both fossil and renewable energy. As a result, the state's industrial and transportation sector are often the highest emitters. The state is also a large coal producer but as of late, U.S. coal demand has decreased along with GHG emissions. New generators are now using "natural gas and retrofitting coal-fired electricity generating plants with emission controls that allow use of higher-sulfur coal, thereby reducing demand for low-sulfur Powder River Basin" (EIA, 2015f). Roughly, half of Montana's electricity derives from coal, hydroelectric power, wind generation, and natural gas-fired generating capacity covering the rest. With Montana's small population, residents only use about half of the electricity generated; the other half is sent to other western states (EIA, 2015f) (Center for Climate Strategies, 2007).

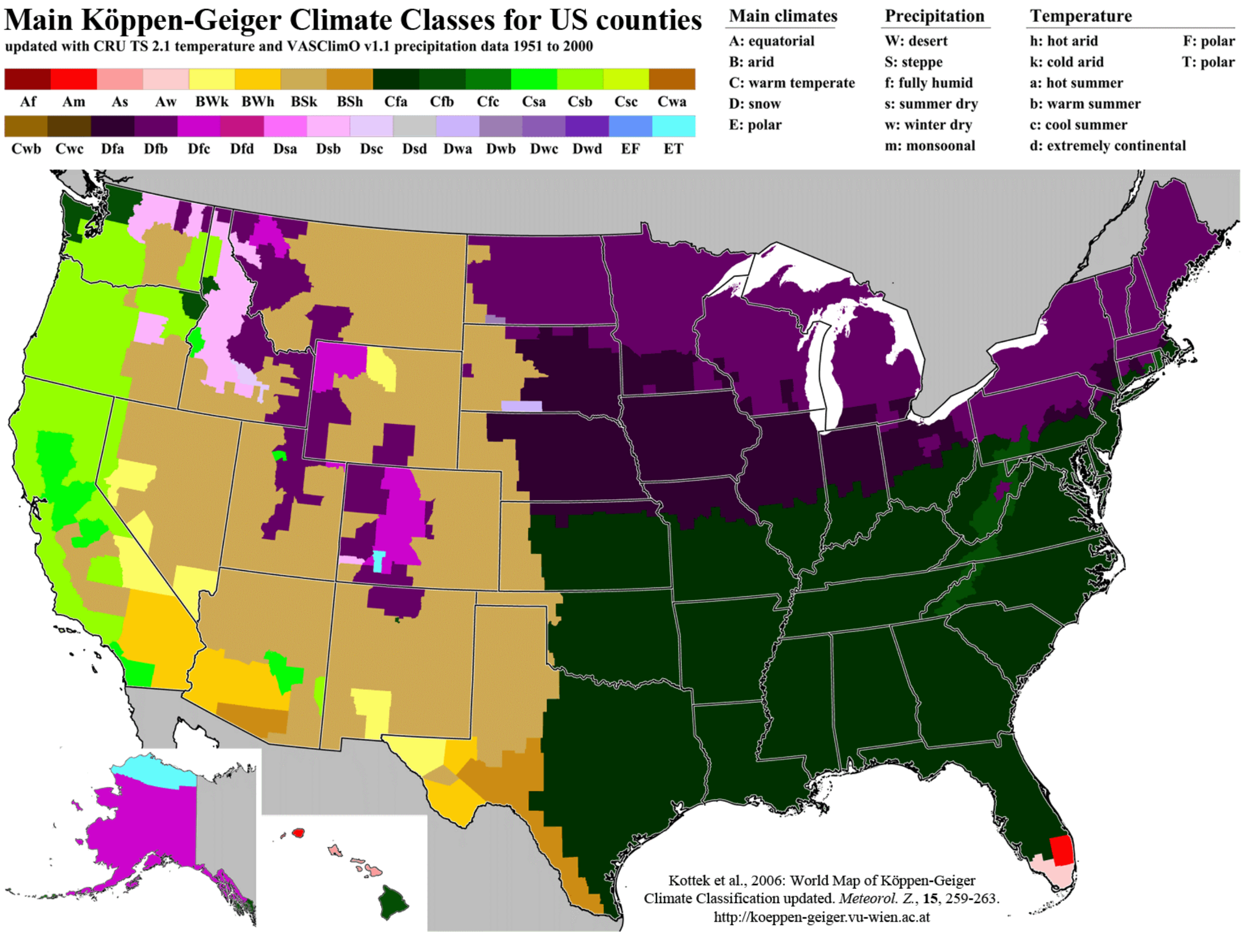
Greenhouse gas emissions will likely follow the same trend as oil and natural gas production (Center for Climate Strategies, 2007). There may be a slight decrease in transportation emissions as energy efficient technology continues to improve. The state continues to increase the number of hydroelectric dams, hydroelectric facilities, and wind farms (EIA, 2015f).

11.1.14.4. Environmental Setting: Existing Climate

The National Weather Service defines climate as the "reoccurring average weather found in any particular place" (NWS, 2011a). The widely-accepted division of the world into major climate categories is referred to as the Köppen-Geiger climate classification system. Climates within this system are classified based "upon general temperature profiles related to latitude" (NWS, 2011a). The first letter in each climate classification details the climate group. The Köppen-Geiger system further divides climates into smaller sub-categories based on precipitation and temperature patterns. The secondary level of classification details the seasonal precipitation, degree of aridity, and presence or absence of ice. The tertiary levels distinguish different monthly characteristics (NWS, 2011a).

The majority of Montana falls into climate group B (see Figure 11.1.14-2). Climates classified as B are dry climates, "in large continental regions of the mid-latitudes often surrounded by mountains" (NWS, 2011a). "The most obvious climatic feature of this climate is that potential evaporation and transpiration exceed precipitation" (NWS, 2011a). Whereas the majority of eastern Colorado falls into climate group B, portions of southern, western, and northwestern Montana are classified as climate groups D (see Figure 11.1.14-2). Climates classified as D are "moist continental mid-latitudinal climates," with "warm to cool summers and cold winters"

(NWS, 2011a). In D climates, the "average temperature of the warmest month is greater than 50 degrees Fahrenheit (°F), while the coldest month is less than negative 22 °F" (NWS, 2011a). 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).



Source: (Kottek, 2006)

Figure 11.1.14-2: Köppen-Geiger Climate Classes for U.S. Counties

Bsk – The Köppen-Geiger climate classification system classifies the majority of Montana Bsk. Climates classified as Bsk, are mid-latitude and dry. "Evaporation exceed precipitation on average but is less than potential evaporation" (NWS, 2011b). Average temperatures in Bsk climate zones are less than 64 °F. (Kottek, Grieser, Beck, Rudolf, & Rubel, 2006)

Dfb – The Köppen-Geiger climate classification system classifies portions of southern, western, and northwestern Montana as Dfb. Climates classified as Dfb are characterized as humid, with warm summers and snowy winters. Montana's secondary classification within this climate zone indicates substantial precipitation during all seasons. (Kottek, Grieser, Beck, Rudolf, & Rubel, 2006) (NWS, 2011a) (NWS, 2011b)

Dfc – The Köppen-Geiger climate classification system classifies portions of northwestern Montana as Dfc. Climates classified as Dfc are characterized subarctic, with severe winters, no dry season, and cool summers. Montana's secondary classification within this climate zone indicates substantial precipitation during all seasons. (Kottek, Grieser, Beck, Rudolf, & Rubel, 2006) (NWS, 2011a) (NWS, 2011b)

Dsb – The Köppen-Geiger climate classification system classifies portions of western Montana as Dsb. Climates classified as Dsb are characterized as humid continental climates and are found in high altitude areas, "near locations that are warm temperate with dry, hot summers" (GLOBE SCRC, 2015). During winter months, snow in Dsb climates is typically dry. In Dsb climates, at least one month is colder than 26.6 ºF and "summers are dry and warm." (GLOBE SCRC, 2015) (Kottek, Grieser, Beck, Rudolf, & Rubel, 2006) (NWS, 2011a) (NWS, 2011b)

Air Temperature

Montana's high topographic variability strongly influences the state's climate. For example, "the northern Rocky Mountains and the Continental Divide all the western one third of the state to receive a modified northern Pacific coast climate – clouds, humidity, and precipitation" (Potts, 2015). The eastern two-thirds of the state on the other hand, lie on the "northern Great Plans and the climate is semi-arid and continental" (Potts, 2015).

In addition to creating these climatic variations, the Rocky Mountains also can "produce tremendous temperature fluctuations," largely through Chinook winds (Potts, 2015). For example, "the fastest 7-minute (34 ºF), 15-minutes (42 ºF), and 24 hour (103 ºF; negative 54 ºF to 49 ºF) warm-ups ever recorded in the U.S. happened along the Rocky Mountain front in eastern Montana" (Potts, 2015). However, temperatures can change in the opposite direction just as quickly too. For example, "the greatest 24-hour chill ever recorded in the U.S. was along the front at Browning (100 ºF; 44 ºF to negative 54 ºF)" (Potts, 2015). Although rapid changes like these are uncommon, temperature fluctuations on a smaller scale happen regularly.

The average temperature throughout Montana is 41.1 °F (NOAA, 2015b). The highest temperature to occur in Montana was on July 20, 1893 and July 5, 1937 with a record high of 117 °F (NOAA, 2015c). The coldest temperature to occur in Montana was on January 20, 1954 with a record low of negative 70 °F (NOAA, 2015c).

The following paragraphs describe annual temperatures as they occur in the various climate classification zones:

Bsk – The large majority of Montana falls within the climate classification zone Bsk. Great Falls, located within central west Montana, is also within the climate classification zone Bsk. The average annual temperature in Great Falls is approximately 44.6 °F; 25.7 °F during winter months; 64.5 °F during summer months; 43.0 °F during spring months; and 44.9 °F during autumn months (NOAA, 2015d).

Dfb – Missoula, in western Montana, is within the climate classification zone Dfb. The average annual temperature in Missoula is approximately 45.9 °F; 26.4 °F during winter months; 65.7 °F during summer months; 46.0 °F during spring months; and 45.2 °F during autumn months (NOAA, 2015d). Glacier National Park, in northern Montana is also located within the climate classification zone Dfb. In northern Montana, temperatures can reach bitter colds, also as a result of dramatic topographic variations (Potts, 2015).

Dfc – Kalispell, also in western Montana, is within the climate classification zone Dfc. The average annual temperature in Kalispell is approximately 43.4 °F; 24.5 °F during winter months; 62.4 °F during summer months; 43.6 °F during spring months; and 42.7 °F during autumn months (NOAA, 2015d).

Dsb – Libby, also in western Montana, is within the climate classification zone Dsb. The average annual temperature in Libby 46.9 °F; 28.3 °F during winter months; 65.8 °F during summer months; 47.1 °F during spring months; 46.1 °F during autumn months (NOAA, 2015d).

Precipitation

In addition to affecting temperature, topography within the state also strongly influences the distribution of rainfall across the state. The greatest 24-hour precipitation record in Montana was set on June 20, 1921 with a total accumulation of 11.5 inches (NOAA, 2015c). In addition to rainfall, Montana commonly experiences abundant snowfall. The greatest 24-hour snowfall record in Montana was set on May 29, 1982 and December 27, 2003 with a total accumulation of 48 inches (NOAA, 2015c).

The following paragraphs describe annual precipitation as it occurs in the various climate classification zones:

Bsk – The large majority of Montana falls within the climate classification zone Bsk. Great Falls, located within central west Montana, is also within the climate classification zone Bsk. The average annual precipitation accumulation in Great Falls is approximately 14.75 inches; 1.53 inches during winter months; 5.60 inches during summer months; 4.75 inches during spring months; and 2.87 inches during autumn months (NOAA, 2015d).

Dfb – Missoula, in western Montana, is within the climate classification zone Dfb. The average annual precipitation accumulation in Missoula is approximately 14.13 inches; 2.59 inches during winter months; 4.25 inches during summer months; 4.23 inches during spring months; and 3.06 inches during autumn months (NOAA, 2015d). Glacier National Park, in northern Montana is also located within the climate classification zone Dfb.

Dfc – Kalispell, also in western Montana, is within the climate classification zone Dfc. The average annual precipitation accumulation in Kalispell is approximately 16.99 inches; 3.86 inches during winter months; 5.00 inches during summer months; 4.31 inches during spring months; and 3.82 inches during autumn months (NOAA, 2015d).

Dsb – Libby, also in western Montana, is within the climate classification zone Dsb. The average annual precipitation accumulation in Libby is approximately 18.40 inches; 5.23 inches during winter months; 3.93 inches during summer months; 4.14 inches during spring months; and 5.10 inches during autumn months (NOAA, 2015d).

Severe Weather Events

In Montana, the most common forms of severe weather include severe flooding, heavy winds, ice storms, thunderstorms, and snowstorms. The most common flood types to Montana are flash flooding, river flooding, burn scars and / or debris flows, ice and / or debris jams, snowmelt, dry wash, and dam breaks / levee failures (NWS, 2015a).

In 1908, severe and catastrophic flooding resulted from "excess precipitation over the western and central thirds of Montana" (NWS, 2015a). The greatest rainfall accumulation totals "were recorded in Gallatin, Park, Sweet Grass, Carbon, and western Cascade counties, where the totals for the month ranged from 8 to nearly 12 inches" (NWS, 2015a). Heavy precipitation continued into the following month, where western portions of the state reported rainfall totals between four to 12 inches (NWS, 2015a). Heavy rains, combined with excess snowmelt, caused the most destructive floods to occur in southwestern Montana, where "unprecedented floods in nearly all rivers and streams" were recorded (NWS, 2015a). Property loss throughout Missoula, Livingston, Butte, Great Falls, and Helena was also severe. In addition, the cities of Helena and Butte were "without train service in any direction" for 24-hours (NWS, 2015a). Specifically in Butte, heavy rains were followed by nine inches of snowfall that caused even further damages, leaving the city without streetcar services or electricity for 25-hours. Perhaps most catastrophically, the 1908 flood left "more than 6.6 million cubic yards of mine waste in the sediment behind" Clark's Dam (NWS, 2015a). This waste was "laden with heavy metals and arsenic" that "contaminated the area from the headwaters of the Silver Bow Creek on down the Clark Fork, and poisoned the aquifer that was used by Milltown residents for generations" (NWS, 2015a). This site was designated as a Superfund site in 1983 by the USEPA. (NWS, 2015a)

Many consider the flood that occurred in 1964 to be Montana's worst flooding disaster since the 1908 flood. This flood was the result of "above normal mountain snowpack" and heavy rainfall (NWS, 2015a). "Rainfall in excess of 10 inches in 36-hours was recorded at several points in the Glacier Park area where the Triple Point on the Upper Columbia, Missouri, and Hudson Bay drainages meet" (NWS, 2015a). Property loss resulting from this flood exceeded $62M. (NWS, 2015a)

Documentation of severe thunderstorms, hail, wind, and tornadoes in Montana rely heavily on "the public's observation and reporting to the National Weather Service" (Montana Department of Military Affairs, 2010). Therefore, populated areas and areas close to weather stations may be more accurate, whereas storms in rural areas may go unreported. In Montana, the majority of tornadoes occur in June, followed by the month of July. Between 1950 and 2009, Montana experienced "an annual average of six tornadoes" (Montana Department of Military Affairs, 2010). "From 1950 to 2009, 100 of the 356 recorded tornado events in Montana were considered F1 (73 to 112 mph) speeds or greater as recorded by the National Weather Service" (Montana Department of Military Affairs, 2010). Between 1880 and 2009, five deaths and 68 injuries occurred due to tornadoes. In addition, 8 deaths and 27 injuries occurred over a 60-year period as a result of lightning strikes. Severe storms in Montana have caused approximately $70.6M in property damages and $35.2M crop damages between the years of 1950 and 2009. In Montana, the frequency and location of severe thunderstorms, hail, wind, and tornadoes are the best determiners of likely future events. "Concentrations of these recorded events identify patterns of where they may likely occur in the future." (Montana Department of Military Affairs, 2010)

In addition to floods, tornadoes, wind, hail, and severe thunderstorms, Montana has also experienced severe drought and wildfire. In 2012, a severe drought occurred throughout many central and western states and is considered by NOAA to be "the most extensive drought to affect the U.S. since the 1930s" (NOAA , 2014). As a result, central and western agricultural states experienced "widespread harvest failure for corn, sorghum, and soybean crops" (NOAA , 2014). The 2012 drought also lead to severe wildfires throughout many of these central and western states (NOAA , 2014). In total, 9.2 million across the U.S. were lost to wildfires. Some of the most destructive fires occurred in Montana (NOAA , 2014).

11.1.15. Human Health and Safety

11.1.15.1. Definition of the Resource

The existing environment for health and safety is defined by occupational and environmental hazards likely to be encountered during the deployment, operation, and maintenance of towers, antennas, cables, utilities, and other equipment and infrastructure at existing and potential FirstNet telecommunication sites. There are two human populations of interest within the existing environment of health and safety, (1) telecommunication occupational workers and (2) the public near telecommunication sites. Each of these populations could experience different degrees of exposure to hazards as a result of their relative access to FirstNet telecommunication sites and their function throughout the deployment of the FirstNet telecommunication network infrastructure.

The health and safety issues reviewed in this section include occupational safety for telecommunications workers, contaminated sites, and manmade or natural disaster sites. This section does not evaluate the health and safety risks associated with radio frequency (RF) emissions or vehicle traffic. Vehicle traffic is evaluated in Section 11.1.1, Infrastructure. RF emissions are discussed in Section 2.4, RF Emissions.

There are unique infectious diseases throughout the continental US, such as Valley Fever (Centers for Disease Control and Prevention, 2016)[161]. Because of the great variety of diseases, as well as all of the variables associated with contracting them, this Final PEIS will not be evaluating infectious diseases. For information on infectious diseases, please visit the Centers for Disease Control and Prevention website at www.cdc.gov.

11.1.15.2. Specific Regulatory Considerations

Federal organizations, such as the OSHA, USEPA, the U.S. Department of Health and Human Services, and others protect human health and the environment. In Montana, the Montana Department of Labor and Industry (MTDLI) regulate public sector occupational safety, and the

[161] Valley fever is caused by breathing in the spores of the fungus *Coccidiodes*, which lives in the soil of infected areas. Valley fever primarily occurs in the southwest and California, although it has recently been found in parts of Washington State.

MDEQ regulates waste and environmental pollution. Federal OSHA regulations apply to workers through either OSHA, or stricter state-specific plans that must be approved by OSHA. Montana does not have an OSHA-approved "State Plan," so private and OSHA enforces public sector occupational safety and health programs in the state. The MTDPHHS regulates health and safety of the public.

Federal laws relevant to protecting occupational and public health and safety are summarized in Appendix C, Environmental Laws and Regulations. Table 11.1.15-1 below summarizes the major Montana laws relevant to the state's occupational health and safety, hazardous materials, and hazardous waste management programs.

Table 11.1.15-1: Relevant Montana Human Health and Safety Laws and Regulations

State Law/ Regulation	Regulatory Agency	Applicability
Montana Code: Title 50, Chapter 71, Part 1	MTDLI	Allows the state to promote occupational safety and health, provide education to public sector employers and employees, conduct research, and investigate occupational injuries, illnesses, and deaths involving public sector employees.
Montana Code: Title 50, Chapter 72	MTDLI	Establishes mine safety regulations for surface or underground metal or nonmetallic mines, excluding coalmines.
Montana Code: Title 50, Chapter 77, Part 1	MTDLI	Establishes regulations for scaffolds, temporary floors, planking, guarding of stairways, and penalties for violations.
Montana Code: Title 82, Chapter 4	MDEQ	Describes requirements to review new mine site locations and reclamation, prevent undesirable offsite environmental impacts, and to promote the health, safety, and general welfare of the people.

Source: (Montana Legislature, 2017c) (Montana Legislature, 2017d)

11.1.15.3. 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 may also be performed at dangerous heights, 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. 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 slip, 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, 2015a). In addition to tower climbing hazards, telecommunication workers have restricted workspace on rooftops or work from bucket trucks parked on uneven ground. Cumulatively, these conditions present fall and injury hazards to telecommunication workers, and the public who may be observing the work or transiting the area (International Finance Corporation, 2007).

Trenches and confined spaces – Installation and maintenance of underground utilities in urban areas or utility manholes[162] are examples of when trenching or confined space work could occur. Installation of telecommunications activities involves laying conduit and limited trenching (generally 6 to 12 inches in width) would occur. 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. The public can be at risk of stepping or driving motor vehicles into open trenches, or falling into uncovered confined spaces.

Heavy equipment and machinery – New and replacement facility deployment and maintenance can involve the use of heavy equipment and machinery. During the lifecycle of a telecommunication site, heavy equipment such as bulldozers, backhoes, dump trucks, cement trucks, and cranes are used to prepare the ground, transport materials and soil, and raise large sections of towers and antennas. Telecommunication workers may be exposed to the additional site traffic and often work near heavy equipment to direct the equipment drivers and to accomplish work objectives. Accessory machinery such as motorized pulley systems, hydraulic metal shears, and air driven tools present additional health and safety risks as telecommunication work sites. These pieces of machinery can potentially sever skin and bone, or cause other significant musculoskeletal injuries to the operator.

Energized equipment and existing utilities – Electrical shock from energized equipment and utilities is an elevated risk at telecommunication sites due to the amount of electrical energy required for powering communication equipment and broadcasting towers. Telecommunication cables are often co-located with underground and overhead utilities, which can further increase occupational risk during earth-breaking and aerial work.

Optical fiber safety – Optical fiber cable installation and repair presents additional risks to telecommunications workers, including potential eye or tissue damage, through ingestion, inhalation, or other contact with glass fiber shards. The shards are generated during termination and splicing activities, and can penetrate exposed skin (International Finance Corporation, 2007). Additionally, fusion splicing (to join optical fibers) in confined spaces or other environments with the potential for flammable gas accumulation presents risk of fire or explosion (Fiber Optic Association, 2010).

Noise – Sources of excess noise at telecommunication sites include heavy equipment operation, electrical power generators and other small engine equipment, air compressors, electrical and pneumatic power tools, and road vehicles, such a diesel engine work trucks. The cumulative noise environment has the potential to exceed the OSHA acceptable level of 85 decibels (dB) per 8-hour time weighted average (see Section 11.1.13, Noise and Vibration) (OSHA, 2002).

[162] 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.

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 use of potentially hazardous products (e.g., herbicides). Secondary hazardous materials (e.g., exhaust fumes) may be a greater health risk than the primary hazardous material (e.g., diesel fuel). Furthermore, the use of hazardous materials creates down-stream potential to generate hazardous waste. While it is unlikely that any FirstNet activities would involve the generation or storage of hazardous waste, older existing telecommunication structures and sites could have hazardous materials present, such as lead-based (exterior and interior) paint at outdoor structures or asbestos tiles and insulation in equipment sheds. The public, unless a telecommunication work site allows unrestricted access, are typically shielded from hazardous materials and hazardous wastes that are components of telecommunication site work.

Aquatic environments – Installation of telecommunication lines may include laying, burying, or boring lines under wetlands and waterways, including lakes, rivers, ponds, and streams. Workers responsible for these activities operate heavy equipment from soft shorelines, boats, barges, and other unstable surfaces. There is potential for equipment and personnel falls, as well as drowning in waterbodies. Wet work conditions also increase risks of electric shock and hypothermia.

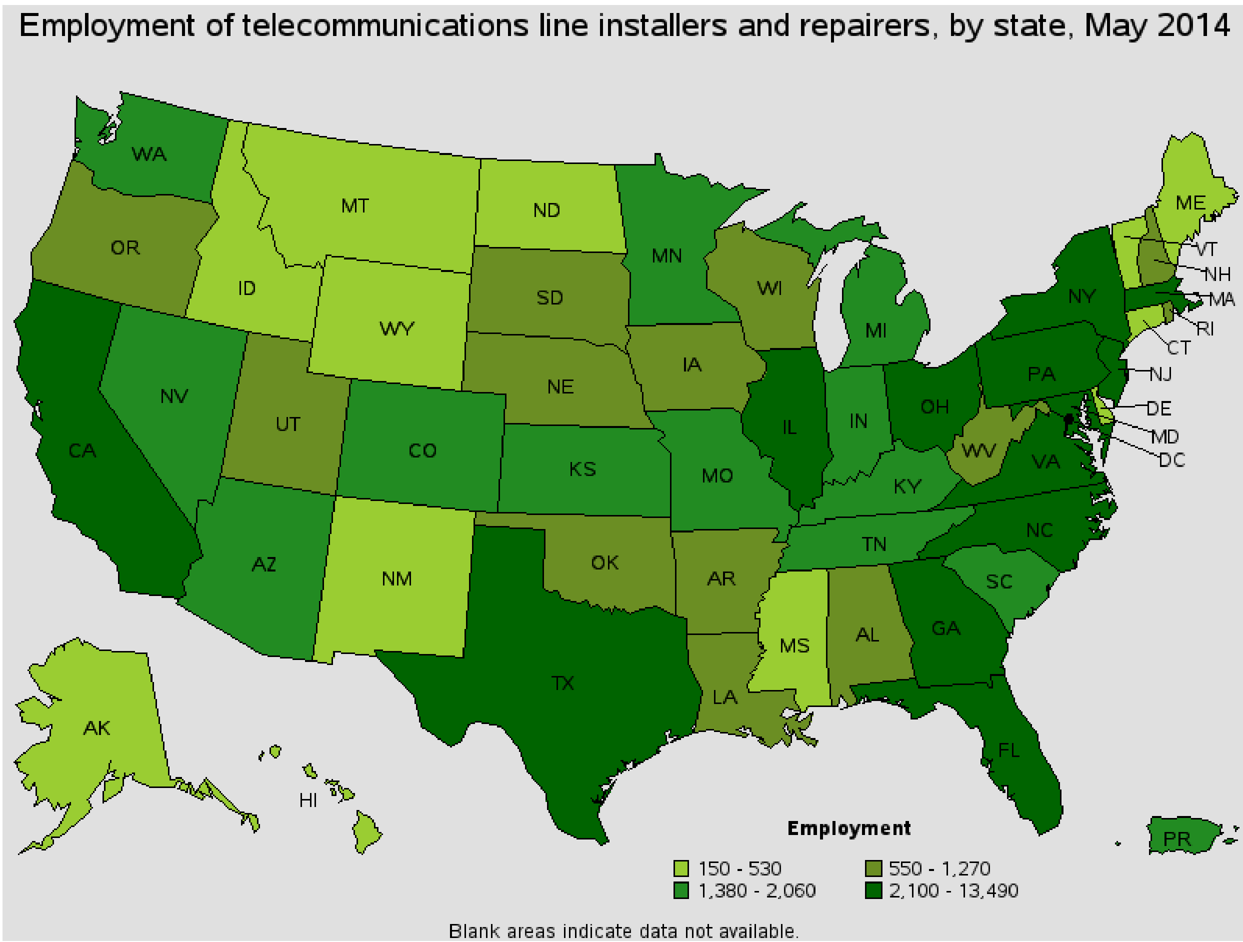
Outdoor elements – Weather conditions have the potential to quickly and drastically reduce safety, and increase hazards at telecommunication work sites. Excessive heat and cold conditions impact judgement, motor skills, hydration, and in extreme cases may lead to hyper- or hypothermia. Precipitation, such as rain, ice, and snow, create slippery climbing conditions and wet or muddy ground conditions. Lightning strikes are risks to telecommunication workers climbing towers or working on top of buildings.

Telecommunication Worker Occupational Health and Safety

The 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 both telecommunication equipment installers and repairers, except line installers (SOC code 49-2022), or telecommunication line installers and repairers (SOC code 49-9052). Both occupations are reported under the installation, maintenance and repair occupations (SOC code 49-0000).

As of May 2014, there were 810 telecommunication equipment installers and repairers, and 260 telecommunication line installers and repairers working in Montana (BLS, 2015c). In 2013, the most recent year that data are available, Montana had 3.4 reportable cases of nonfatal occupational injuries and illnesses in the telecommunications industry per 100 full-time workers (BLS, 2013a). By comparison, there were 2.2 nonfatal occupational injuries and illnesses reported nationwide per 100 full-time workers in the telecommunications industry (BLS, 2014a).

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). Montana has not had any fatalities in the telecommunications industry or telecommunications occupations since 2003, when data are first available (BLS, 2015d).



Source: (BLS, 2014b)

Figure 11.1.15-1: Number of Telecommunication Line Installers and Repairers Employed per State, May 2014

Public Health and Safety

The public unlikely to encounter occupational hazards at telecommunication sites due to limited access. Environmental and public health data are reported at the federal level through the Center for Disease Control and Prevention Wide-ranging Online Data for Epidemiologic Research

(WONDER). While the WONDER database cannot be searched for cases specific to telecommunication sites, many available injury categories are consistent with risks present at telecommunication sites. For example, between 1999 and 2013, there were 36 fatalities due to a fall from, out of, or through a building or structure, and 11 fatalities due to being caught, crushed, jammed or pinched in or between objects (Centers for Disease Control and Prevention, 2015). Among the public, trespassers entering telecommunication sites would be at the greatest risk for exposure to health and safety hazards.

11.1.15.4. 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 telecommunication site occupants, including practices before current environmental laws, could result in environmental contamination, affecting the quality of soil, sediments, groundwater, surface water, and air.

Contaminated property is typically classified by the federal environmental remediation or cleanup programs that govern them, such as sites administered through the Superfund Program[163] 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.

In Montana, the MDEQ, Federal Superfund and Construction Bureau manages NPL sites that have been delegated to the state. The program provides management and technical oversight on remedial action projects, and coordinates with other agencies to complete projects (USGS, 2012e). Montana's Hazardous Waste Cleanup Bureau, State Superfund Program is responsible for remediating sites that have had a release of a hazardous substance, except for Abandoned Mine Lands (AMLs) and NPL facilities (MDEQ, 2015h). As of May 2016, Montana had 11 RCRA Corrective Action sites,[164] 252 brownfields, and 18 proposed or final Superfund/NPL sites (USEPA, 2015q). Based on a September 2015 search of USEPA's Cleanups in My Community (CIMC) database, four Superfund sites still exist in Montana where contamination has been detected at an unsafe level, or a reasonable human exposure risk exists (Anaconda Minerals Co., near Black Eagle, MT; Burlington Northern Livingston Shop Complex, near Livingston, MT; Libby Asbestos Site, near Libby, MT; and Upper Tenmile Creek Mining Area,

[163] The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) enacted in 1980, commonly referred to as the Superfund Program, governs abandoned hazardous waste sites, and collects a tax on chemical and petroleum industries. CERCLA was amended by the Superfund Amendments and Reauthorization Act (SARA) in 1986; see Appendix C, Environmental Laws and Regulations, (USEPA, 2011).
[164] Data gathered using the U.S. Environmental Protection Agency's Cleanups in My Community (CIMC) search on October 1, 2015, for all sites in the State of Montana, where cleanup type equals 'RCRA Hazardous Waste – Corrective Action,' and excludes sites where cleanup phase equals 'Construction Complete' (i.e., no longer active).

near Helena, MT) (USEPA, 2015r). The Voluntary Cleanup and Redevelopment Act (VCRA) allows an entity to submit a Voluntary Cleanup Plan (VCP), which encourages voluntary cleanup and redevelopment of contaminated sites to promote economic development (MDEQ, 2015p).

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. The Toxic Release Inventory database is a measure of the industrial nature of an area and the over-all chemical use, and can be used to track trends in releases over time. The "releases" do not necessarily equate to chemical exposure by humans or necessarily constitute to quantifiable health risks because the releases include all wastes generated by a facility – the majority of which are disposed of via managed, regulated processes that minimize human exposure and related health risks (e.g., in properly permitted landfills or through recycling facilities). As of September 2015, Montana had 57 TRI reporting facilities. The identification of a TRI facility does not necessarily indicate that the facility is actively releasing to the environment; the majority of TRI reports involve permitted disposal facilities. According to the USEPA, in 2013, the most recent data available, Montana released 34.8 million pounds of toxic chemicals through on-site and offsite disposal or other releases, largely from the metals mining and electric utilities industries. This accounted for 0.85 percent of total nationwide TRI releases, ranking Montana 46 of 56 states and territories based on total releases per square mile (USEPA, 2013c).

Another USEPA program is the National Pollutant 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. As of November 12, 2015, Montana had 42 permitted major discharge facilities registered with the USEPA Integrated Compliance Information System (USEPA, 2015s). The Montana Pollutant Discharge Elimination System (MPDES) controls point source discharges of wastewater to protect the quality of surface water. Point sources of wastewater discharge in Montana are required to obtain an MPDES permit (MDEQ, 2015q).

The National Institute of Health, U.S. National Library of Medicine, provides an online mapping tool called TOXMAP, which allows users to "visually explore data from the USEPA's TRI and Superfund Program" (National Institute of Health, 2015a). Figure 11.1.15-2 provides an overview of potentially hazardous sites in Montana.

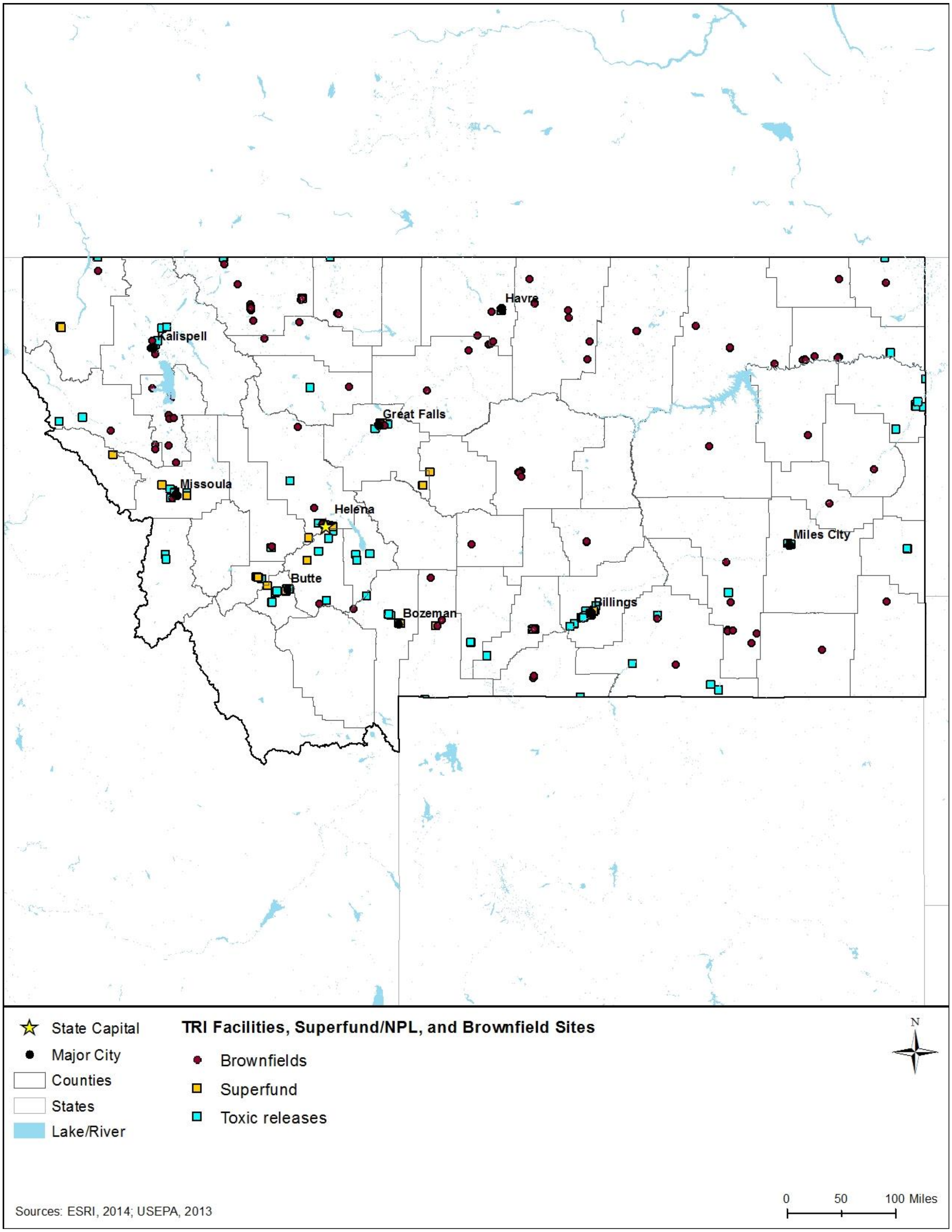


Figure 11.1.15-2: TOXMAP Superfund/NPL and TRI Facilities in Montana (2013)

Telecommunication Worker Occupational Health and Safety

Telecommunications sites may be situated 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 also be impacted from vapor intrusion infiltrating indoors from contaminated soil or groundwater that are present beneath a building's foundation. As of November 2015, there are nine USEPA-regulated telecommunications sites in Montana (USEPA, 2015t). These sites are regulated under one or more environmental programs including NPDES compliance, Superfund/NPL status, and TRI releases.

Montana has not reported occupational fatalities within the telecommunications industry resulting from exposure to "harmful substances or environments" since 2003, when data are first available (BLS, 2015d). By comparison, BLS reported three fatalities in 2011 and three 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 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, 2014c).

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 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 MTDPHHS 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 (MTDPHHS, 2015c).

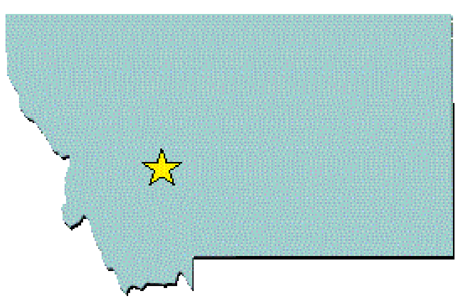
11.1.15.5. Environmental Setting: Abandoned Mine Lands at or near Telecommunications Sites

Another health and safety hazard in Montana includes surface and subterranean mines. In 2015, the Montana mining industry ranked 21st for non-fuel minerals (primarily palladium, molybdenum concentrates, copper, platinum, and gold), generating a value of $1.34B (USGS, 2016c). In 2013, the most recent data available, Montana had 6 coalmining operations (one underground and five surface) (EIA, 2013b). Health and safety hazards at active mines and AMLs include falling into open shafts, cave-ins from unstable rock and decayed support, deadly gases and lack of oxygen inside the mine, unused explosives and toxic chemicals, horizontal and vertical openings, high walls, and open pits (BLM, 2015h).

The MDEQ, Abandoned Mine Lands Section administers mine reclamation projects funded by grants from the Surface Mining Control and Reclamation Act (SMCRA). The AML section is responsible for managing AML health and safety hazards resulting from pre-1977 mining operations (MDEQ, 2015r). Figure 11.1.15-4 shows the distribution of High Priority (Priority 1, 2 and adjacent Priority 3) AMLs in Iowa, where Priority 1 and 2 sites pose a significant risk to human health and safety, and Priority 3 sites pose a risk to the environment. As of November 2015, Montana had 736 Priority 1 and 2 AMLs, with 706 unfunded problem areas (U.S. Department of Interior, Office of Surface Mining Reclamation and Enforcement, 2015a).

Spotlight on Montana AMLs: Upper Tenmile Creek Mining Area Superfund Site

The Upper Tenmile Creek Mining Area site, located southwest of Helena, MT, is one of four Montana Superfund sites where human exposure risks are present. The site includes a series of abandoned mines historically used for gold, lead, zinc, and copper production back to 1870. The USEPA has identified 150 abandoned mines within the area, many within the Tenmile Creek watershed, which supplies drinking water to 70 percent of Helena, MT residents. Seventy of the known 150 abandoned mines were prioritized for cleanup after exposure risks to arsenic and lead contaminated soils and groundwater were identified at nearby residences. Between 1999 and 2000, the USEPA spent $10M to remove more than 150,000 cubic yards of contaminated soil and mine waste from the Upper Tenmile Creek Mining Area. (USEPA, 2004)



Source: (Lewis and Clark County, 2015)

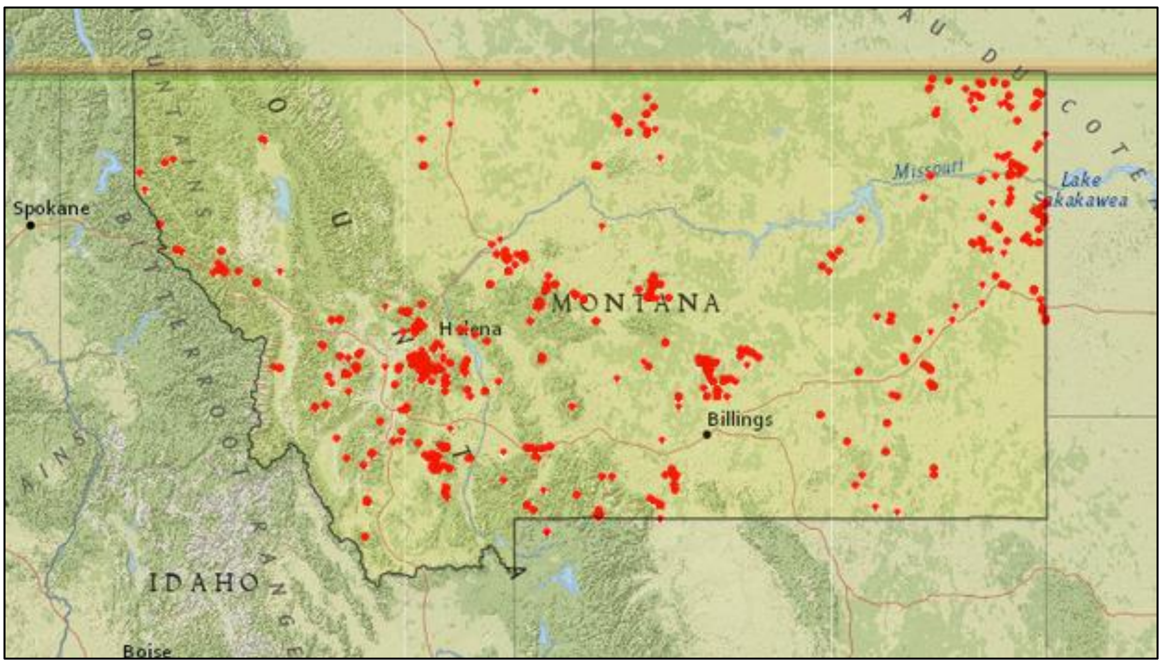
Figure 11.1.15-3: Upper Tenmile Soils Clean-up Areas near Helena, MT

Telecommunication Worker Occupational Health and Safety

Telecommunications sites may be on or near AMLs or coalmine fires, presenting occupational exposure risks from fire, toxic gases, and subsidence during FirstNet deployment, operation, and maintenance activities. Because the locations of many abandoned mines are unknown or hidden, these mines pose a risk to telecommunications workers because they may be encountered during deployment and maintenance operations.

Public Health and Safety

Subterranean coalmines present additional health and safety risks, by generating toxic combustible gases, which can penetrate the surface through ground fractures, potentially seeping into residential structures. Additionally, coalmine fires can consume enough sub-surface material, that risk of subsidence increases. As a result, AMLs and coalmine fires in particular, can result in evacuations of entire communities. (U.S. Department of the Interior, Office of Surface Mining Reclamation and Enforcement, 2015b)



Source: (U.S. Department of the Interior, Office of Surface Mining Reclamation and Enforcement, 2015c)

Figure 11.1.15-4: High Priority Abandoned Mine Lands in Montana (2015)

11.1.15.6. Environmental Setting: Natural & Manmade Disaster Sites

Natural and manmade disaster events can create health and safety risks, as well as present unique hazards, to telecommunication workers and the 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 incident involving the release of hazardous constituents. A common example of a natural disaster is flooding. Floodwaters damage transportation infrastructure (roads, railways, etc.) and utility lines (sewer, water, electric power, broadband, natural gas lines, etc.). Hazardous chemicals and sanitary wastes often contaminate floodwaters, which can cause headaches, skin rashes, dizziness, nausea, excitability, weakness, fatigue, and disease to exposed workers (OSHA, 2003). Physical hazards may also be present at disaster sites, such as downed utility lines, debris blockage or road washout conditions, which increases exposure risks to telecommunication workers. Climbing and working from tower structures damaged by wind increases the risk of slips, trips, or falls. During natural and manmade disasters, access to the telecommunication sites can be obstructed by debris.

Spotlight on Montana Manmade Disaster: Alberton Chlorine Spill

In April 1996, 19 train cars derailed near Alberton, MT, releasing 1300,000 pounds of chlorine gas, 17,000 gallons of potassium hydroxide, and 85 dry gallons of sodium chlorate (Figure 11.1.15-5). The incident forced the evacuation of 1,000 people in a 15 square mile area, injured 123, hospitalized 9 and killed 1 due to chlorine inhalation.

The chlorine gas cloud generated from the derailment also drifted across the nearby Interstate 90 and caused traffic accidents and stranded motorists. As of August 2007, this incident is the second largest chlorine release in the United States

Source: (Montana Disaster and Emergency Services, 2007)

Figure 11.1.15-5: Aerial View of Alberton Derailment (1996)

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 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, MTDLI 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. Of the 40 NRC-reported incidents for Illinois in 2015 with known causes, no incidents were attributed to natural disaster (e.g., natural phenomenon), while 40 incidents were attributed to manmade disasters (e.g., derailment, dumping, equipment failure, operator error, over pressuring, transport accident, or trespasser) or other indeterminate causes (USCG, 2015). For example, due to a single-vehicle accident in 2012 near Butte, MT, a tanker truck released approximately 7,000 gallons of magnesium chloride (U.S. Coast Guard, 2012). Such incidents present unique, hazardous challenges to telecommunication workers responding during natural and manmade disasters.

Public Health and Safety

Hazards present during natural and manmade disasters are often far-reaching, affecting large geographic areas and affecting all populations living within the area. Similar to telecommunication workers, the public faces risks during these types of disasters, such as compromised transportation infrastructure and utilities, potential for exposure to unknown chemical and biologic hazards, and inadequate medical support. In 2014, a year of severe storms, flooding, and ice jams, Montana experienced 7 weather-related injuries and 6 fatalities (NWS, 2015b). By comparison, 384 weather-related fatalities and 2,203 injuries were reported nationwide the same year (NWS, 2015b).

11.2. 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 measures 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 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.

11.2.1. Infrastructure

11.2.1.1. Introduction

This section describes potential impacts to infrastructure in Montana associated with construction, deployment, and operation of the Proposed Action and alternatives. See Chapter 19, Best management Practices 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.

11.2.1.2. Impact Assessment Methodology and Significance Criteria

The impacts of the Proposed Action on infrastructure were evaluated using the significance criteria presented in Table 11.2.1-1. The categories of impacts are defined at the programmatic level as *potentially significant*, *less than significant with mitigation measures incorporated*, *less than significant*, or *no impact*. Characteristics of each impact type, including magnitude or intensity, geographic extent, and duration or frequency, were used to determine the impact significance rating associated with each potential impact.

Given the nature of this programmatic evaluation, and because the Proposed Action could potentially cover a wide variety of actions that would take place in various landscapes, the potential impacts to infrastructure addressed in this section are presented as a range of possible impacts.

Table 11.2.1-1: Impact Significance Rating Criteria for Infrastructure at the Programmatic Level

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	Impact Level: Less than Significant with BMPs and Mitigation Measures Incorporated	Impact Level: Less than Significant	Impact Level: 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

<table>
<tr><th rowspan="2">Type of Effect</th><th rowspan="2">Effect Characteristics</th><th colspan="4">Impact Level</th></tr>
<tr><th>Potentially Significant</th><th>Less than Significant with BMPs and Mitigation Measures Incorporated</th><th>Less than Significant</th><th>No Impact</th></tr>
<tr><td rowspan="3">Effects to utilities, including electric power transmission facilities and water and sewer facilities</td><td>Magnitude or Intensity</td><td>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.</td><td rowspan="3">Effect that is potentially significant, but with mitigation is less than significant.</td><td>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.</td><td>There would be no perceptible impacts to delivery of other utilities and no service disruptions.</td></tr>
<tr><td>Geographic Extent</td><td>Local/City, County/Region, or State/Territory.</td><td>Local/City, County/Region, or State/Territory.</td><td>Local/City, County/Region, or State/Territory.</td></tr>
<tr><td>Duration or Frequency</td><td>Effects to other utilities would be seen throughout the entire construction phase.</td><td>Effects to other utilities would be of short duration (minutes to hours) and would occur sporadically during the entire construction phase.</td><td>NA</td></tr>
</table>

NA = Not Applicable

11.2.1.3. 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 construction phases of deployment. Depending on the exact site locations and placement of new assets in the field, temporary impacts on traffic congestion, railway use, airport 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., MDT, airport authorities, and railway companies) to ensure proper coordination during deployment. Based on the impact significance criteria presented in Table 11.2.1-1, 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 local health, public safety, and emergency response services through enhanced communications infrastructure, thereby increasing capacity for and enhancing the ability of first responders to communicate during emergency response situations. Based on the impact significance criteria presented in Table 11.2.1-1, potential negative impacts would be *less than significant*. Substantial beneficial impacts are likely to result from implementation.

Modifies Existing Public Safety Response Telecommunication Practices, Physical Infrastructure, or Level of Service in a manner that directly affects Public Safety Communication Capabilities and Response Times

The Proposed Action and alternatives contemplated by FirstNet would not cause negative impacts to existing public safety response telecommunication practices, physical infrastructure, or level of service in a manner that directly affects public safety communication capabilities and response times. Based on the impact significance criteria presented in Table 11.2.1-1, any potential impacts would be *less than significant* during deployment. As described above, during deployment and system optimization, existing services likely would remain operational in a redundant manner ensuring continued operations and availability of services to the public. Once operational, state and local public safety organizations would need to evaluate telecommunication practices and standard operating procedures (SOPs). FirstNet's mission is to complement such practices and SOPs in a positive manner; therefore, only beneficial or complementary impacts would be anticipated. Public safety communication capabilities and response times would be expected to also experience beneficial impacts through enhanced communications abilities. It is possible that FirstNet would be upgrading physical telecommunications infrastructure, thus the infrastructure would also experience a positive and beneficial impact. Disposal or reuse of old public safety communications infrastructure would also likely need to be considered once the specifics are known. Any negative impacts would be expected to be *less than significant* given the short-term nature of the deployment activities.

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.[165] Anticipated impacts would be *less than significant* due to the limited extent and temporary nature of the deployment.

Effects to Utilities, including Electric Power Transmission Facilities, and Water and Sewer Facilities

The activities proposed by FirstNet would have *less than significant* impacts on utilities, 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.

11.2.1.4. Potential Impacts of the Preferred Alternative

The following section assesses potential impacts associated with implementation of the Preferred Alternative, including deployment and operation activities.

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[165] 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.

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 at the Programmatic Level

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 at the Programmatic Level

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),[166] huts, or other associated facilities or hand-holes to access fiber could result in potential impacts to infrastructure resources, depending on the specific assets connected on either end of the buried fiber. If a fiber optic plant is being used to tie into existing telecommunications assets, then localized impacts to telecommunications sites could occur during the deployment phase, however, it is anticipated that this tie-in would cause *less than significant* impacts as the activity would be temporary and minor.
  - New Build – Aerial Fiber Optic Plant: Installation of a new aerial fiber optic plant could impact new telecommunications infrastructure through the installation of new or replacement of existing telecommunications poles.
  - Collocation on Existing Aerial Fiber Optic Plant: Similar to new build activities (above), collocation on existing aerial fiber optic plant could include installation of new or replacement towers requiring ground disturbance.
  - New Build – Submarine Fiber Optic Plant: The installation of cables in or near bodies of water would not impact infrastructure resources because there would be no local infrastructure to impact. However, impacts to infrastructure resources could potentially occur as result of the construction of landings and/or facilities on shore or the banks of water bodies that accept the submarine cable, depending on the exact site location and proximity to existing infrastructure.
  - Installation of Optical Transmission or Centralized Transmission Equipment: Installation of transmission equipment such as small boxes or huts, or access roads, could potentially impact infrastructure. Impacts could include disruption of service in transportation corridors, disruption of service to telecommunications infrastructure, or other temporary impacts.
- Wireless Projects
  - New Wireless Communication Towers: Installation of new wireless towers and associated structures (generators, equipment sheds, fencing, security and aviation lighting, electrical feeds, and concrete foundations and pads) or access roads might result in temporary or unintended impacts to current utility services during installation or interconnection activities. Generally, however, these deployment activities would be independent and would not be expected to interfere with other existing towers and structures. In addition, installation activities would have beneficial impacts due to expansion of infrastructure at a local level. Such activities could enhance public safety infrastructure, and other telecommunications as the site could potentially be available for subsequent collocation.

[166] Points of Presence are connections or access points between two different networks, or different components of one network.

- 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 utilized but 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 existing or new telecommunications sites, and more permanent impacts on utilities, if new infrastructure required tie-in to the electric grid.

These impacts are expected to be *less than significant at the programmatic level* as the deployment activities will likely be of short duration (generally a few hours to a few months depending on the activity), would be regionally based around the on-going phase of deployment, and minor. Chapter 19, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

Positive impacts to infrastructure resources may result from the expansion of public safety and commercial telecommunications capacity and an improvement in public safety telecommunications coverage, system resiliency, response times, and system redundancy.

Operation Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, operation activities associated with the Preferred Alternative would consist of routine maintenance and inspection of the facilities. Any major infrastructure replacement as part of ongoing system maintenance would result in potential impacts similar to the abovementioned deployment impacts. It is anticipated that there would be *no impacts* to infrastructure at the programmatic level 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 occur. These potential impacts would be expected to be minor and temporary as explained above.

Numerous beneficial impacts would be associated with operation of the NPSBN. The new system is intended to result in substantial improvements in public safety response times and the ability to communicate effectively with and between public safety entities, and would 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. Chapter 19, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

11.2.1.5. Alternatives Impact Assessment

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

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 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, at the programmatic level, implementation of deployable technologies could result in *less than significant* impacts to infrastructure even if deployment requires expansion of infrastructure, such as paving of previously unpaved surfaces or other new infrastructure built to support deployment. This is primarily due to the small amount of paving or new infrastructure that might have to be constructed to accommodate the deployable technologies. The site-specific location of deployment would need to be considered, and any local infrastructure assets (transportation, telecommunications, or utilities) would need to be considered, planned for, and managed accordingly to try and 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* at the programmatic level to infrastructure resources associated with routine inspections of the Preferred Alternative, assuming that the same access roads used for deployment are also used for inspections. If usage of heavy equipment, as part of routine maintenance or inspection occurs off an established access road or utility ROW, or if additional maintenance-related construction activities occur within public road and utility ROWs, *less than significant* impacts would likely still occur to transportation systems or utility services due to the limited amount of new infrastructure needed to accommodate the deployable technologies. Chapter 19, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

No Action Alternative

Under the No Action Alternative, the NPSBN would not be deployed; therefore, there would be no associated deployment or installation of wired, wireless, deployable infrastructure or satellites and other technologies. Therefore, there would be *no impacts* to infrastructure from the No Action Alternative. Environmental conditions would therefore be the same as those described in Section 11.1.1, Infrastructure. The state also would not realize positive, beneficial impacts to infrastructure resources described above.

11.2.2. Soils

11.2.2.1. Introduction

This section describes potential impacts to soil resources in Montana associated with deployment and operation of the Proposed Action and alternatives. See Chapter 19, 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.

11.2.2.2. Impact Assessment Methodology and Significance Criteria

The impacts of the Proposed Action on soil resources were evaluated using the significance criteria presented in Table 11.2.2-1. As described in Section 11.1.2, Environmental Consequences, the categories of impacts are defined at the programmatic level, as *potentially significant*, *less than significant with mitigation measures 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 11.2.2-1: Impact Significance Rating Criteria for Soils at the Programmatic Level

Type of Effect	Effect Characteristics	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

11.2.2.3. 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 Montana and other states with similar geography and weather patterns is the erosion of construction site soils to natural waterways, where the sediment could impair water and habitat quality, and potentially affect aquatic plants and animals (NRCS, 2000). Areas exist in Montana that have steep slopes (i.e., greater than 20 percent) or where the erosion potential is medium to high, including locations with Argids, Cryalfs, Cryands, Cryepts, Cryods, Cryolls, Orthents, Psamments, Udalfs, Udepts, Uderts, Udolls, Ustalfs, Ustepts, Usterts, Ustolls, Vitrands, Xeralfs, Xerepts, and Xerolls suborders, which are found in the state (see Section 11.1.2.6, Soil Erosion and Figure 11.1.2-2).

Based on the impact significance criteria presented in Table 11.2.2-1, building of FirstNet's network deployment sites could cause *potentially significant* erosion at locations with highly erodible soil and steep grades. However, for the majority of projects, impacts to soils would be expected to be *less than significant* at the programmatic level, given the short-term and temporary duration of the activities.

To the extent practicable, FirstNet would 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 19).

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 11.2.2-1, 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 19), minimal topsoil mixing is anticipated, therefore impacts are expected to be *less than significant*.

Soil Compaction and Rutting

Soil compaction and rutting at construction sites could involve heavy land clearing equipment such as bulldozers and backhoes, trenchers and directional drill rigs to install buried fiber, and cranes to install towers and aerial infrastructure. Soils with the highest potential for compaction or rutting were identified by using the STATSGO2 database (see Section 11.1.2.4, Soil Suborders). Heavy equipment could cause perceptible compaction and rutting of susceptible soils, but could be minimized with implementation of BMPs and mitigation measures.

Soils with the highest potential for compaction or rutting were identified by using the STATSGO2 database (see Section 11.1.2.4, Soil Suborders). The most compaction susceptible soils in Montana are Aqualfs, Aquents, Aquolls, Fibrists, and Ustalfs suborders, which are found primarily in northeastern parts of the state (Figure 11.1.2-2). These suborders approximately 8.3 percent of Montana's land area.[167] 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 11.2.2-1, 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 and to the limited scale of deployment activities in any one location.

11.2.2.4. Potential Impacts of the Preferred Alternative

The following section assesses potential impacts associated with implementation of the Preferred Alternative, including deployment and operation activities.

Deployment Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, implementation of the Preferred Alternative could deploy various types of facilities or infrastructure. Depending on the physical nature and location of FirstNet facilities or infrastructure and the specific action, some activities would result in potential impacts to soil resources and others would not. In addition, and as explained in this section, 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 at the Programmatic Level

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.

[167] 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.

- 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 at the Programmatic Level

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 or near bodies of water could potentially impact soil resources at and near the landings or facilities on shore or the banks of water bodies that accept the 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* at the programmatic level, as the activity would likely be short term, localized to the deployment locations, and those locations would return to normal conditions as soon as revegetation occurs, often by the next growing season. It is expected that heavy equipment would utilize existing roadways and utility rights-of-way for deployment activities. Chapter 19, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

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. At the programmatic level, 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. The impacts are expected to be *less than significant* at the programmatic level, due to the temporary nature and small scale of operations activities with the potential to create impacts. Chapter 19, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

11.2.2.5. 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 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, at the programmatic level, 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. However, these potential impacts are expected to be *less than significant* at the programmatic level, due to the small scale and short term nature of the deployment. Chapter 19, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

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 at the programmatic level 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 at the programmatic level, as previously explained above. Finally, if deployable technologies are parked and operated with air conditioning for extended periods, the condensation water from the air conditioner could result in minimal soil erosion. However, it is anticipated that the potential soil erosion would result in *less than significant* impacts at the programmatic level, as described above. Chapter 19, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

No Action Alternative

Under the No Action Alternative, the NPSBN would not be deployed. Therefore, there would be no associated construction or installation of wired, wireless, deployable infrastructure or satellites and other technologies. Therefore, there would be *no impacts* to soil resources as a result of the No Action Alternative. Environmental conditions would therefore be the same as those described in Section 11.1.2, Soils.

11.2.3. Geology

11.2.3.1. Introduction

This section describes potential impacts to Montana geology resources associated with deployment and operation of the Proposed Action and Alternatives. Chapter 19, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

11.2.3.2. Impact Assessment Methodology and Significance Criteria

The impacts of the Proposed Action on geology resources were evaluated using the significance criteria presented in Table 11.2.3-1. As described in Section 11.2, Environmental Consequences, the categories of impacts are defined at the programmatic level as *potentially significant*, *less than significant with mitigation measures incorporated*, *less than significant*, or *no impact*. Characteristics of each impact type, including magnitude or intensity, geographic extent, and duration or frequency, were used to determine the impact significance rating associated with each potential impact.

Given the nature of this programmatic evaluation, and because the Proposed Action could potentially cover a wide variety of actions that would take place in various landscapes, the potential impacts to geology addressed in this section are presented as a range of possible impacts.

Table 11.2.3-1: Impact Significance Rating Criteria for Geology at the Programmatic Level

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.

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	Landslide areas are highly prevalent within the state/territory.		Landslide areas occur within the state/territory, but may be avoidable.	Landslide hazard areas do not occur within the state/territory.
	Duration or Frequency	NA		NA	NA
Land Subsidence	Magnitude or Intensity	High likelihood that a project activity could be located within an area with a hazard for subsidence (e.g., karst terrain).	Effect that is *potentially significant*, but with mitigation is *less than significant*.	Low likelihood that a project activity could be located within an area with a hazard for subsidence.	Project activity located outside an area with a hazard for subsidence.
	Geographic Extent	Areas with a high hazard for subsidence (e.g., karst terrain) are highly prevalent within the state/territory.		Areas with a high hazard for subsidence occur within the state/territory, but may be avoidable.	Areas with a high hazard for subsidence do not occur within the state/territory.
	Duration or Frequency	NA		NA	NA
Potential Mineral and Fossil Fuel Resource Impacts	Magnitude or Intensity	Severe, widespread, observable impacts to mineral and/or fossil fuel resources.	Effect that is *potentially significant*, but with mitigation is *less than significant*.	Limited impacts to mineral and/or fossil resources.	No perceptible change in mineral and/or fossil fuel resources.
	Geographic Extent	Regions of mineral or fossil fuel extraction areas are highly prevalent within the state/territory.		Mineral or fossil fuel extraction areas occur within the state/territory, but may be avoidable.	Mineral or fossil fuel extraction areas do not occur within the state/territory.
	Duration or Frequency	Long-term or permanent degradation or depletion of mineral and fossil fuel resources.		Temporary degradation or depletion of mineral and fossil fuel resources.	NA

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
Potential Paleontological Resources Impacts	Magnitude or Intensity	Severe, widespread, observable impacts to paleontological resources.	Effect that is *potentially significant*, but with mitigation is *less than significant*.	Limited impacts to paleontological and/or fossil resources.	No perceptible change in paleontological resources.
	Geographic Extent	Areas with known paleontological resources are highly prevalent within the state/territory.		Areas with known paleontological resources occur within the state/territory, but may be avoidable.	Areas with known paleontological resources do not occur within the state/territory.
	Duration or Frequency	NA		NA	NA
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

11.2.3.3. 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.

Seismic Hazard

A concern related to deployment is placement of equipment in highly active seismic 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.

As shown in Figure 11.1.3-5, western Montana is more susceptible to earthquakes than the remainder of the state. The largest earthquake ever recorded in Montana measured 7.3 on the Richter scale. Based on the impact significance criteria presented in Table 11.2.3-1, seismic impacts from deployment or operation of the Proposed Action would have *no impact* on seismic activity, however, seismic impacts to the Proposed Action could be *potentially significant* if FirstNet's deployment locations were within high-risk earthquake hazard zones. Given the potential for severe earthquakes in or near Montana, some amount of infrastructure could be subject to earthquake hazards, in which case BMPs and mitigation measures (see Chapter 19) could help avoid or minimize the potential impacts.

Volcanic Activity

Volcanoes do not occur in Montana and were therefore not analyzed. However, Montana is located in relatively close proximity to areas with the potential to experience volcanic activity, including the West Coast's Cascade Range and Wyoming's Yellowstone Caldera. Volcanic eruptions from the Cascades are more likely to affect Montana through the delivery of volcanic ash, though such impacts would be weather and wind dependent (MTDPHHS, 2015a).

Landslides

As discussed in Section 11.1.3.8, portions of Montana are at moderate to high risk of experiencing landslide events. Based on the impact significance criteria presented in Table 11.2.3-1, 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. 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. Areas at risk to landslides in Montana are generally in the southern and western portions of the state. In particular, Lincoln County in northwestern Montana is at the greatest risk to landslides. The moderate potential for landslides in Montana include the cities of Billings, Havre, and Great Falls. To the extent practicable, FirstNet would avoid deployment in areas that are susceptible to landslide events. However, given that several of Montana's major cities are in or near areas that experience landslides with moderate to high frequency, some amount of infrastructure be subject to landslide hazards, in which case BMPs and mitigation measures (see Chapter 19) would help avoid or minimize the potential impacts.

Land Subsidence

As discussed in Section 11.1.3.8 and shown in Figure 11.1.3-7, portions of Montana are vulnerable to land subsidence due to the presence of mines and karst topography. Based on the significance criteria presented in Table 11.2.3-1, potential impacts to soil subsidence from deployment or operation of the Proposed Action would have *less than significant* impacts; however, subsidence impacts to the Proposed Action could be *potentially significant* to the Proposed Action if FirstNet's deployed locations were within areas at high risk to karst topography or located in mining areas. Equipment that is exposed to land subsidence, such as sinkholes created by karst topography, is subject to misalignment, alteration, or, in extreme cases, destruction. All of these activities could result in connectivity loss. To the extent practicable, FirstNet would avoid deployment in known areas of mine subsidence and karst topography. However, where infrastructure is subject to subsidence hazards, BMPs and mitigation measures, as discussed in Chapter 19, could help avoid or minimize the potential impacts.

Potential Mineral and Fossil Fuel Resource Impacts

Equipment deployed 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 11.2.3-1, 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. To the extent practicable, FirstNet would avoid construction in areas where these resources exist.

Potential Paleontological Resource Impacts

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 11.2.3-1, impacts to paleontological resources could be *potentially significant* if FirstNet's buildout/deployment locations uncovered paleontological resources during construction activities. As discussed in Section 11.1.3.6., although fossil-bearing formations occur throughout the state, of note in Montana is the Hell Creek Formation which is particularly dense with fossils (Figure 11.1.3-4). Site-specific analysis may be required depending on the site conditions, the type of deployment, or any other permits or permissions necessary to perform the work. BMPs and mitigation measures may be required help avoid or minimize the potential impacts.

Surface Geology, Bedrock, Topography, Physiography, and Geomorphology

Equipment installation and construction activities that degrade or alter surface geology, bedrock, or topography could cause measurable changes in physiographic characteristics of an area's geology, topography, physiography, or geomorphology. Based on the impact significance criteria presented in Table 11.2.3-1, impacts could be *potentially significant* if FirstNet's deployment were to cause substantial and measurable degradation or alteration of surface geology, bedrock, topography, physiographic characteristics, or geomorphological processes. Construction activities related to the Proposed Action and Alternatives are likely to be minor and *less than significant* 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 19) could be implemented to help avoid or minimize the potential impacts.

Potential Impacts of the Preferred Alternative

The following section assesses potential impacts associated with implementation of the Preferred Alternative, including deployment and operation activities.

Deployment Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, implementation of the Preferred Alternative could result in the deployment of various types of facilities or infrastructure. Depending on the physical nature and location of the facility/infrastructure and the specific deployment requirements, some activities have the potential to be impacted by geologic hazards, some activities could result in potential impacts to geology, and other activities would have *no impacts*. In addition, and as explained in this section, 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 at the Programmatic Level

Of the types of facilities or infrastructure deployment scenarios described in Section 2.1.2, Proposed Action Infrastructure, the following are likely to have *no impacts* to geology under the conditions described below:

- Wired Projects
  - Use of Existing Conduit – New Buried Fiber Optic Plant: Disturbance associated with the installation of fiber optic cable in existing conduit would be limited to entry and exit points of the existing conduit in previously disturbed areas. In most cases, there would be *no impacts* to geologic resources since the activities that would be conducted at these small entry and exit points are not likely to produce perceptible changes.
  - Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting up of dark fiber would have *no impacts* to geologic resources because there would be no ground disturbance.

- Satellites and Other Technologies
  - *Deployment of Satellites*: FirstNet does not anticipate launching satellites as part of the deployment of the NPSBN, however it may include equipment on satellites that are already being launched for other purposes. As adding equipment to an existing launch vehicle would be very unlikely to impact geologic resources, it is anticipated that this activity would have *no impact* on geologic resources.

Activities with the Potential to Have Impacts at the Programmatic Level

Potential deployment-related impacts to geologic resources, or resulting from geologic hazards due to implementation of the Preferred Alternative, would encompass a range of impacts that could occur as a result of ground disturbance activities, including loss of mineral and fuel resources and paleontological resources. The types of infrastructure development scenarios or deployment activities that could be part of the Preferred Alternative and result in potential impacts to geologic resources, or impacts from geologic hazards, include the following:

- Wired Projects
  - New Build – Buried Fiber Optic Plant: Plowing (including vibratory plowing), trenching, or directional boring and the construction of 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 fuel and mineral resources or paleontological resources. Where equipment is installed in locations that are susceptible to land subsidence, earthquakes, and other geologic hazards, it is possible that equipment could be affected by that hazard.
  - New Build – Aerial Fiber Optic Plant: Installation of new utility poles, and associated use of heavy equipment during construction, could result in potential impacts to geologic resources due to associated ground disturbance. Where equipment is installed in locations that are susceptible to land subsidence, earthquakes, and other geologic hazards, it is possible that equipment could be affected by that hazard.
  - Collocation on Existing Aerial Fiber Optic Plant: Replacement of utility poles and structural hardening, and associated use of heavy equipment during construction, could result in potential impacts to geologic resources due to associated ground disturbance. Where equipment is installed in locations that are susceptible to land subsidence, earthquakes, and other geologic hazards, it is possible that equipment could be affected by that hazard.
  - New Build – Submarine Fiber Optic Plant: The installation of cables in or near 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 land subsidence, earthquakes, and other geologic hazards, it is possible that equipment could be affected by that hazard.
  - Installation of Optical Transmission or Centralized Transmission Equipment: If installation of transmission equipment would occur in existing boxes or huts and require ground disturbance in locations that are susceptible to geologic hazards (e.g., land

subsidence, landslides, or earthquakes), it is possible that they could be affected by that hazard.

- Wireless Projects
    - New Wireless Communication Towers: Installation of new wireless towers and associated structures (generators, equipment sheds, fencing, security and aviation lighting, electrical feeds, and concrete foundations and pads) or access roads could result in impacts to geologic resources. Land/vegetation clearing, excavation activities, landscape grading, and other ground disturbance activities during the installation of new wireless towers and associated structures or access roads could result in erosion or disturbance of geologic resources. Where equipment is installed in locations that are susceptible to land subsidence, earthquakes, and other geologic hazards, it is possible that equipment could be affected by that hazard.
    - Collocation on Existing Wireless Tower, Structure, or Building: Collocation would involve mounting or installing equipment (such as antennas or microwave dishes) on an existing tower, which would not result in ground disturbance. However, if additional power units, structural hardening, and physical security measures required ground disturbance, such as grading, or excavation activities, impacts to geologic resources could occur due to ground disturbance. Where equipment is installed in locations that are susceptible to land subsidence, earthquakes, and other geologic hazards, it is possible that equipment could be affected by that hazard.
    - Deployable Technologies: Implementation of deployable technologies could result in potential impacts to geologic resources depending on the technology and location proposed for deployment. Potential impacts may result if deployment of vehicles (i.e., SOWs, COWs, COLTs, or UAVs) occurs in unpaved areas, or if the implementation results in paving of previously unpaved surfaces. Some staging or landing areas (depending on the type of technology) may require land/vegetation clearing, excavation, and paving. Where deployable technologies would be implemented on existing paved surfaces, there would be *no impacts* to/from geologic resources because there would be no ground disturbance and mobile technologies could be moved to avoid geologic hazards.
- Satellites and Other Technologies
    - Satellite-Enabled Devices and Equipment: In most cases, the installation of permanent equipment on existing structures 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 land subsidence, earthquakes, and other geologic hazards, it is possible that they could be affected by that hazard. The use of portable satellite-enabled devices would not impact geologic resources nor would it be affected by geologic hazards because there would be no ground disturbance nor any impact to the built or natural environment.

In general, the abovementioned activities could potentially involve ground disturbance resulting from land/vegetation clearing, topsoil removal, excavation, excavated material placement, trenching or directional boring, construction of access roads and other impervious surfaces, landscape grading, and heavy equipment movement. Potential impacts to geological resources associated with deployment could include minimal removal of bedrock or mineral resources, or adverse impacts to installed equipment resulting from geologic hazards (e.g., seismic hazards, landslides, and land subsidence). Specific FirstNet projects are likely to be small scale; correspondingly, disturbance to geologic resources for those types of projects with the potential to impact geologic resources is also expected to be small scale. These potential impacts are expected to be *less than significant* at the programmatic level. See Chapter 19, 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 deployment impacts. At the programmatic level, 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 geologic hazards including seismic activity, volcanic activity, landslides, and land subsidence. However, potential impacts would be anticipated to be *less than significant* as it is anticipated that deployment locations would avoid, as practicable and feasible, locations that are more likely to be affected by potential seismic activity, landslides, or land subsidence. Chapter 19, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

11.2.3.4. 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 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* at the programmatic level due to the minor amount of paving or new infrastructure needed to accommodate the deployables. Chapter 19, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

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, at the programmatic level, 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* at the programmatic level, as the deployment would be temporary and likely would attempt to avoid locations that was subject to increased seismic activity, landslides, and land subsidence. Chapter 19, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

No Action Alternative

Under the No Action Alternative, the NPSBN would not be deployed; therefore, there would be no associated construction or installation of wired, wireless, deployable infrastructure, or satellites and other technologies. Therefore, there would be *no impacts* to geologic resources (or from geologic hazards) as a result of the No Action Alternative. Environmental conditions would therefore be the same as those described in Section 11.2.3, Geology.

11.2.4. Water Resources

11.2.4.1. Introduction

This section describes potential impacts to water resources in Montana associated with deployment and operation of the Proposed Action and alternatives. See Chapter 19, 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.

11.2.4.2. Impact Assessment Methodology and Significance Criteria

The impacts of the Proposed Action on water resources were evaluated using the significance criteria presented in Table 11.2.4-1. As described in Section 11.2, Environmental Consequences, the categories of impacts are defined at the programmatic level as *potentially significant*, *less than significant with mitigation measures 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 11.2.4-1: Impact Significance Rating Criteria for Water Resources at the Programmatic Level

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.		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	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
				encountering a 500-year floodplain within a state or territory.	
	Geographic Extent	Watershed level, and/or within multiple watersheds.		Watershed or subwatershed level.	NA
	Duration or Frequency	Chronic and long term changes not likely to be reversed over several years or seasons.		Impact is temporary, lasting no more than one season or water year, or occurring only during an emergency.	NA
Drainage pattern alteration	Magnitude or Intensity	Alteration of the course of a stream of a river, including stream geomorphological conditions, or a substantial and measurable increase in the rate or amount of surface water or changes to the hydrologic regime.	Effect that is *potentially significant*, but with mitigation is *less than significant*.	Any alterations to the drainage pattern are minor and mimic natural processes or variations.	Activities do not impact drainage patterns.
	Geographic Extent	Watershed level, and/or within multiple watersheds.		Watershed or subwatershed level.	NA
	Duration or Frequency	Impact occurs in perennial streams, and is ongoing and permanent.		Impact is temporary, lasting no more than six months.	NA

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
Flow alteration	Magnitude or Intensity	Consumptive use of surface water flows or diversion of surface water flows such that there is a measurable reduction in discharge.	Effect that is *potentially significant*, but with mitigation is *less than significant*.	Minor or no consumptive use with negligible impact on discharge.	Activities do not impact discharge or stage of waterbody (stream height).
	Geographic Extent	Watershed level, and/or within multiple watersheds.		Watershed or subwatershed level.	NA
	Duration or Frequency	Impact occurs in perennial streams, and is ongoing and permanent.		Impact is temporary, not lasting more than six months.	NA
Changes in groundwater or aquifer characteristics	Magnitude or Intensity	Substantial and measurable changes in groundwater or aquifer characteristics, including volume, timing, duration, and frequency of groundwater flow, and other changes to the groundwater hydrologic regime.	Effect that is *potentially significant*, but with mitigation is *less than significant*.	Any potential impacts to groundwater or aquifers are temporary, lasting no more than a few days, with no residual impacts.	Activities do not impact groundwater or aquifers.
	Geographic Extent	Watershed level, and/or within multiple watersheds.		Watershed or subwatershed level.	NA
	Duration or Frequency	Impact is ongoing and permanent.		Impact is temporary, not lasting more than six months.	NA

* 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

11.2.4.3. 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 TMDL or other strategy to reduce the input of the specific pollutant(s) restricting waterbody uses, in order to restore and protect such uses.

Approximately 85 percent of Montana's assessed rivers and streams, and 84 percent of the state's assessed lakes, reservoirs, and ponds are impaired. The main sources of impairment are agriculture practices, abandoned mines, and atmospheric deposition.[168] (USEPA, 2015b) (see Table 11.1.4-2, Figure 11.1.4-3). Generally, the water quality of Montana's aquifers is suitable for drinking and most daily water needs; however, MDEQ identified contaminants and contamination sources, which are described in Section 5.1.3 of the 2014 Water Quality Integrated Report (MDEQ, 2014e).

Deployment activities could 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 could increase erosion. Impacts to water quality may occur from post construction vegetation management, such as herbicides, that may leach into groundwater or move to surface waters through soil erosion or runoff, spray drift, or inadvertent direct overspray. Fuel, oil, and other lubricants from equipment could contaminate groundwater and surface waters if carried in runoff. Other water quality impacts could include changes in temperature, pH or dissolved oxygen levels, water odor, color, or taste, or addition of suspended solids.

Soil erosion or the introduction of suspended solids into waterways from implementation of the Preferred Alternative could contribute to degradation of water quality. If the Proposed Action and Alternatives would disturb more than one 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 storm water pollution prevention plan (SWPPP) would need to be prepared containing BMPs that would be implemented to prevent, or minimize the potential for, sedimentation and erosion. Adherence to the CGP and the BMPs would help prevent sediment and suspended solids from entering the waterways and ensure that effects on water quality during construction would not be adverse.

Deployment activities associated with the Proposed Action have the potential to increase erosion and sedimentation around construction and staging areas. Grading activities associated with construction would potentially result in a temporary increase in the amount of suspended solids

[168] Atmospheric deposition occurs when pollutants are transferred from the air to the earth's surface and pollutants travel from the air into the water through rain and snow, falling particles, and absorption of the gas form of the pollutants into the water (USEPA, 2015a).

running off construction sites. If a storm event were to occur, construction site runoff could result in sheet erosion of exposed soil. If not adequately controlled, water runoff from these areas would have the potential to degrade surface water quality. Implementing BMPs could reduce potential impacts to surface water quality.

Expected deployment activities would not violate applicable state, federal (e.g., CWA, SDWA), and local regulations, cause a threat to the human environment, biodiversity, or ecological integrity through water degradation, or cause a sediment water quality violation from local construction, or otherwise substantially degrade water quality. Therefore, based on the impact significance criteria presented in Table 11.2.4-1, 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[169] 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 Montana 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 Montana 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 11.2.4-1, 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, site-specific analysis may be required depending on the site conditions, the type of deployment, or any other permits or permissions necessary to perform the work. 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 11.2.4-1, floodplain degradation impacts would be potentially *less than significant* since the majority of FirstNet's likely

[169] 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).

deployment activities, on the watershed or subwatershed level, would 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 with the exception of deployable technologies which may be deployed in response to an emergency. Additionally, any effects would be temporary, lasting no more than one season or water year,[170] or occur only during an emergency.

Examples of activities that would have *less than significant* impacts include:

- Construction of any structure in the 500-year floodplain that 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 could reduce the risk of additional impacts to floodplain degradation (see Chapter 19).

Flow Alteration

Flow alteration refers to the modification of flow characteristics, relative to natural conditions. Human activities may change the amount of water reaching a stream, divert flow through artificial channels, or alter the shape and location of streams. Surface water and groundwater withdrawals could alter flow by reducing water volumes in streams. Withdrawals may return to the surface/groundwater system at a point further downstream, be removed from the watershed through transpiration by crops, lawns or pastures, or be transferred to another watershed altogether (e.g., water transferred to a different watershed for drinking supply). Altered flow could increase flooding and introduce more erosion and potential for pollution. Alternatively, if water is diverted from its normal flow, the opposite may occur; wetlands and streams may not receive as much water as necessary to maintain the ecology and previous functions.

Activities that do not impact discharge or stage of waterbody (stream height) are not anticipated to have an impact on flow, according to Table 11.2.4-1. 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 previously.
- Minor clearing or grading activities.

[170] 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, 2016e)

Since the proposed activities would not likely alter flow characteristics or change the hydrologic regime, there would likely be *less than significant* impacts to flow alteration. BMPs and mitigation measures, and avoidance would further reduce any impacts.

Drainage Pattern Alteration

Flooding and erosion from land disturbance could changes drainage patterns. Stormwater runoff causes erosion while construction activities and land clearing could change drainage patterns. Clearing or grading activities, or the creation of walls or berms, could alter water flow in an area or cause changes to drainage patterns. Drainage could be directed to stormwater drains, storage, and retention areas designed to slow water and allow sediments to settle out. Improperly handled drainage could cause increased erosion, changes in stormwater runoff, flooding, and damage to water quality. Existing drainage patterns could be modified by channeling (straightening or restructuring natural watercourses); creation of impoundments (detention basins, retention basins, and dams); stormwater increases; or altered flow patterns.

According to the significance criteria in Table 11.2.4-1, 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.
- Activities designed so that stormwater is contained on site and does not flow to or impact surface waterbodies offsite on other properties.
- Activities designed so that the amount of stormwater generated before construction is the same as afterwards.
- Activities designed using low impact development 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 impacts.

Changes in Groundwater or Aquifer Characteristics

As described in Section 11.1.4.7, groundwater in Montana is used for human use, such as irrigation, public supply, industrial uses, and livestock use (USGS, 2014j). Generally, the water quality of Montana's aquifers is suitable for drinking and daily water needs (MDEQ, 2014e).

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 unlikely 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.

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, as practicable and feasible, be considered to avoid areas that would extract groundwater from potable groundwater sources in the area.

11.2.4.4. Potential Impacts of the Preferred Alternative

The following section assesses potential impacts associated with implementation of the Preferred Alternative, including deployment and operation activities.

Deployment Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, implementation of the Preferred Alternative could result in the deployment of various types of facilities or infrastructure. Depending on the physical nature and location of the facility/infrastructure and the specific deployment requirements, some activities would result in potential impacts to water resources and others would not. In addition, and as explained in this section, the same type of Proposed Action Infrastructure could result in a range of *no impacts* to *potentially significant* impacts depending on the deployment scenario or site-specific conditions. The impact on the water resources that could be affected would depend on the watershed, duration (chronic or short-term) and frequency (many years or a few months) the resource would be used, and the water resource’s current use (sole source for drinking water, considered exceptional value for recreation, or provides critical habitat for a species).

Activities Likely to Have No Impacts at the Programmatic Level

Of the types of facilities or infrastructure deployment scenarios described in Section 2.1.2, Proposed Action Infrastructure, the following are likely to have *no impacts* to water resources under the conditions described below:

- Wired Projects
  - Use of Existing Conduit – New Buried Fiber Optic Plant: Disturbance associated with the installation of fiber optic cable in existing conduit would be limited to entry and exit points of the existing conduit in previously disturbed areas. It is anticipated that there would be *no impacts* to water resources since the activities that would be conducted at these small entry and exit points are not likely to produce perceptible changes.

  - Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting up of dark fiber would have *no impacts* to water resources because there would be no ground disturbance.
- Satellites and Other Technologies
  - Satellite-Enabled Devices and Equipment: It is anticipated that the installation of permanent equipment on existing structures and the use of portable devices that use satellite technology would not impact water resources because those activities would not require ground disturbance.
  - Deployment of Satellites: FirstNet does not anticipate launching satellites as part of the deployment of the NPSBN; however, it could include equipment on satellites that are already being launched for other purposes. As adding equipment to an existing launch vehicle would be very unlikely to impact water resources, it is anticipated that this activity would have *no impact* on water resources.

Activities with the Potential to Have Impacts at the Programmatic Level

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 suspended solids running off construction sites. The amount of impact depends on the land area affected, installation technique, and location. Trenching would not be expected to occur near or below the existing water table (depth to water). Implementing BMPs and mitigation measures could reduce impact intensity.
  - New Build – Submarine Fiber Optic Plant: The installation of cables in or near bodies of water would impact water resources from a short-term increase in suspended solids in the water. Site-specific impact assessment could be required to marine and shoreline environments prior to installation to 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; groundwater impacts from trenching activities are not expected. If a new roadway were built, additional impervious surface would not be expected to impact water resources or the overall amount of runoff and nonpoint pollution.

- Collocation on Existing Aerial Fiber Optic Plant: Replacement of poles or structural hardening could result in ground disturbance 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 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.

- o 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* due to the small scale of individual activities. See Chapter 19, 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* at the programmatic level due to the limited geographic scale of individual activities and would likely return to baseline conditions once revegetation of disturbed areas is complete. Chapter 19, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

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* at the programmatic level, 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 construction impacts. Impacts to surface and groundwater quality from routine operations and maintenance, such as herbicide application to control vegetation, are not expected. Chapter 19, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

11.2.4.5. 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 construction associated with wired or wireless projects discussed above under the Preferred Alternative. Some limited construction could be associated with implementation such as land clearing or paving for parking or staging areas. The specific infrastructure associated with the Deployable Technologies Alternative would be the same as the deployable technologies implemented as part of the Preferred Alternative but would likely be implemented in greater numbers, over a larger geographic extent, and used with greater frequency and duration. Therefore, potential impacts to water resources as a result of implementation of this alternative could be as described below.

Deployment Impacts

As explained above, at the programmatic level, implementation of deployable technologies could result in *less than significant* impacts to water resources if the deployment occurred on paved surfaces. Some staging or launching/landing areas (depending on the type of technology) may require land/vegetation clearing, excavation, and paving, however, these activities would be isolated and short term, and would likely return to baseline conditions once revegetation was complete. Additionally, project activities could result in direct and indirect impacts to water quality from a temporary increase in suspended solids running off construction sites. The amount of impact depends on the land area affected, installation technique, and location. Implementing the BMPs and mitigation measures identified in Chapter 19 could further avoid or reduce potential impacts. The activities could also result in indirect impacts on water quality if fuels leak into surface or groundwater.

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 at the programmatic level 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. Finally, if ground-based deployable technologies are parked and operated with air conditioning for extended periods of time, the condensation water from the air conditioner could result in soil erosion that could potentially impact waterbodies if the deployables are located adjacent to waterbodies, however, due to the limited and temporary nature of the deployable activities, it is anticipated that these potential impacts would be *less than significant* at the programmatic level. Site maintenance, including mowing or herbicides, may result in *less than significant* impacts to water quality at the programmatic level, due to the small scale of expected FirstNet activities in any particular location. In addition, the presence of new access roads could increase the overall amount of impervious surface in the area and increase runoff effects on water resources, as explained above. Chapter 19, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

No Action Alternative

Under the No Action Alternative, the NPSBN would not be deployed; therefore, there would be no associated construction or installation of wired, wireless, deployable infrastructure or satellites and other technologies. Therefore, there would be *no impacts* to water resources as a result of the No Action Alternative. Environmental conditions would therefore be the same as those described in Section 11.1.4, Water Resources.

11.2.5. Wetlands

11.2.5.1. Introduction

This section describes potential impacts to wetlands in Montana associated with deployment and operation of the Proposed Action and alternatives. Chapter 19 identifies BMPs and mitigation measures that could be implemented, as appropriate, to avoid or minimize potential impacts.

11.2.5.2. Impact Assessment Methodology and Significance Criteria

The impacts of the Proposed Action on wetlands were evaluated using the significance criteria presented in Table 11.2.5-1. As described in Section 11.2, Environmental Consequences, the categories of impacts are defined at the programmatic level as *potentially significant*, *less than significant with mitigation measures 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 11.2.5-1: Impact Significance Rating Criteria for Wetlands at the Programmatic Level

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 USACE wetland categories. Category 1 are the highest quality, highest functioning wetlands (USACE, 2014).
[b] Indirect effects are those resulting from direct effects, but they occur elsewhere in space and/or time. Includes indirect hydrologic effects (wetting or drying) that in turn alters wetland function or type.
[c] Wetland functions include hydrologic, ecological, geomorphic, and social functions typically assessed for wetlands as part of USACE compensatory mitigation planning. Typical functions assessed may include flood attenuation, bank stabilization, water quality, organic matter input/transport, nutrient processing, wildlife habitat, T/E species habitat, biodiversity, recreational/social value.
NA = Not Applicable

11.2.5.3. 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, vibration, 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. Site-specific analysis may be required depending on the site conditions, the type of deployment, or any other permits or permissions necessary to perform the work. Potential wetlands impacts could be further reduced by implementing BMPs and mitigation measures (see Chapter 19).

The main type of wetlands in Montana are palustrine (freshwater) wetlands found on river and lake floodplains across the state. There are approximately 1.2 million acres of palustrine wetlands throughout Montana, as shown in Figure 11.1.5-1, Figure 11.1.5-2, Figure 11.1.5-3, and Figure 11.1.5-4 (USFWS, 2014a).

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 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 11.2.5-1, 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) could cause *potentially significant* impacts. In addition, introduction and establishment of invasive species to high quality wetlands within a watershed or multiple watersheds could be *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. Site-specific analysis may be required depending on the site conditions, the type of deployment, or any other permits or permissions necessary to perform the work. Potential wetlands impacts could be further reduced by implementing BMPs and mitigation measures (see Chapter 19).

Examples of activities that could have other direct effects to wetlands in Montana 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 from increased impervious surface or vegetation removal in and near wetlands could alter water level response times, depths, and duration of water detention. Reduction of watershed infiltration capacity could cause wetland water depths to rise more rapidly following storm events.
- Direct Hydrologic Changes (flooding or draining): Greater frequency and duration of flooding could destroy native plant communities, as could depriving them of their water supply. Hydrologic changes could make a wetland more vulnerable to pollution. Increased water depths or flooding frequency could distribute pollutants more widely through a wetland. Sediment retention in wetlands is directly related to flow characteristics, including degree and pattern of channelization, flow velocities, and storm surges.
- Direct Soil Changes: Changes in soil chemistry from removal of vegetation near or in wetlands could lead to degradation of wetlands that have a specific pH range and/or other parameters.
- Water Quality Degradation (spills or sedimentation): The loss of wetlands results in a depletion of water quality both in the wetland and downstream. Filtering of pollutants by wetlands is an important function and benefit. High levels of suspended solids (sedimentation) could reduce light penetration, dissolved oxygen, and overall wetland productivity. Toxic materials in runoff could interfere with the biological processes of wetland plants, resulting in impaired growth, mortality, and changes in plant communities.

Indirect Effects:[171] Change in Function(s)[172] or Change in Wetland Type

Indirect effects to wetlands could include change in wetland function or conversion of a resource to another type (i.e., wetland to an open body of water). The construction of curb and gutter systems diverts surface runoff and could cause flooding or wetlands to dry out, depending on the direction of diversion. Indirect effects to both 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. Site-specific analysis may be required depending

[171] 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.
[172] 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.

on the site conditions, the type of deployment, or any other permits or permissions necessary to perform the work. Potential wetlands impacts could be further reduced by implementing BMPs and mitigation measures (see Chapter 19).

Examples of functions related to wetlands in Montana that could potentially be impacted from construction-related deployment activities include:

- Flood Attenuation: Wetlands provide flood protection by holding excess runoff after storms, before slowly releasing it to surface waters. While wetlands may not prevent flooding, they could lower flood peaks by providing detention of storm flows. An increase in impervious surface or vegetation removal near the wetland could increase the amount of runoff into the wetland; thus reducing its ability to provide flood protection.
- Bank Stabilization: By reducing the velocity and volume of flow, wetlands provide erosion control, floodwater retention, and reduce stream sedimentation.
- Water Quality: Water quality impacts on wetland soils could eventually threaten a wetland's existence. Where sediment inputs exceed rates of sediment export and soil consolidation, a wetland would gradually become filled.
- Nutrient Processing: Wetland forests retain ammonia during seasonal flooding. Wetlands absorb metals in the soils and by plant uptake via the roots. They also allow metabolism of oxygen-demanding materials and reduce fecal coliform populations. These pollutants are often then buried by newer plant material, isolating them in the sediments.
- Wildlife Habitat: Impacts on wetland hydrology and water quality affect wetland vegetation. While flooding could harm some wetland plant species, it promotes others. Shifts in plant communities because of hydrologic changes could have impacts on the preferred food supply and animal cover.
- Recreational Value: Wetlands provide recreation opportunities for people, such as hiking, bird watching, and photography.
- Groundwater Recharge: Wetlands retain water, allowing time for surface waters to infiltrate into soils and replenish groundwater.

According to the significance criteria defined in Table 11.2.5-1, 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 1.2 million acres of wetlands in Montana are not considered high quality due to their small average size of only 2 acres (MDEQ, 2013c), 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 of the state with high quality wetlands, 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.

11.2.5.4. 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 would 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 at the Programmatic Level

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 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 at the Programmatic Level

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/or 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 or near bodies of water would potentially impact wetlands found along shorelines. Additional project-specific environmental reviews would be required to assess potential impacts to wetland environments, including coastal and marine environments.
  - New Build – Aerial Fiber Optic Plant: Potential impacts would be similar to Buried Fiber Optic Plant. Any ground disturbance could cause direct and indirect impacts wetlands, depending on the proximity to wetlands and type of wetlands that could be affected.
  - Collocation on Existing Aerial Fiber Optic Plant: Any ground disturbance could cause direct and indirect impacts to wetlands from increased suspended solids and runoff from activities, depending on the proximity to wetlands and type of wetlands that could be affected.
  - Installation of Optical Transmission or Centralized Transmission Equipment: If installation of transmission equipment required grading or other ground disturbance to install small boxes or hunts, or access roads, there could potentially be direct and indirect impacts to wetlands. The amount of impact from a temporary increase in the amount of suspended solids running off construction sites and into wetlands, depends on the land area affected, installation technique, and location. If trenching were to occur near wetlands, it could cause impacts on wetlands. Implementing BMPs and mitigation measures could reduce impact intensity.
- Wireless Projects
  - New Wireless Communication Towers: Installation of new wireless towers and associated structures (generators, equipment sheds, fencing, security and aviation lighting, electrical feeds, and concrete foundations and pads) or access roads could potentially cause direct and indirect impacts to wetlands. The activities could cause a temporary increase in the amount of suspended solids running off construction sites and

into wetlands, depending on their proximity. The amount of impact depends on the land area affected, installation technique, and proximity to wetlands, and wetland type. If trenching were to occur near wetlands, it could cause impacts on wetlands. Implementing BMPs and mitigation measures could reduce impact intensity.

- Collocation on Existing Wireless Tower, Structure, or Building: Collocation would involve mounting or installing equipment (such as antennas or microwave dishes) on an existing tower, which would not result in impacts to wetlands. However, if additional power units, structural hardening, and physical security measures required ground disturbance, such as grading, or excavation activities, impacts to wetlands could occur near wetlands, it could cause impacts on wetlands. Implementing BMPs and mitigation measures (see Chapter 19) could reduce impact intensity.
- Deployable Technologies: Implementation of deployable technologies could result in potential impacts to wetlands if deployment occurs in unpaved areas, or if the implementation results in paving of previously unpaved surfaces. Some staging or landing areas (depending on the type of technology) may require land/vegetation clearing, excavation, and paving. The amount of impact depends on the land area affected, installation technique, and location. Implementing BMPs and mitigation measures could reduce impact intensity. The activities could also result in other direct impacts on wetlands if fuels leak into nearby waterbodies or wetlands. Deployment of drones, balloons, or blimps 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/or indirect impacts to wetlands, depending on the proximity to wetlands and type of wetlands that could be affected. These impacts are expected to be *less than significant* at the programmatic level, due to the small 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 19, 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 other potential direct impacts to wetlands if heavy equipment is used for routine operations and maintenance, or if application of herbicides occurs to control vegetation along all ROWs and near structures, depending on the proximity to wetlands. The intensity of the impact depends on the amount of herbicides used, frequency, and location of nearby sensitive wetlands. These impacts are expected to be *less than significant* at the programmatic level due to the limited nature of deployment activities. It is also anticipated that routine maintenance activities would be conducted on existing roads and utility ROW. Chapter 19, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

11.2.5.5. 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, at the programmatic level 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/or indirect impacts to wetlands from a temporary increase in the amount of suspended solids running off construction sites to nearby surface waters. The amount of impact depends on the land area affected, installation technique, and proximity to wetlands, and wetland type; however, impacts are expected to be *less than significant* at the programmatic level due to the small scale and temporary duration of expected FirstNet deployment activities in any one location. To minimize any potential impacts to wetlands, BMPs and mitigation measures would be implemented in compliance with any issued federal, state, and local permits. See Chapter 19, 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.

At the programmatic level, 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. At the programmatic level, 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. Chapter 19, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

No Action Alternative

Under the No Action Alternative, the NPSBN would not be deployed; therefore, there would be no associated construction or installation of wired, wireless, deployable infrastructure or satellites and other technologies. Therefore, there would be *no impacts* to wetlands as a result of the No Action Alternative. Environmental conditions would therefore be the same as those described in Section 11.1.5, Wetlands.

11.2.6. Biological Resources

11.2.6.1. Introduction

This section describes potential impacts to terrestrial vegetation, wildlife, fisheries and aquatic habitat, and threatened and endangered species in Montana associated with deployment and operation of the Proposed Action and its alternatives. Chapter 19, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

11.2.6.2. 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 11.2.6-1. As described in Section 11.2, Environmental Consequences, the categories of impacts are defined at the programmatic level as *potentially significant*, *less than significant with mitigation measures 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 11.2.6.3, 11.2.6.4, and 11.2.6.5, respectively, are presented as a range of possible impacts. Refer to Section 11.2.6.6 for impact assessment methodology and significance criteria associated with threatened and endangered species in Montana.

Table 11.2.6-1: Impact Significance Rating Criteria for Terrestrial Vegetation, Wildlife, Fisheries, and Aquatic Habitats at the Programmatic Level

Type of Effect	Effect Characteristics	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: MBTA and Bald and Golden Eagle Protection Act (BGEPA).	Effect that is *potentially significant*, but with BMPs and mitigation measures is *less than significant*.	Individual mortality observed but not sufficient to affect population or sub-population survival.	No direct individual injury or mortality would be observed.
	Geographic Extent	Regional effects observed within Montana for at least one species. Anthropogenic[a] disturbances that lead to exclusion from nutritional or habitat resources, or direct injury or mortality of endemics or a significant portion of the population or sub-population located in a small area during a specific season.		Effects realized at one location when population is widely distributed, and not concentrated in affected area.	NA
	Duration or Frequency	Chronic and long-term effects not likely to be reversed over several years for at least one species.		Temporary, isolated, or short-term effects that are reversed within one to three years.	NA

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
Vegetation and Habitat Loss, Alteration, or Fragmentation	Magnitude or Intensity	Population-level or sub-population effects observed for at least one species or vegetation cover type, depending on the distribution and the management of the subject species. Impacts to terrestrial, aquatic, or riparian habitat or other sensitive natural community vital for feeding, spawning/breeding, foraging, migratory rest stops, refugia, or cover from weather or predators. Violation of various regulations including: MBTA and BGEPA.	Effect that is *potentially significant*, but with BMPs and mitigation measures is *less than significant*.	Habitat alteration in locations not designated as vital or critical for any period. Temporary losses to individual plants within cover types, or small habitat alterations take place in important habitat that is widely distributed and there are no cover type losses or cumulative effects from additional projects.	Sufficient habitat would remain functional to maintain viability of all species. No damage or loss of terrestrial, aquatic, or riparian habitat from project would occur.
	Geographic Extent	Regional effects observed within Montana 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 Characteristics	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 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: MBTA and BGEPA.	Effect that is *potentially significant*, but with BMPs and mitigation measures is *less than significant*.	Individual injury/mortality observed but not sufficient to affect population or sub-population survival. Partial exclusion from resources in locations not designated as vital or critical for any given species or life stage, or exclusion from resources that takes place in important habitat that is widely distributed. Anthropogenic disturbances are measurable (although 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 Montana 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 Characteristics	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: MBTA and BGEPA.	Effect that is *potentially significant*, but with BMPs and mitigation measures is *less than significant*.	Temporary loss of migratory rest stops due to anthropogenic activities take place in important habitat that is widely distributed and there are no cumulative effects from additional projects.	No alteration of migratory pathways, no stress or avoidance of migratory paths/patterns due to project.
	Geographic Extent	Regional effects observed within Montana 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

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	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
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: MBTA and BGEPA.	Effect that is *potentially significant*, but with BMPs and mitigation measures is *less than significant*.	Effects to productivity are at the individual rather than population level. Effects are within annual variances and not sufficient to affect population or sub-population survival.	No reduced breeding or spawning success.
	Geographic Extent	Regional effects observed within Montana for at least one species. Anthropogenic disturbances that lead to exclusion from prey or habitat resources required for breeding/spawning or stress, abandonment and loss of productivity for endemics or a significant portion of the population or sub-population located in a small area during the breeding/spawning season.		Effects realized at one location.	NA

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	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 BMPs and mitigation measures is *less than significant*.	Mortality observed in individual native species with no measurable increase in invasive species populations.	No loss of forage and cover due to the invasion of exotic or invasive plants introduced to project sites from machinery or human activity.
	Geographic Extent	Regional impacts observed throughout Montana.		Effects realized at one location.	NA
	Duration or Frequency	Chronic and long-term changes not likely to be reversed over several years or seasons.		Periodic, temporary, or short-term changes that are reversed over one or two seasons.	NA

[a] Anthropogenic: "Made by people or resulting from human activities. Usually used in the context of emissions that are produced as a result of human activities" (USEPA, 2016f)
NA = Not Applicable

11.2.6.3. Terrestrial Vegetation

Impacts to terrestrial vegetation occurring in Montana are discussed in this section.

Description of Environmental Concerns

Direct Injury/Mortality

Direct injury/mortality effects are physical injuries, extreme physiological stress, or death of an individual organism from interactions associated with the Proposed Action. The most common direct injuries are permanent or temporary loss or disturbance of individual plants. Based on the impact significance criteria presented in Table 11.2.6-1, direct injury or mortality impacts could be *potentially 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 would help to minimize or altogether avoid potential impacts to plant population survival.

Vegetation and Habitat Loss, Alteration, or Fragmentation

Habitat impacts are primarily physical disturbances that result in alterations in the amount or quality of a habitat. As with all of the effects categories, the magnitude of the 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.

Comments received on other regional Draft PEIS documents for the Proposed Action expressed concerns related to the potential impacts to vegetation from RF emissions. Some studies have indicated the potential for adverse effects to vegetation from RF emissions. As explained in Section 2.4, Radio Frequency Emissions, as well as Section 11.2.6.4, Wildlife, additional, targeted research needs to be conducted to more fully document the nature and effects of RF exposure, including the potential impacts to vegetation.

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 could be recommended to help 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 could include stress related to disturbance. The alteration of soils or hydrology within a localized area could result in stress or mortality of plants. Construction activities that remove large quantities of soil in the immediate vicinity of trees could cause undue stress to trees from root exposure, such as to coniferous tress that are the dominant vegetation type across five of the seven Ecoregions of Montana (i.e., Northern Rockies, Idaho Batholith, Middle Rockies, Wyoming Basin, and Canadian Rockies), 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 could 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 could sometimes dramatically increase. The unnaturally large population numbers could then have severe impacts to the environment, local economy, and human health. Invasive species could 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. Montana regulates 31 terrestrial vegetation species/complexes, including: Shrubs (Russian olive (*Elaeagnus angustifolia*) and saltcedar (*Tamarix spp.*)) and Terrestrial Forbs and Grasses (knotweed complex, meadow hawkweed complex, knotweed complex, blueweed (*Echium vulgare*), Canada thistle (*Cirsium arvense*), cheatgrass (*Bromus tectorum*), common tansy (*Tanacetum vulgare*), dalmatian toadflax (*Linaria dalmatica*), diffuse knapweed (*Centaurea diffusa*), Dyer's woad (*Isatis tinctoria*), field bindweed (*Convolvulus arvensis*), hoary alyssum (*Berteroa incana*), houndstongue (*Cynoglossum officinale*), leafy spurge (*Euphorbia esula*), orange hawkweed (*Hieracium aurantiacum*), oxeye daisy (*Leucanthemum vulgare*), perennial pepperweed (*Lepidium latifolium*), purple loosestrife (*Lythrum salicaria*), rush skeletonweed (*Chondrilla juncea*), Russian knapweed (*Acroptilon repens*), scotch broom (*Cytisus scoparius*), St. Johnswort (*Hypericum perforatum*), spotted knapweed (*Centaurea stoebe*), sulfur cinquefoil (*Potentilla recta*), tall buttercup (*Ranunculus acris*), tansy ragwort (*Senecio jacobaea*), whitetop (*Cardaria draba*), yellowflag iris (*Iris pseudacorus*), yellow starthistle (*Centaurea solstitialis*), and yellow toadflax (*Linaria vulgaris*)) (Montana Department of Agriculture, 2013).

The potential to introduce invasive plants within construction zones and during long-term site maintenance could occur from vehicles and equipment being transported from one region to another, or when conducting revegetation of a site after deployment activities are complete. BMPs 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 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[173], and the nature as well as the extent of the habitats affected.

Activities Likely to Have No Impacts at the Programmatic Level

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.

[173] Phenology is the seasonal changes in plant and animal lifecycles, such as emergence of insects or migration of birds.

- Satellites and Other Technologies
  - o 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.
  - o 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 to Have Impacts at the Programmatic Level

Construction, deployment, and operation activities related to the Preferred Alternative could create noise impacts from either the construction or operation of the infrastructure. The types of infrastructure deployment scenarios or deployment activities that could be part of the Preferred Alternative and result in potential impacts to air quality include the following:

- Wired Projects
  - o New Build – Buried Fiber Optic Plant: Plowing (including vibratory plowing), trenching, or directional boring and the construction of POPs , huts, or other associated facilities or hand-holes to access fiber as well as land/vegetation clearing, excavation activities, and landscape grading could result in high noise levels from the use of heavy equipment and machinery.
  - o 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.
  - o 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.
  - o Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Installation of new associated huts or equipment, if required, could result in short-term and temporarily higher noise levels if the activity required the use of heavy equipment for grading or other purposes.
  - o New Build – Submarine Fiber Optic Plant: The installation of cables near 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 or banks of water bodies that accept the 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* at the programmatic level, due to the small-scale of expected deployment activities. Chapter 19, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

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.

At the programmatic level, it is anticipated that there would *less than significant* 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* impacts at the programmatic level due to the small-scale of expected activities. These potential impacts could result from accidental spills from maintenance equipment or release of herbicides and because these areas would not be allowed to revert to a more natural state. If usage of heavy equipment or land clearing activities occurs off established roads or corridors as part of routine maintenance or inspections, direct or indirect injury/mortality to plants; the loss, alteration, or fragmentation of vegetative communities; and invasive species could occur to terrestrial vegetation, however impacts are expected to be *less than significant* at the programmatic level due to the small-scale of expected activities. Chapter 19, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

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 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, at the programmatic level, 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. Chapter 19, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

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, at the programmatic level it is anticipated that there would be *less than significant* impacts to terrestrial vegetation associated with routine operations and maintenance due to the relatively small scale of likely FirstNet project sites. 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 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. Therefore, there would be *no impacts* to terrestrial vegetation as a result of the No Action Alternative. Environmental conditions would therefore be the same as those described in Section 11.1.6.3, Terrestrial Vegetation.

11.2.6.4. Wildlife

Impacts to amphibians and reptiles, terrestrial mammals, birds, and terrestrial invertebrates occurring in Montana 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 11.2.6-1, *less than significant* impacts would be anticipated given the size and nature of the majority of proposed deployment activities as discussed below, except for birds which would be *less than significant with BMPs and mitigation measures incorporated.* 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.

<u>Terrestrial Mammals</u>

Vehicle strikes are common sources of direct mortality or injury to both small and large mammals in Montana. As of 2012, Montana was among the top ten states in the nation for vehicle strikes to deer and collisions outside of Anaconda and Thompson Falls killed more than 100 bighorn sheep (Ovis Canadensis) (French, B., 2012). Mammals are attracted to roads for a variety of reasons including use as a source of minerals, preferred vegetation along roadways, areas of insect relief, and ease of travel along road corridors (FHWA, 2015g). 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 tree-roosting bats, 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 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 help avoid disturbance to bats.

Birds

Mortalities from collisions or electrocutions with manmade cables and wires are environmental concerns for avian species and could 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 spans (Gehring, Kerlinger, & Manville, 2011).

Avian mortalities or injuries could 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 nesting or shelter from predators and inclement weather, or as nest trees for rearing young. The scale of this impact would be associated with the amount of tree removal and the abundance of forest-dwelling birds roosting/nesting in the area. These impacts could be particularly pronounced in IBAs within the state as these areas provide them with essential habitat that supports various life stages (Hill, et al., 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 Montana 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. DOI comments dated October 11, 2016[174], state that communication towers are "currently estimated to kill between four and five million birds per year", although collisions with towers have the potential to impact a large number of birds unless BMPs and mitigation measures are incorporated, tower collisions are unlikely to cause population-level impacts (Regulations.gov, 2016). Of particular concern is avian mortality due to collisions with towers at night, when birds can be attracted to tower obstruction lights. Research has shown that birds are attracted to steady, non-flashing red lights and are much less attracted to flashing lights, which can reduce migratory bird collisions by as much as 70%. The FAA has issued requirements to eliminate steady-burning flashing obstruction lights and use

[174] See Appendix F, Draft PEIS Public Comments, for the full text of the Department of Interior Comments.

only flashing obstruction lights (FAA, 2016a) (FAA, 2016b) (FCC, 2017). See Chapter 19, BMPs and Mitigation Measures, for BMPs and mitigation measures that FirstNet and/or their partners would require, as practicable and feasible, to further avoid or minimize potential impacts to birds from tower lighting. If siting considerations and BMPs and mitigation measures are implemented (Chapter 19), potential impacts could be minimized. Additionally, potential impacts under MBTA and BGEPA could be addressed through BMPs and mitigation measures, including permitted "take", developed in consultation with USFWS.

Reptiles and Amphibians

Montana's reptiles and amphibians occur in a wide variety of habitats from the arid plains in the east to moist coniferous forests in the west. Very few species are widespread throughout the state, and are instead more commonly found in either the plains region in the east or the mountainous region in the west. Direct mortality to amphibians or reptiles could occur in construction zones either by excavation activities or by vehicle strikes. For example, snapping turtle (*Chelydra serpentina*) nests "are built in soft sand, loam, vegetation debris, or even sawdust piles, most often in open areas and often 100 meters or more from water," making them potentially vulnerable (MFWP, 2016). However, these events are expected to be temporary and isolated, affecting only individual animals.

Terrestrial Invertebrates

Ground disturbance or land clearing activities as well as use of heavy equipment could result in direct injury or mortality to terrestrial invertebrates. However, deployment activities are expected to be temporary and isolated, thereby limiting the potential for direct mortality and likely affecting only a small number of terrestrial invertebrates. The terrestrial invertebrate populations of Montana 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 disturbances 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. Areas near urban areas such as Billings, Missoula, and Helena have experienced extensive land use changes. However, a large portion of the state is mountainous and forested.

Additionally, habitat loss could occur through exclusion, directly or indirectly, preventing an animal from accessing an optimal habitat (e.g., breeding, forage, or refuge), either by physically preventing use of a habitat or by causing an animal to avoid a habitat, either temporarily or long-term. It is expected that activities associated with the Proposed Action would cause exclusion effects only in very special circumstances, as in most cases an animal could fly, swim, or walk to a nearby area that would provide refuge.

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

Terrestrial Mammals

Mammals occupy a wide range of habitats throughout Montana and may experience localized effects of habitat loss or fragmentation. Removal or loss of vegetation may impact large mammals (e.g., elk, moose) by decreasing the availability of forest for cover from predators or foraging. Loss of cover may increase predation on both breeding adults as well as their young. The loss, alteration, or fragmentation of forested habitat would also impact some small mammals (e.g., squirrels, rabbits) 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 implementing BMPs and mitigation measures.

Birds

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

Noise and vibration 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, et al., 1997).

The degree to which habitat exclusion affects birds depends on many factors. The impact to passerine[175] species from disturbance or displacement from construction activities is likely to be short-term with minor effects from exclusion. Exclusion from resources concentrated in a small migratory stop area during peak migration could have major impacts to species that migrate in large flocks and concentrate at stopovers (e.g., piping plover migrating through Montana). 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 Montana's amphibians and reptiles typically consist of wetlands and, in some cases, as with the timber rattlesnake, the surrounding upland forest. Impacts are expected to be *less than significant*. If proposed project sites were unable to avoid sensitive areas, BMPs and mitigation measures (see Chapter 19) could help to avoid or minimize the potential impacts.

[175] 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.

Filling or draining of wetland breeding habitat (see Section 11.2.4, Water Resources) and alterations to ground or surface water flow from development associated with the Proposed Action may also have effects on Montana's amphibian and reptile populations, though BMPs and mitigation measures would help to avoid or minimize the potential impacts.[176]

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, *less than significant* impacts to terrestrial invertebrates are expected. Impacts to sensitive invertebrate species are discussed below in Section 11.2.6.6, Threatened and Endangered Species and Species of Concern.

Indirect Injury/Mortality

Indirect injury/mortality impacts vary depending on the species, time of year and duration of deployment. Overall, potential impacts are expected to remain *less than significant* at the programmatic level (except for birds and bats) due to potential exposure to RF emissions, see below, due to the short-term nature and limited geographic scope of expected activities, as FirstNet would attempt to avoid these areas, though BMPs and mitigation measures could further help to avoid or minimize the potential impacts. Chapter 19, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Terrestrial Mammals

Stress from repeated disturbances during critical time periods (e.g., roosting and mating) could reduce the overall fitness and productivity of young and adult terrestrial mammals. Indirect effects could occur 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; and, repeated disturbances would be unlikely to occur. Depending on the project type and location, individual species may be disturbed resulting in *less than significant* impacts.

There are no published studies that document physiological or other adverse effects to bats from radio frequency (RF) exposure. However, because bats are similar ecologically and physiologically to birds, they have the potential to be affected by RF exposure in similar ways to birds (see the birds subsection below). One study demonstrated that foraging bats avoided areas exposed to varying levels of electromagnetic emissions compared with control sites, and attributed this behavior to the increased risk of overheating and echolocation interference caused by electromagnetic field exposure (Nicholls & Racey, 2009). As stated below, experts emphasize that targeted field research needs to be conducted to more fully document the nature

[176] See Section 11.2.5, Wetlands, for a discussion of BMPs for wetlands.

and extent of effects of RF exposure on bats and other wildlife, and the implications of those effects on populations over the long term (Manville II, 2015) (Manville II, 2016a) (Appendix G). FirstNet recognizes that RF exposure has the potential to adversely impact bats, particularly bats that communally roost or breed and nurture young in areas with RF exposure, and concurs with the need for further research. As such, and as a precaution, FirstNet would implement BMPs and mitigation measures that focus on siting towers away from known communal bat use areas to the extent practicable or feasible (described in Chapter 19, BMPs and Mitigation Measures) to help reduce bird mortalities associated with both RF emissions and tower collision. See Section 2.4, Radio Frequency Emissions, for additional information on potential RF exposure impacts.

Birds

Repeated disturbance, especially during the breeding and nesting season, could cause stress to individuals lowering fitness and productivity. These impacts could be particularly pronounced in IBAs within the state if birds temporarily avoid those areas, since they provide essential habitat for various life stages (Hill, et al., 1997). The majority of FirstNet deployment activities would be short-term in nature, and repeated disturbances are not expected. Depending on the project type and location, individual species may be disturbed resulting in *less than significant* impacts.

Research indicates that RF exposure may adversely affect birds. A comment letter on the Draft Programmatic Environmental Impact Statement for the West region, presented by Dr. Albert Manville, former USFWS agency lead on avian-structural impacts, summarizes the state of scientific knowledge of the potential effects of RF exposure on wildlife, particularly migratory birds; the comment letter is presented in its entirety in Appendix G. RF exposure may result in adverse impacts on wildlife, although a distinct causal relationship between RF exposure and responses in wild animal populations has not been established. Further, important scientific questions regarding the mechanisms of impact, the exposure levels that trigger adverse effects, and the importance of confounding factors in the manifestation of effects, among other questions, remain unanswered (Manville II, 2016b) (Appendix G).

Research conducted to date under controlled laboratory conditions has identified a wide range of physiological and behavioral changes in avian and mammalian subjects, including embryonic mortality in bird eggs, genetic abnormalities, cellular defects, tumor growth, and reproductive and other behavioral changes in adult birds and rodents (Wyde, 2016) (Levitt & Lai, 2010) (DiCarlo, 2002) (Grigor'ev, 2003) (Panagopoulos, 2008).

Few studies of the effects of RF exposure on wild animal populations have been conducted due to the difficulty of performing controlled studies on wild subjects. Those that have been conducted are observational in nature (i.e., documenting of reproductive success and behavior in birds near RF-emitting facilities). These studies lack controls on exposure levels or other potentially confounding factors. Nevertheless, findings from these studies indicate reduced survivorship at all life stages; physiological problems related to locomotion and foraging success; and behavioral changes that resulted in delayed or unsuccessful mating in several species of nesting birds (Balmori, 2005) (Balmori, 2009) (Balmori & Hallberg, 2007) (Manville II, 2016b) (Appendix G). Balmori (*2005*) documented effects as far as 1,000 feet from an RF source consisting of multiple cellular phone towers. Another study of wild birds conducted by (Engels, 2014) documented that migratory birds are unable to use their magnetic compass in the presence of urban electromagnetic noise,[177] which can disrupt migration or send birds off course, potentially resulting in reduced survivorship.

Experts emphasize that targeted field research needs to be conducted to more fully document the nature and extent of effects of RF exposure on birds and other wildlife and the implications of those effects on wildlife populations over the long term (Manville II, 2015) (Manville II, 2016b) (Appendix G). Such studies should be conducted over multiple generations and include controls to more clearly establish causal relationships, identify potential chronic effects, and determine threshold exposure levels. FirstNet recognizes that RF exposure may adversely impact wildlife, particularly birds that nest, roost, forage, or otherwise spend considerable time in areas with RF exposure, and concurs with the need for further research. As such, and as a precaution, FirstNet would implement BMPs and mitigation measures that focus on siting towers away from high bird use areas to the extent practicable or feasible (described in Chapter 19, BMPs and Mitigation Measures). See Section 2.4, Radio Frequency Emissions, for additional information on potential RF exposure impacts.

Reptiles and Amphibians

Changes in water quality and quantity, especially during the breeding seasons, could cause stress resulting in lower productivity. The majority of FirstNet deployment activities would be short-term in nature, and repeated disturbances would be unlikely to occur. Depending on the project type and location, individual species may be disturbed resulting in *less than significant* impacts.

Terrestrial Invertebrates

Terrestrial invertebrates could experience chronic stress, either by changes in habitat composition or competition for resources, resulting in lower productivity. Due to the large number of invertebrates distributed throughout the state, and given the short-term nature of most of the deployment activities, this impact would likely be *less than significant*.

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 Montana's amphibians and reptiles, terrestrial mammals, birds, and terrestrial invertebrates are described below. See Section 2.4, Radio Frequency Emissions, for additional information on potential RF exposure impacts.

Terrestrial Mammals

Large game animals (e.g., elk, moose) have well-defined migratory routes. Route knowledge is passed on from one generation to the next and includes important feeding and calving areas.

[177] Urban electromagnetic noise is a term used to describe an area with a concentration of cell phone towers and users, which by sheer volume and level of use, creates a zone of electromagnetic noise.

Small mammals (e.g., bats) also have migratory routes that include spring and fall roosting areas between their summer maternity roosts and hibernacula.[178] Any clearance, drilling, and construction activities needed for network deployment, including noise and vibration associated with these activities, has the potential to divert mammals from these migratory routes. Impacts could vary depending on the species, time of year of construction/operation, and duration, but are generally expected to be *less than significant*. 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, some birds undertake long-distance migrations. Montana is located within both the Central and Pacific Flyways. Covering the eastern two-thirds of Montana, the Central Flyway spans from the Gulf Coast of Texas to the Canadian boreal forest. The Pacific Flyway covers the western third of Montana and spans from the west coast of Mexico to the arctic. According to the Montana Audubon Society, 42 IBAs, covering approximately 10 million acres, have been identified in Montana, including breeding,[179] migratory stop over, feeding, and over-wintering areas, and a variety of habitats such as native grasslands, grasslands, sage brush, and wetland/riparian[180] areas (Montana Audubon Society, 2015). These IBAs are widely distributed throughout the state, although the largest concentration of IBAs are located in the central and north central regions of the state, within the Great Plains and Rocky Mountains. Many migratory routes are passed from one generation to the next. Additionally, there is some evidence in the scientific literature that RF emissions could affect bird migration. Engels (*2014*) documented that migratory birds are unable to use their magnetic compass in the presence of urban electromagnetic noise, which can disrupt migration or send birds off course, potentially resulting in reduced survivorship. It is unlikely that the limited amount of infrastructure, the amount of RF emissions generated by Project infrastructure, and the temporary nature of the deployment activities would result in impacts to large populations of migratory birds, but more likely that individual birds could be impacted.

Impacts could 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, and impacts are expected to be *less than significant*. BMPs and mitigation measures could help to further avoid or minimize effects to migratory pathways.

Reptiles and Amphibians

Several species of mole salamanders and the northern leopard frog are known to seasonally migrate in Montana. These amphibians often travel by the hundreds on their migration pathway

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

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

[180] Riparian: "Referring to the areas adjacent to rivers and streams with a differing density, diversity, and productivity of plant and animal species relative to nearby uplands." (USEPA, 2015f)

that often crosses roadways. Mole salamanders are typically found in burrows in the forest floor (Montana Field Guide, 2015). Mortality and barriers to movement could occur as result of the Proposed Action (Berven & Grudzien, 1990) (Calhoun & DeMaynadier, 2007).

Species that use streams as dispersal or migratory corridors may be impacted if these waterways are restricted or altered, but and impacts are expected to be *less than significant*. BMPs and mitigation measures could help to further avoid or minimize the potential impacts.

<u>Terrestrial Invertebrates</u>

The proposed deployment activities would be expected to be short-term or temporary in nature. *No effects* to migratory patterns of Montana's terrestrial invertebrates are expected as a result of the Proposed Action.

Reproductive Effects

Reproductive effects are considered those that either directly or indirectly reduce an animal's ability to produce offspring or reduce the rates of growth, maturation, and survival of offspring, which could affect the overall population of individuals. See Section 2.4, Radio Frequency Emissions, for additional information on potential RF exposure impacts.

<u>Terrestrial Mammals</u>

Restricted access to important winter hibernacula or summer maternity roosts for bats and calving grounds for large mammals, such as elk and moose, have the potential to negatively affect body condition and reproductive success of mammals in Montana. For example, moose use certain types of habitats that allow for more effective defense of their calves from predators.

There are no published studies that document adverse effects to bats from RF exposure. As stated above, experts emphasize that targeted field research needs to be conducted to more fully document the nature and extent of effects of RF exposure on bats and other wildlife, and the implications of those effects on populations over the long term (Manville II, 2015) (Manville II, 2016b) (Appendix G). FirstNet recognizes that RF exposure has the potential to adversely impact bats, particularly bats that communally roost or breed and nurture young in areas with RF exposure, and concurs with the need for further research. As such, and as a precaution, FirstNet would implement BMPs and mitigation measures that focus on siting towers away from known communal bat use areas to the extent practicable or feasible (described in Chapter 19, BMPs and Mitigation Measures). See Section 2.4, Radio Frequency Emissions, for additional information on potential RF exposure impacts.

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*. Chapter 19, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

Birds

Impacts due to Proposed Action deployment and operations could include abandonment of the area and nests due to disturbance. Disturbance (visual, noise, and vibration) 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, et al., 1997). Research conducted to date under controlled laboratory conditions has identified a wide range of physiological and behavioral changes in avian subjects, including embryonic mortality in bird eggs and reproductive changes in adult birds (Wyde, 2016) (Levitt & Lai, 2010) (DiCarlo, 2002) (Grigor'ev, 2003) (Panagopoulos, 2008). Laboratory studies conducted with domestic chicken embryos have shown that emissions at the same frequency and intensity as that used in cellular telephones have appeared to result in embryonic mortality (DiCarlo, 2002) (Manville, A.M., II, 2007). These studies suggest that RF emissions at low levels (far below the existing exposure guidelines for humans) (see Section 2.4.2, RF Emissions and Humans) may be harmful to wild birds; however, given the controlled nature of the studies and potential exposure differences in the wild, it is unclear how this exposure would affect organisms in the wild.

As such, and as a precaution, FirstNet would implement BMPs and mitigation measures that focus on siting towers away from high bird use areas to the extent practicable or feasible (described in Chapter 19, BMPs and Mitigation Measures). See Section 2.4, Radio Frequency Emissions, for additional information on potential RF exposure impacts.

The majority of FirstNet deployment or operation activities are likely to be small scale in nature. Chapter 19, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

Reptiles and Amphibians

Reproductive effects to reptile nests may occur through direct loss or disturbance of nests. For example, the snapping turtle leaves its breeding pool in the spring 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. Chapter 19, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

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 could 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 Montana's wildlife are described below.

<u>Terrestrial Mammals</u>

In Montana, feral boars could adversely impact several native large and small mammals, including bear, turkey, waterfowl, and deer; however, there are currently no established populations in Montana (Invasive.org, 2010). They feed on reptiles and amphibians, destroy native vegetation resulting in erosion and water resource concerns, and could carry/transmit disease to livestock and humans.

FirstNet deployment or operation activities could result in short-term or temporary changes to specific project sites, although these sites are expected to return to their natural state in a year or two. FirstNet deployment activities are not expected to introduce terrestrial mammal species to project sites as these activities are temporary and would not provide a mechanism for transport of invasive terrestrial mammals to project sites from other locations. BMPs and mitigation measures (see Chapter 19) would help to avoid or minimize the potential for introducing invasive plant species during implementation of the Proposed Action as well as minimize effects to terrestrial mammals as a result of the introduction of invasive species.

<u>Birds</u>

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 Montana, mute swans are an exotic species that could impact native waterfowl and wetland birds causing nest abandonment or impacts to rearing young due to their aggressive behavior. Further, this invasive bird could 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 (Guillaume et al., 2014). Although FirstNet deployment activities could result in short-term or temporary changes to specific project sites; these sites are expected to return to their natural state in a year or two. Chapter 19, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts. BMPs and mitigation measures (see Chapter 19) would help to avoid or minimize the potential for introducing invasive plant species during implementation of the Proposed Action as well as minimize effects to birds as a result of the introduction of invasive species.

Reptiles and Amphibians

The red-eared slider (*Trachemys scripta elegans*) (a turtle species) and African clawed frog (*Xenopus laevis*) are regulated in Montana under MCA87-5-709. Both of these species are highly adaptable and could threaten native wildlife by competing with them for food sources and also spread disease (ISSG, 2010). Although FirstNet deployment activities could result in short-term or temporary changes to specific project sites, these sites are expected to return to their natural state in a year or two. Invasive reptile or amphibian species are not expected to be introduced at project sites as part of the deployment activities. Invasive reptile or amphibian species are not expected to be introduced at project sites from machinery or laborers. BMPs and mitigation measures (see Chapter 19) would help to avoid or minimize the potential for introducing invasive plant species during implementation of the Proposed Action as well as minimize effects to reptiles and amphibians as a result of the introduction of invasive species.

Terrestrial Invertebrates

Terrestrial invertebrate populations are susceptible to invasive plant species that may change or alter the community composition of specific plants on which they depend. Effects from invasive plant species to terrestrial invertebrates would be similar to those described for habitat loss and degradation.

Invasive insects pose a large threat to Montana's forest and agricultural resources (USFS, 2015k). Species such as the gypsy moth (*Lymantria dispar*), Asian longhorn beetle (*Anoplophora glabripennis*), and emerald ash borer (*Agrilus plannipennis*) are of particular concern in Montana and are known to cause irreversible damage to native forests. Populations of gypsy moth discovered in Montana were eliminated. Asian longhorn beetles and emerald ash borers have not been detected within the state (MT DNRC, 2016). The potential to introduce invasive invertebrates within construction zones and during long-term site maintenance could occur from vehicles and equipment being transported from one region to another, or when conducting revegetation of a site after deployment activities are complete. Chapter 19, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

Potential Impacts of the Preferred Alternative

The following section assesses potential impacts associated with implementation of the Preferred Alternative, including deployment and operational activities.

Deployment Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, implementation of the Preferred Alternative could result in the deployment of various types of facilities or infrastructure. Depending on the physical nature and location of the facility/infrastructure and the specific deployment requirements, some activities would result in potential 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.

Activities Likely to Have No Impacts at the Programmatic Level

Of the types of facilities or infrastructure deployment scenarios described in Section 2.1.2, Proposed Action Infrastructure, the following are expected to have *no impacts* to wildlife resources under the conditions described below:

- Wired Projects
  - Use of Existing Conduit – New Buried Fiber Optic Plant: Disturbance associated with the installation of fiber optic cable in existing conduit would be limited to entry and exit points of the existing conduit in previously disturbed areas. Noise and vibration generated by equipment required to install fiber would be infrequent and of short duration, and unlikely to produce measurable changes in wildlife behavior. It is anticipated that effects to wildlife would be temporary and would not result in any perceptible change.
  - Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting up of dark fiber would have *no impacts* to wildlife resources because there would be no ground disturbance.
- Satellites and Other Technologies
  - Satellite-Enabled Devices and Equipment: It is anticipated that the installation of permanent equipment on existing structures 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 at the Programmatic Level

Potential deployment-related impacts to wildlife resources as a result of implementation of the Preferred Alternative would encompass a range of impacts that could occur, including direct injury/mortality; vegetation and habitat loss, alteration, or fragmentation; effects to migratory patterns; indirect injury/mortality; reproductive effects; and invasive species effects. The types of infrastructure development scenarios or deployment activities that could be part of the Preferred Alternative and result in potential impacts to wildlife resources include the following:

- Wired Projects
  - New Build – Buried Fiber Optic Plant: Plowing, trenching, or directional boring and the construction of POPs, huts, or other associated facilities or hand-holes to access fiber could result in potential impacts to wildlife resources. Land/vegetation clearing and excavation activities, associated with construction of POPs, huts, or other associated

facilities could result in direct injury/mortalities of wildlife that are not mobile enough to avoid construction activities (e.g. reptiles, small mammals, and young individuals), that utilize burrows (e.g., ground squirrels), or that are defending nest sites (such as ground-nesting birds). Disturbance, including noise and vibration, 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 and vibration 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 or near bodies of water and construction of landings and/or facilities on the shore to accept submarine cables could potentially impact wildlife (see Section 11.2.4, 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/or 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.

- o 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.
- o 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 and vibration disturbance could potentially impact migratory patterns of wildlife. RF emissions 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 and vibration. The magnitude of these effects depends on the timing and frequency of deployments. However, deployment activities are expected to be temporary and isolated, and likely affecting only a small number of wildlife.

In general, the abovementioned activities could potentially involve land/vegetation clearing; excavation and trenching; construction of access roads; installation or restructuring of towers or poles; installation of security/safety lighting and fencing; and deployment of aerial platforms. Potential impacts to wildlife resources associated with deployment of this infrastructure are anticipated to be *less than significant* at the programmatic level, given the small scale of likely individual FirstNet projects, with the exception of impacts to birds and bats, which are expected to be *less than significant with BMPs and mitigation measures incorporated.* 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. Site-specific analysis may be required depending on the site conditions, the type of deployment, or any other permits or permissions necessary to perform the work. Chapter 19, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

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.

At the programmatic level, it is anticipated that there would be *less than significant* impacts to wildlife resources associated with routine inspections of the Preferred Alternative, other than birds and bats (see below). Site maintenance would be infrequent, including mowing or limited application of herbicides, may result in *less than significant* impacts to wildlife at the programmatic level, 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. In particular, collisions with new cell towers that may be installed as part of the Preferred Alternative could increase avian mortality. As stated above, these impacts would likely be limited to individual wildlife species. DOI comments dated October 11, 2016[181] stated that communication towers are "currently estimated to kill between four and five million birds per year", although collisions with towers have the potential to impact a large number of birds unless BMPs and mitigation measures are incorporated, tower collisions are unlikely to cause population-level impacts (Regulations.gov, 2016).

Wildlife resources could 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 than *less than significant* at the programmatic level, given the short-term nature and limited geographic scope for individual activities. Chapter 19, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

[181] See Appendix F, Draft PEIS Public Comments, for the full text of the Department of Interior comments.

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 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.

Deployment Impacts

As described above, at the programmatic level, implementation of deployable technologies could result in *less than significant* impacts from direct and indirect injury or mortality events, changes in migratory patterns, disturbance, or displacement. Greater frequency and duration of deployments could change the magnitude of impacts depending on species, life history, and region of the state. However, impacts are expected to remain *less than significant* at the programmatic level, because deployment activities are expected to be temporary, likely affecting only a small number of wildlife. Chapter 19, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

Operational Impacts

As described above, operational activities would consist of implementation/running of the deployable technology and routine maintenance and inspections. As with the Preferred Alternative, it is anticipated that there would be *less than significant* impacts at the programmatic level because deployable activities are expected to be temporary and likely affecting only a small number of wildlife. The impacts can vary greatly among species and geographic region. Chapter 19, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

No Action Alternative

Under the No Action Alternative, the nationwide, interoperable, public safety broadband network would not be deployed and there would be no associated construction or installation of wired, wireless, deployable infrastructure or satellites and other technologies. Therefore, there would be *no impacts* to wildlife resources as a result of the No Action Alternative. Environmental conditions would therefore be the same as those described in Section 11.1.6.4, Terrestrial Wildlife.

11.2.6.5. Fisheries and Aquatic Habitats

Impacts to fisheries and aquatic habitats occurring in Montana 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, 2012f).

Based on the impact significance criteria presented in Table 11.2.6-1, *less than significant* impacts would be anticipated at the programmatic level, 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 disturbances 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, the 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. Additionally, deployment activities with the potential for impacts under the MSFCMA or other sensitive aquatic habitats could be addressed through BMPs and mitigation measures.

Indirect Injury/Mortality

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* at the programmatic level, and BMPs and mitigation measures to protect water resources (see Section 11.2.4, Water Resources) could help to minimize or avoid potential impacts.

Effects to Migration or Migratory Patterns

Migration is the regular movement of animals from one region to another and back again. Migratory patterns vary by species and sometimes within the same species. For example, restrictions or alterations to waterways could alter migration patterns, limit fish passage, or affect foraging and spawning site access, such as the Burbot (*Lota lota*), which is an SGCN in Montana whose decline is believed to be caused in part by the construction of the Libby Dam on the Kootenai River (MFWP and MNHP, 2015). However, impacts are expected to be *less than significant* at the programmatic level, 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. Chapter 19, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

Reproductive Effects

Reproductive effects are considered those that either directly or indirectly reduce an animal's ability to produce offspring or reduce the rates of growth, maturation, and survival of offspring, which could affect the overall population of individuals. 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* at the programmatic level. Chapter 19, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

Invasive Species Effects

The potential to introduce invasive plants within construction zones could occur from vehicles and equipment being transported from one region to another, or when conducting revegetation of a site after deployment activities are complete. Aquatic vegetation regulated in Montana include the curlyleaf pondweed (*Potamogeton crispus*), Eurasian watermilfoil (*Myriophyllum spicatum*), hydrilla (*Hydrilla verticillata*), and flowering rush (*Butomus umbellatus*) (Montana Department of Agriculture, 2013). FirstNet deployment activities could result in short-term or temporary changes to specific project sites although these sites are expected to return to their natural state in a year or two. Invasive 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* at the programmatic level. Chapter 19, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

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 at the Programmatic Level

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 and vibration, associated with the installation of fiber optic cable in existing conduit would be limited to entry and exit points of the existing conduit in previously disturbed areas. It is anticipated that effects to fisheries would be temporary and would not result in any perceptible change.
  - Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting up of dark fiber would have *no impacts* to fisheries and aquatic habitats because there would be no ground disturbance.
- Satellites and Other Technologies
  - Satellite-Enabled Devices and Equipment: It is anticipated that the installation of permanent equipment on existing structures and the use of portable devices that use satellite technology would not impact fisheries and aquatic habitats because those activities would not require ground disturbance.
  - Deployment of Satellites: FirstNet does not anticipate launching satellites as part of the deployment of the NPSBN; however, it could include equipment on satellites that are already being launched for other purposes. As adding equipment to an existing launch vehicle would be very unlikely to impact fisheries, it is anticipated that this activity would have *no impact* on the aquatic environment.

Activities with the Potential to Have Impacts at the Programmatic Level

Potential deployment-related impacts to fisheries and aquatic habitats as a result of implementation of the Preferred Alternative would encompass a range of impacts that could occur, including direct injury/mortality; vegetation and habitat loss, alteration, or fragmentation; effects to migratory patterns; indirect injury/mortality; reproductive effects; and invasive species effects. The types of infrastructure deployment activities that could be part of the Preferred Alternative and result in potential impacts to fisheries and aquatic habitats include the following:

- Wired Projects
  - New Build – Buried Fiber Optic Plant: Plowing, trenching, or directional boring and the construction of POPs, huts, or other associated facilities or hand-holes to access fiber could result in potential impacts to fisheries and aquatic habitats. Land/vegetation clearing and excavation activities, associated with construction of POPs, huts, or other associated facilities, particularly if they occur adjacent to water resources that support fish, could result in habitat loss, alteration and fragmentation; indirect injury/mortality; and invasive species effects 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.
  - New Build – Submarine Fiber Optic Plant: The installation of cables in or near bodies of water and construction of landings and/or facilities on the 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 and vibration, 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* at the programmatic level due to the small scale of deployment activities and the limited number of aquatic species expected to be impacted. Chapter 19, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

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.

At the programmatic level, 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 near fish habitat may result in *less than significant* effects to fisheries and aquatic habitats at the programmatic level, due to accidental spills from maintenance equipment or pesticide runoff.

Fisheries and aquatic habitat could still be affected by the reduction in habitat quality associated with habitat fragmentation from the presence of access roads, transmission corridors, and support facilities. These features could also continue to disrupt movements of fish passage. In addition, the presence of new access roads and transmission line ROWs near water resources that support fish may increase human use of the surrounding areas, which could increase disturbance to fisheries and aquatic habitats resulting in effects to migratory pathways, indirect injury/mortalities, reproductive effects, as well as the potential introduction and spread of invasive species as explained above. Fisheries and aquatic habitat may also be impacted if increased access leads to an increase in the legal or illegal take of biota. However, impacts are expected to be *less than significant* at the programmatic level due to the small scale of expected activities with the potential to affect fisheries and aquatic habitat. As a result of the small scale, only a limited number of individuals are anticipated to be impacted, furthermore, habitat impacts would also be minimal in scale. Chapter 19, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

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 construction associated with wired or wireless projects discussed above under the Preferred Alternative. Some limited construction could be associated with implementation such as land clearing or paving for parking or staging areas. The specific infrastructure associated with the Deployable Technologies Alternative would be the same as the deployable technologies implemented as part of the Preferred Alternative but would likely be implemented in greater numbers, over a larger geographic extent, and used with greater frequency and duration. Therefore, potential impacts to fisheries and aquatic habitats as a result of implementation of this alternative could be as described below.

<u>Deployment Impacts</u>

As explained above, at the programmatic level, implementation of deployable technologies could result in *less than significant* impacts from habitat loss, alteration and fragmentation; indirect injury/mortality, and invasive species effects. Greater frequency and duration of deployments could change the magnitude of impacts depending on species, life history, and region of the state. However, impacts are expected to remain *less than significant* at the programmatic level due to the limited nature of expected deployment activities. Chapter 19, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

<u>Operational Impacts</u>

Operational activities would consist of implementation/running of the deployable technology and routine maintenance and inspections. As with the Preferred Alternative, at the programmatic level 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 19, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

No Action Alternative

Under the No Action Alternative, the NPSBN would not be deployed; therefore there would be no associated construction or installation of wired, wireless, deployable infrastructure or satellites and other technologies. Therefore, there would be *no impacts* to fisheries and aquatic habitats as a result of the No Action Alternative. Environmental conditions would therefore be the same as those described in Section 11.1.6.5, Fisheries and Aquatic Habitats.

11.2.6.6. Threatened and Endangered Species and Species of Conservation Concern

This section describes potential impacts to threatened and endangered species in Montana 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 19, BMPs and Mitigation Measures, may be implemented as appropriate to further minimize potential impacts.

11.2.6.7. 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 11.2.6-2. The categories of impacts for threatened and endangered species and their habitats are defined at the programmatic level as *may affect*, *likely to adversely affect*; *may affect*, *not likely to adversely affect*; and *no effect*. These impact categories are comparable to those defined in the *Endangered Species Consultation Handbook* and are described in general terms below (USFWS, 1998):

- *No effect* means that no listed resources would be exposed to the action and its environmental consequences.
- *May affect, not likely to adversely affect* means that all effects are beneficial, insignificant, or discountable. Beneficial effects have contemporaneous positive effects without any adverse

effects to the species or habitat. Insignificant effects relate to the size of the impact and include those effects that are undetectable, not measurable, or cannot be evaluated. Discountable effects are those extremely unlikely to occur.

- *May affect, likely to adversely affect* means that listed resources are likely to be exposed to the action or its environmental consequences and would respond in a negative manner to the exposure.

Characteristics of each effect type, including magnitude or intensity, geographic extent, and duration or frequency, were used to determine the impact significance rating associated with each potential impact.

Given the nature of this programmatic evaluation, and because the Proposed Action could potentially cover a wide variety of actions that would take place in various landscapes across the state, the potential impacts to threatened and endangered species addressed below are presented as a range of possible impacts.

Table 11.2.6-2: Impact Significance Rating Criteria for Threatened and Endangered Species at the Programmatic Level

Type of Effect	Effect Characteristics	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 Characteristics	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.	

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 11.2.6-2, any direct injury or mortality of a listed species at the individual-level *may affect* those species and could 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, fish, invertebrates, and plants with known occurrence in Montana are described below.

Terrestrial Mammals

The Northern long-eared bat (*Myotis septentrionalis*) is found in Montana. Direct mortality or injury to the northern long-eared bat could occur from collisions or electrocutions with manmade cables and wires, vehicle strikes, or when nests are either disturbed or destroyed. 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 19, BMPs and Mitigation Measures, may be implemented as appropriate to further minimize potential impacts.

The Canada lynx (*Lynx canadensis*) and grizzly bear (*Ursus arctos horribilis*) are found in western Montana, while the black-footed ferret (*Mustela nigripes*) is an eastern Montana species (USFWS, 2015c). Direct mortality or injury to these species could occur from vehicle strikes as these species are occasionally found along transportation corridors. Entanglement in fences or other barriers could also be a source of mortality or injury to these species. 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 19, BMPs and Mitigation Measures, may be implemented as appropriate to further minimize potential impacts.

Birds

Two endangered, three threatened, and one candidate bird species are known to occur in Montana. Red knots (*Calidris canutus rufa*), Sprague's pipits (*Anthus spragueii*), piping plovers (*Charadrius melodus*), and whooping cranes (*Grus americana*) are found in the eastern interior plains of Montana, while yellow-billed cuckoos (*Coccyzus americanus*) are found only in western Montana. The least tern (*Sterna antillarum*) has a slightly larger range occurring throughout eastern, central, and southwestern Montana. Depending on the project type and location, direct mortality or injury to these birds could occur from collisions or electrocutions with manmade cables and wires, vehicle strikes, or by disturbance or destruction of nests during ground disturbing activities. 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 19, BMPs and Mitigation Measures, may be implemented as appropriate to further minimize potential impacts.

Fish

Federally listed bull trout (*Salvelinus confluentus*) and white sturgeon (*Acipenser transmontanus*) are found in northwestern Montana, while the pallid sturgeon (*Scaphirhynchus albus*) is located in central and eastern Montana. Direct mortality or injury to these protected fish species from vessel/boat strikes or entanglements resulting from the Proposed Action are unlikely as the majority of FirstNet deployment projects would not occur in the 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 19, BMPs and Mitigation Measures, may be implemented as appropriate to further minimize potential impacts.

Reptiles and Amphibians

No federally listed reptiles or amphibians occur in Montana. Therefore, no injury or mortality effects to federally threatened and endangered reptiles or amphibian species are expected as a result of the Proposed Action.

Invertebrates

No federally endangered or threatened invertebrates are listed for Montana. However, one federally listed candidate species, the meltwater lednian stonefly occurs in Glacier National Park within high elevation meltwater streams. In the U.S., this species' entire range includes only two counties in Montana: Flathead and Glacier (USFWS, 2015i). Federal candidate species are not currently protected under the ESA. However, USFWS recommends conservation measures still be applied for these species. 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. 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 19, BMPs and Mitigation Measures, may be implemented as appropriate to further minimize potential impacts.

Plants

Direct mortality to federally listed plants could occur if land clearing or excavation activities associated with the Proposed Action occur in an area inhabited by one of these species. Three threatened and one candidate plant species are federally listed and known to occur in Montana. Spalding's campion (*Silene spaldingii*) and water howellia (*Howellia aquatilis*) occur in northwestern Montana; Ute ladies' tresses (*Spiranthes diluvialis*) occurs in the southwestern counties of Montana; and whitebark pine (*Pinus albicaulis*) occurs in western and central Montana (USFWS, 2015c). 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 19, BMPs and Mitigation Measures, 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 could affect the breeding success. Potential effects to federally listed terrestrial mammals, birds, fish, invertebrates, and plants with known occurrence in Montana are described below.

Terrestrial Mammals

Noise, vibration, 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 19, BMPs and Mitigation Measures, may be implemented as appropriate to further minimize potential impacts.

Birds

The piping plover nests in Montana on open, sparsely vegetated beaches composed of sand or gravel on islands or shorelines of inland lakes or rivers (USFWS, 1988). Sprague's pipit also nests in Montana and its preferred habitat includes native grasslands (USFWS, 2014i). The majority of FirstNet deployment activities would not occur on beaches or native grasslands; therefore, impacts to these bird species are not anticipated. Noise, vibration, light, or human disturbance within nesting areas could cause nesting birds 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 19, BMPs and Mitigation Measures, may be implemented as appropriate to further minimize potential impacts.

Fish

Deployment activities in the Missouri, Yellowstone, and Kootenai Rivers and the Clark Fork, Flathead, St. Mary, and Belly River basins in Montana could result in increased disturbance (e.g., humans, noise, vibration), especially during spawning activity, and changes in water quality could cause stress resulting in lower productivity (see Section 11.2.4, Water Resources, for a discussion of potential impacts to water resources). Impacts to reproduction for the protected pallid sturgeon, white sturgeon, or bull trout species are unlikely as the majority of 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 19, BMPs and Mitigation Measures, may be implemented as appropriate to further minimize potential impacts.

<u>Invertebrates</u>

Impacts to glacier-fed streams and altered stream flow could affect the meltwater lednian stonefly in reduced survival and reproduction (MFWP and MNHP, 2015) (USFWS, 2014j). Impacts associated with deployment activities *may affect, but is not likely to adversely affect*, listed invertebrates. 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 19, BMPs and Mitigation Measures, may be implemented as appropriate to further minimize potential impacts.

<u>Plants</u>

Deployment activities have the potential to create dust emissions, which could impact reproduction in federally-listed plants. Operations activities that require the limited use of herbicides or pesticides may also impact reproduction in listed plants. It is expected that these activities *may affect*, *but are not likely to adversely effect*, listed species. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 19, may be implemented as appropriate to further minimize potential impacts.

Behavioral Effects

Effects to normal behavior patterns that could lead to disruptions in breeding, feeding, or sheltering, resulting in take of a listed species *may affect, but are not likely to adversely affect*. Potential effects to federally listed terrestrial mammals, birds, fish, invertebrates, and plants with known occurrence in Montana are described below.

<u>Mammals</u>

Noise associated with the deployment activities could affect mammal migration patterns, though impacts are likely to be short-term. It is clear that behavioral responses are strongly affected by the context of exposure and by the animal's experience, motivation, and conditioning; however, mammals have the capacity to divert from sound sources during migration. 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 19, may be implemented as appropriate to further minimize potential impacts.

<u>Birds</u>

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 could cause stress to individuals causing them to abandon areas for less desirable habitat and potentially reduce over fitness and productivity. Activities related to the Proposed Action, such as aerial deployment or construction activities, could result in 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 19, BMPs and Mitigation Measures, may be implemented as appropriate to further minimize potential impacts.

Fish

Changes in water quality as a result of ground disturbing activities could impact food sources for the pallid sturgeon, white sturgeon, and bull trout. Further, increased human disturbance, noise, and vessel traffic could cause stress to these fish species causing them to abandon spawning locations or altering migration patterns. Behavioral changes to the shortnose sturgeon are unlikely as the majority of 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 19, BMPs and Mitigation Measures, may be implemented as appropriate to further minimize potential impacts.

Invertebrates

Disturbances to glacier-fed streams including food supply and water quality could impact meltwater lednian stoneflys. 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 19, BMPs and Mitigation Measures, 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. Potential effects to federally listed terrestrial mammals, birds, fish, invertebrates, and plants with designated critical habitat in Montana are described below.

Terrestrial Mammals

Critical habitat has been designated for the Canada lynx population in the Northern Rockies within northwestern Montana in Flathead, Glacier, Lincoln, Lake, Granite, Lewis and Clark, Lincoln, Missoula, Pondera, Powell, and Teton Counties; and the Yellowstone National Park population within southwestern Montana in Carbon, Gallatin, Park, Sweet Grass, and Stillwater Counties (USFWS, 2014k) . Land clearing, excavation activities, and other ground disturbing activities in these regions of Montana could lead to habitat loss or degradation, which could lead to adverse effects to the Canada lynx depending on the duration, location, and spatial scale of the associated 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 19, BMPs and Mitigation Measures, may be implemented as appropriate to further minimize potential impacts.

Birds

Critical habitat has been established for piping plovers in Montana in portions of seven counties. Four separate critical habitat units have been delineated geographically for the purpose of conserving this species that encompass alkali lake, wetland, and riverine habitats (USFWS, 2002). Land clearing, excavation activities, and other ground disturbing activities in these regions of Montana could lead to habitat loss or degradation, which could lead to adverse effects to the piping plover depending on the duration, location, and spatial scale of the associated 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 19, BMPs and Mitigation Measures, may be implemented as appropriate to further minimize potential impacts.

Fish

Critical habitat has been designated for bull trout in portions of 12 counties. This includes rivers, streams, lakes, and reservoirs within the Clark Fork, Flathead, Kootenai, St. Mary, and Belly River basins. Land clearing, excavation activities, and other ground disturbing activities in these regions of Montana could lead to habitat loss or degradation, which could lead to adverse effects to the bull trout depending on the duration, location, and spatial scale of the associated 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 19, may be implemented as appropriate to further minimize potential impacts.

Invertebrates

No designated critical habitat occurs for terrestrial or aquatic invertebrates in Montana. Therefore, *no effect* to threatened and endangered invertebrate species from the loss or degradation of designated critical habitat is expected as a result of the Proposed Action.

Plants

There is no designated critical habitat for listed plants in Montana. Therefore, *no effect* to threatened and endangered plant species from the loss or degradation of designated critical habitat is expected as a result of the Proposed Action.

Potential Impacts of the Preferred Alternative

The following section assesses potential impacts associated with implementation of the Preferred Alternative, including deployment and operational activities.

Deployment Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, implementation of the Preferred Alternative could result in the deployment of various types of facilities or infrastructure. Depending on the physical nature and location of the facility/infrastructure and the specific deployment requirements, some activities would result in potential effects to threatened and endangered species and others would not. In addition, and as explained in this section, the same type of Proposed Action infrastructure could result in a range of *no effect* to *may affect, but not likely to adversely affect*, depending on the deployment scenario or site-specific conditions. Site-specific analysis may be required depending on the site conditions, the type of deployment, or any other permits or permissions necessary to perform the work. 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 at the Programmatic Level

Of the types of facilities or infrastructure deployment scenarios described in Section 2.1.2, Proposed Action Infrastructure, the following are expected to have *no effect* on threatened and endangered species or their habitat under the conditions described below:

- Wired Projects
  - Use of Existing Conduit – New Buried Fiber Optic Plant: Disturbance, including noise, associated with the installation of fiber optic cable in existing conduit would be limited to entry and exit points of the existing conduit in previously disturbed areas. Although threatened and endangered species and their habitat could be impacted, it is anticipated that effects to threatened and endangered species would be temporary, infrequent, and likely not conducted in locations designated as vital or critical for any period.
  - Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting up of dark fiber would have *no impacts* to threatened and endangered species or their habitat because there would be no ground disturbance and very limited human activity.
- Satellites and Other Technologies
  - Satellite-Enabled Devices and Equipment: It is anticipated that the installation of permanent equipment on existing structures and the use of portable devices that use satellite technology would not impact threatened or endangered species because those activities would not require ground disturbance.

- Deployment of Satellites: FirstNet does not anticipate launching satellites as part of the deployment of the NPSBN; however, it could include equipment on satellites that are already being launched for other purposes. As adding equipment to an existing launch vehicle would be very unlikely to impact protected species, it is anticipated that this activity would have *no impact* on protected species.

Activities with the Potential to Affect Listed Species at the Programmatic Level

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. 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 or near 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 11.2.4, 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 to adversely affect* protected species at the programmatic level, as FirstNet activities are generally expected to be small-scale in nature. Therefore, large-scale impacts are not expected. 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 19, BMPs and Mitigation Measures, may be implemented as appropriate to further 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 threatened and endangered species that would be affected would depend on the species' phenology and the nature and extent of the habitats affected. For potential impacts to birds and bats from RF emissions, please see section 11.2.6.4. Wildlife.

It is anticipated that operational impacts *may affect, but are not likely to adversely affect* threatened and endangered species at the programmatic level 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 at the programmatic level, 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 at the programmatic level. 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 19, BMPs and Mitigation Measures, may be implemented as appropriate to further minimize potential impacts.

Threatened and endangered species may be affected, but are not likely to be adversely affected at the programmatic level, 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. Additional BMPs and mitigation measures, as defined in Chapter 19, may be implemented as appropriate to further 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 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.

Deployment Impacts

As explained above, at the programmatic level 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 19, may be implemented as appropriate to further minimize potential impacts.

Operational Impacts

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 at the programmatic level as a result of routine operations, management, and monitoring. For potential impacts to birds and bats from RF emissions, please see section 11.2.6.4. Wildlife. 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 19, 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. Therefore, there would be no effects to threatened and endangered species as a result of the No Action Alternative. Environmental conditions would therefore be the same as those described in Section 11.1.6.6, Threatened and Endangered Species and Species of Conservation Concern.

11.2.7. Land Use, Recreation, and Airspace

11.2.7.1. Introduction

This section describes potential impacts to land use, recreation, and airspace resources in Montana associated with deployment and operation of the Proposed Action and Alternatives. See Chapter 19, 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

11.2.7.2. 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 11.2.7-1. As described in Section 11.2, Environmental Consequences, the categories of impacts are defined at the programmatic level as *potentially significant*, *less than significant with mitigation measures 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 11.2.7-1: Impact Significance Rating Criteria for Land Use, Recreation, and Airspace at the Programmatic Level

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

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	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
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	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.

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	Less than Significant with BMPs and Mitigation Measures Incorporated	Less than Significant	No Impact
make recreational activity less desirable)	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
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

11.2.7.3. Description of Environmental Concerns

Direct Land Use Change

The deployment, operation, and maintenance of facilities or other infrastructure, and the acquisition of rights-of-way or easement could influence changes in land use. The deployment, operation, and maintenance of structures, towers, roads, and other permanent features could conflict with exiting development or land use. The installation of poles, towers, structures, or other aboveground facilities or assets could have short- or long-term effects to existing development or land use based on the characteristics of the structures or facilities, such as the location, type, or height. In addition, the acquisition of ROWs or easements and the construction of roads to access facilities and locations could influence changes in land use. The effects from these actions would depend on the geographic location; compatibility with existing land uses; and characteristics of the right-of-way, easement, or access road. These characteristics, such as the length, width, and location could change the existing land use to another category or result in the short- or long-term loss of the existing land use.

Based on the impact significance criteria presented in Table 11.2.7-1, *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 aboveground facilities or assets could have short- or long-term effects to surrounding land use patterns or options for surrounding land uses based on the characteristics of the structures or facilities, such as the location, type, or height. In addition, the acquisition of ROWs or easements and the construction of roads to access facilities and locations could influence changes in surrounding land uses. The effects from these actions would depend on the geographic location; compatibility with surrounding land uses; and characteristics of the ROW, easement, or access road. These characteristics, such as the length, width, and location could conflict with surrounding land use patterns or restrict options for surrounding land uses.

Based on the impact significance criteria presented in Table 11.2.7-1, *less than significant* impacts would be anticipated as any new land use would be small scale and only short-term impacts during the construction phase would be expected.

Loss of Access to Public or Private Recreation Land or Activities

The deployment, operation, and maintenance of facilities and the acquisition of ROW or easement could influence access to public or private recreation land or activities. Localized, short-term accessibility to recreation land or activities could be impacted by the deployment and maintenance of structures, towers, roads, and other permanent features. In the long-term, the deployment and installation of poles, towers, structures, or other aboveground facilities could alter the types and locations of recreation activities.

Based on the impact significance criteria presented in Table 11.2.7-1, *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. Crews accessing the site during the deployment and maintenance of structures, towers, roads, and other permanent features could temporarily impact enjoyment of recreation land. For example, Glacier National Park is famous for its stunning landscape, concentration of glaciers and lakes, and Going-to-the-Sun Road, a National Historic Civil Engineering Landmark consisting of 50 miles of scenic roadway (NPS, 2015g). 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 11.2.7-1, *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 FirstNet's likely 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 11.2.7-1, 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 not impact airspace resources.

11.2.7.4. Potential Impacts of the Preferred Alternative

The following section assesses potential impacts associated with implementation of the Preferred Alternative, including deployment and operation activities.

Deployment Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, implementation of the Preferred Alternative could result in the deployment of various types of facilities or infrastructure. Depending on the physical nature and location of the facility/infrastructure, and the specific deployment requirements, some activities would result in potential impacts to land use, recreation, and airspace resources and others would not. In addition, and as explained in this section, 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 at the Programmatic Level

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 11.1.7.5 Obstructions to Airspace Considerations).
  - Use of Existing Conduit – New Buried Fiber Optic Plant: Disturbance associated with the installation of fiber optic cable in existing conduit would be limited to entry and exit points of the existing conduit in previously disturbed areas.
    - Land Use: It is anticipated that there would be *no impacts* to land use since the activities that would be conducted would not directly or indirectly result in changes to existing and surrounding land uses.
    - Recreation: See Activities 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 11.1.7.5 Obstructions to Airspace Considerations).

- New Build – Aerial Fiber Optic Plant: Installing new poles and hanging cables on previously disturbed or new (undisturbed) ROWs or easements and the potential construction of access roads.
  - Land Use: See Activities 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 fiber would not impact recreation because it would not impede access to recreational resources.
  - Airspace: Lighting of dark fiber would have *no impacts* to airspace.
- New Build – Submarine Fiber Optic Plant: Installing cables in or near bodies of water and the constructing landings and/or facilities on shore or the banks of water bodies that accept the 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 or near bodies of water and construction of landings/facilities would not impact flight patterns or cause obstructions that would require FAA and/or state review based on FAR 14 CFR, Part 77, *Safe, Efficient Use, and Preservation of the Navigable Airspace* (See Section 11.1.7.5 Obstructions to Airspace Considerations).
- Installation of Optical Transmission or Centralized Transmission Equipment: Installation of transmission equipment would occur in existing boxes or huts. The section below addresses potential impacts to land use, recreation resources, and airspace if deployment of new boxes, huts, or access roads is required.
  - Land Use: See Activities 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 11.1.7.5 Obstructions to Airspace Considerations).

- Wireless Projects
  - o 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
  - o Deployable Technologies: These technologies would be used where permanent, fixed infrastructure cannot be deployed due to a variety of factors such as the need to supplement coverage or to avoid or mitigate permanent impacts to sensitive resources or receptors.
    - Land Use: It is anticipated that there would be *no impacts* to existing or surrounding land uses because these technologies would be temporarily located in areas compatible with other land uses.
    - Recreation: *No impacts* to recreation are anticipated as deployable technologies would not affect the use or enjoyment of recreational lands.
    - Airspace: Use of land-based deployable technologies (COW, COLT, and SOW) is not expected to result in impacts to airspace, provided antenna masts do not exceed 200 feet Above Ground Level (AGL) or do not trigger any of the other FAA obstruction to airspace criteria listed in Section 11.1.7.5 Obstructions to Airspace Considerations.
- Satellites and Other Technologies
  - o 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.
  - o 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 at the Programmatic Level

Potential deployment-related impacts to land use, recreation resources, or airspace as a result of implementation of the Preferred Alternative would encompass a range of impacts that could occur, including changes to existing and surrounding land uses. The types of infrastructure deployment activities that could be part of the Preferred Alternative and result in potential impacts to land use resources include the following:

- Wired Projects
  - New Build – Buried Fiber Optic Plant: Plowing (including vibratory plowing), trenching, or directional boring alongside the road in utility corridors or within public road rights-of-way.
    - Land Use: Deployment activities could temporarily restrict existing and surrounding land uses at isolated locations.
    - Recreation: It is anticipated that plowing, trenching, or directional boring may cause temporary, localized restrictions to recreational land or activities, which may persist during the deployment phase. It is reasonable to anticipate that small reductions in visitation to localized areas may occur during the deployment phase.
    - Airspace: *No impacts* are anticipated – see previous section.
  - New Build – Aerial Fiber Optic Plant: Installing new poles and hanging cables on previously disturbed or new (undisturbed) ROWs or easements and the potential construction of access roads.
    - Land Use: These activities could result in term potential impacts to land uses. Construction activities could temporarily restrict existing and surrounding land uses at isolated locations. New structures, poles, or access roads on previously undisturbed 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.
    - Recreation: Deployment activities may cause temporary, localized restricted access to recreation land or activities, which may persist for the duration of the deployment phase. Small reductions to visitation during the deployment phase may be anticipated.
    - Airspace: *No impacts* are anticipated – see previous section.
  - New Build – Submarine Fiber Optic Plant: Installing cables in or near bodies of water and the constructing landings and/or facilities on shore or the banks of water bodies that accept the submarine cable.
    - Land Use: Deployment 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 or near 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: Deployment 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: Deployment 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 11.1.7.5 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 Montana'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 Montana's airports (See obstruction criteria in Section 11.10.5.3 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, including the construction of access roads. 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* at the programmatic level, due to the temporary and small-scale nature of deployment activities. Additionally FirstNet (or its network partners), would prepare an OE/AAA for any proposed tower that might affect navigable airways or flight patterns of an airport. Chapter 19, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

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. At the programmatic level, it is anticipated that there would be *no impacts* to land use, recreation resources, or airspace associated with routine inspections of the Preferred Alternative, assuming that the same access roads used for deployment are also used for temporary, short-term inspections because there would be no ground disturbance, no airspace activity, and no access restrictions to recreational lands. If routine maintenance or inspection activities would conflict with existing or surrounding land uses, impact recreation resources, or conflict with airspace, impacts could result as explained above. Operation of the Deployable Technologies options of the Preferred Alternative could result in the temporary presence of deployable vehicles and equipment (including airborne equipment), potentially for up to two years in some cases. The degree of change in the visual environment (see Section 11.2.8, 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 19, 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.

11.2.7.5. 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.

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 construction associated with wired or wireless projects discussed above under the Preferred Alternative. Some limited construction could be associated with implementation such as land clearing or paving for parking or staging areas. The specific infrastructure associated with the Deployable Technologies Alternative would be the same as the deployable technologies implemented as part of the Preferred Alternative but would likely be implemented in greater numbers, over a larger geographic extent, and used with greater frequency and duration. Therefore, potential impacts to land use, recreation, and airspace resources as a result of implementation of this alternative could be as described below.

Deployment Impacts

As explained above, implementation of deployable technologies could result in less than significant impacts to land use at the programmatic level. While a single deployable technology may have imperceptible impact, multiple technologies operating in close proximity for longer periods could impact existing and surrounding land uses. There could be impacts to recreation activities during the deployment of technologies if such deployment were to occur within or near designated recreation areas. Enjoyment of activities dependent upon the visibility of wildlife or scenic vistas may be affected, however, impacts would be *less than significant* at the programmatic level due to the temporary nature of likely deployment activities. If deployment triggers any obstruction criterion or result in changes to flight patterns and airspace restrictions, FirstNet (or its partners) would consult with the FAA to determine how to proceed. Chapter 19, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

As explained above, operation activities would consist of implementation/running of the deployable technology and routine maintenance and inspections. As with the Preferred Alternative, it is anticipated that there would be *no impacts* to land use, recreation resources, or airspace associated with routine inspections of the Deployable Technologies Alternative, assuming that the same access roads used for deployment are also used for inspections. Operation of deployable technologies would result in land use, land ownership, airspace, and recreation (access and enjoyment) similar in type to those described for the Preferred Alternative. The frequency and extent of those potential impacts would be greater than for the Proposed Action because under this Alternative, deployable technologies would be the only options available. As a result, this alternative would require a larger number of terrestrial and airborne deployable vehicles and a larger number of deployment locations in—all of which would potentially affect a larger number of properties and/or areas of airspace. Overall, these potential impacts would be *less than significant* at the programmatic level due to the temporary nature of deployment activities. Chapter 19, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

No Action Alternative

Under the No Action Alternative, the NPSBN would not be deployed; therefore, there would be no associated construction or installation of wired, wireless, deployable infrastructure, or satellites and other technologies. Therefore, there would be *no impacts* to land use, recreation resources, or airspace as a result of the No Action Alternative. Environmental conditions would therefore be the same as those described in Section 11.1.7, Land Use, Recreation, and Airspace.

11.2.8. Visual Resources

11.2.8.1. Introduction

This section describes potential impacts to visual resources in Montana associated with deployment and operation of the Proposed Action and alternatives. See Chapter 19, 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.

11.2.8.2. Impact Assessment Methodology and Significance Criteria

The impacts of the Proposed Action on visual resources were evaluated using the significance criteria presented in Table 11.2.8-1. As described in Section 11.2, Environmental Consequences, the categories of impacts are defined at the programmatic level as *potentially significant*, *less than significant with mitigation measures 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 11.2.8-1: Impact Significance Rating Criteria for Visual Resources at the Programmatic Level

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.

11.2.8.3. 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 Montana, residents and visitors travel to Yellowstone National Park and other areas around the state for scenic vistas and recreational activities. If lands considered visually significant or scenic were subject to vegetation loss or removal, short- or long-term effects to viewsheds or scenic resources could occur. Bare ground or interruption of a landscape due to vegetation removal could be considered an adverse change in the aesthetic character of scenic resources or viewsheds. New towers or structures constructed within scenic areas could disrupt the perceived aesthetic character or scenery of an area. If new towers were constructed to a height that required lighting, nighttime vistas could be affected in areas where the night skies do not have light disruptions or are within unpopulated areas.

Based on the impact significance criteria presented in Table 11.2.8-1, 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. The majority of FirstNet deployment activities would not cause negative impacts to the aesthetic character to a noticeable degree. However, some projects, such a towers, facilities, or infrastructure could cause a negative impact on the aesthetic character of local viewsheds depending on their size and location. However, given the small scale of likely FirstNet activities, impacts are expected to be *less than significant* at the programmatic level.

Nighttime Lighting

If new towers or facilities were constructed to a height that required lighting, nighttime vistas could be affected in areas where the night skies do not have light disruptions or are within unpopulated areas. If nighttime lighting were necessary for the operation or function of a facility that caused regional impacts or permanent changes to night sky conditions, those effects would be considered *potentially significant*.

Based on the impact significance criteria presented in Table 11.2.8-1, lighting that illuminates the night sky, 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, although potentially minimized to *less than significant* with implementation of BMPs and mitigation measures, as defined in Chapter 19, BMPs and Mitigation Measures. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented.

11.2.8.4. Potential Impacts of the Preferred Alternative

The following section assesses potential impacts associated with implementation of the Preferred Alternative, including deployment and operation activities.

Deployment Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, implementation of the Preferred Alternative could result in the deployment of various types of facilities or infrastructure. Depending on the physical nature and location of the facility/infrastructure and the specific deployment requirements, some activities would result in potential impacts to visual resources and others would not. In addition, and as explained in this section, 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 at the Programmatic Level

Of the types of facilities or infrastructure deployment scenarios described in Section 2.1.2, Proposed Action Infrastructure, the following are likely to have *no impacts* to visual resources under the conditions described below:

- Wired Projects
  - Collocation on Existing Aerial Fiber Optic Plant: While the addition of new aerial fiber optic plant to an existing aerial fiber optic transmission system would likely be visible, the change associated with this option is so small as to be essentially imperceptible. This option would involve no new nighttime lighting and pole replacement would be limited.
  - Use of Existing Conduit – New Buried Fiber Optic Plant: Disturbance associated with the installation of fiber optic cable in existing conduit would be limited to entry and exit points of the existing conduit in previously disturbed areas. It is anticipated that there would be *no impacts* to visual resources since the activities would be conducted at small entry and exit points and are not likely to produce perceptible changes, and would not require nighttime lighting.
  - Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting up of dark fiber would have *no impacts* to visual resources 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 at the Programmatic Level

Potential deployment-related impacts to visual resources as a result of implementation of the Preferred Alternative would encompass a range of impacts that could occur as a result of ground disturbance, vegetation removal, or installation of permanent structures if development occurs in scenic areas. The types of deployment activities that could be part of the Preferred Alternative and result in potential impacts to visual resources include the following:

- Wired Projects
  - New Build – Buried Fiber Optic Plant: Plowing (including vibratory plowing), trenching, or directional boring and the construction of POPs, huts, or other associated facilities or hand-holes to access fiber could result in potential impacts to visual resources. The degree of impact would depend on the timing, location, and type of project; installation of a hut or POP would be permanent, whereas ground disturbing activities would be short-term. In most cases, development 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 or near 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 or the banks of water bodies that accept the submarine cable.
  - Installation of Optical Transmission or Centralized Transmission Equipment: If installation of transmission equipment required grading, vegetation removal, or other ground disturbance to install small boxes or huts, or access roads, potential impacts to visual resources could occur but effects would be temporary and localized.
- Wireless Projects
  - New Wireless Communication Towers: Installation of new wireless towers and associated structures (generators, equipment sheds, fencing, security and aviation lighting, electrical feeds, and concrete foundations and pads) or access roads could result in impacts to visual resources. Land/vegetation clearing, excavation activities, landscape grading, and other surface disturbing activities during the installation of new wireless towers and associated structures or access roads could result in the degradation of the aesthetic character of scenic resources or viewsheds. Impacts may be experienced by viewers if new towers were located in or near a national park unit or other sensitive area. If new towers were constructed to a height that required aviation lighting, nighttime vistas could be impacted in areas where the night skies do not have light disruptions or are within unpopulated areas. If nighttime lighting were necessary for the operation or function of a facility, impacts to night sky conditions could occur.

- o Collocation on Existing Wireless Tower, Structure, or Building: Collocation would involve mounting or installing equipment (such as antennas or microwave dishes) on an existing tower and would not likely result in additional impacts to visual resources. However, if additional power units, structural hardening, or physical security measures required ground disturbance or removal of vegetation, impacts to the aesthetic character of scenic resources or viewsheds could occur.
- o Deployable Technologies: Implementation of deployable technologies could result in potential impacts to visual resources if long-term deployment occurs in scenic areas, or if the implementation requires minor construction of staging or landing areas, results in vegetation removal, areas of surface disturbance, or additional nighttime lightning.

In general, the abovementioned activities could potentially involve land/vegetation clearing, and potential scenic intrusion of towers, poles, roads, infrastructure, and other structures. Potential impacts to visual resources associated with deployment could include interruptions of landscapes, degradation of the aesthetic character of scenic resources or viewsheds, and overall changes in valued scenic resources, particularly for permanent fixtures such as towers or facilities. These impacts are expected to be *less than significant* at the programmatic level due to the temporary and small-scale nature of deployment activities. See Chapter 19, 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. At the programmatic level, 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. At the programmatic level, 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 and/or its partners 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.

11.2.8.5. Alternatives Impact Assessment

The following section assesses potential impacts to visual resources associated with the Deployable Technologies Alternative and the No Action Alternative.

Deployable Technologies Alternative

Under the Deployable Technologies Alternative option, a nationwide fleet of mobile communications systems would provide temporary coverage in areas not covered by the existing, usable infrastructure. There would be no collocation of equipment and minimal construction associated with wired or wireless projects discussed above under the Preferred

Alternative. Some limited construction could be associated with implementation such as land clearing or paving for parking or staging areas. The specific infrastructure associated with the Deployable Technologies Alternative would be the same as the deployable technologies implemented as part of the Preferred Alternative but would likely be implemented in greater numbers, over a larger geographic extent, and used with greater frequency and duration. Therefore, potential impacts to infrastructure as a result of implementation of this alternative could be as described below.

Deployment Impacts

As explained above, implementation of deployable technologies could result in potential impacts to visual resources if long-term deployment occurs in scenic areas. If staging or landing areas (depending on the type of technology) require surface disturbance or vegetation clearing, or if these areas were within scenic landscapes or required new nighttime lighting, impacts could occur to the aesthetic character of scenic resources or viewsheds. These impacts are expected to be *less than significant* at the programmatic level, as generally they would be limited to the deployment location and could often be screened or otherwise blocked from view. Chapter 19, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

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, at the programmatic level, it is anticipated that there would be *no impacts* to visual resources associated with routine inspections of the Preferred Alternative, assuming that the same access roads used for deployment are also used for inspections. The potential visual impacts - including aesthetic conditions and nighttime lighting - of the operation of deployable technologies would be *less than significant* at the programmatic level. 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.

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. Therefore, there would be *no impacts* to visual resources as a result of the No Action Alternative. Environmental conditions would therefore be the same as those described in Section 11.1.8, Visual Resources.

11.2.9. Socioeconomics

11.2.9.1. Introduction

This section describes potential impacts to socioeconomics in Montana associated with deployment and operation of the Proposed Action and alternatives. See Chapter 19, 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.

11.2.9.2. Impact Assessment Methodology and Significance Criteria

The impacts of the Proposed Action on socioeconomics were evaluated using the significance criteria presented in Table 11.2.9-1. As described in Section 11.2, Environmental Consequences, the categories of impacts are defined at the programmatic level, as *potentially significant*, *less than significant with mitigation measures 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 11.2.9-1: Impact Significance Rating Criteria for Socioeconomics at the Programmatic Level

Type of Effect	Effect Characteristics	Impact Level: Potentially Significant	Impact Level: Less than Significant with BMPs and Mitigation Measures Incorporated	Impact Level: Less than Significant	Impact Level: No Impact
Impacts to real estate (could be positive or negative)	Magnitude or Intensity	Changes in property values and/or rental fees, constituting a significant market shift.	Effect that is *potentially significant*, but with mitigation is *less than significant*.	Indiscernible impact to property values and/or rental fees.	*No impacts* to real estate in the form of changes to property values or rental fees.
	Geographic Extent	Regional impacts observed throughout the state/territory.		Effects realized at one or multiple isolated locations.	NA
	Duration or Frequency	Persists during the life of the project.		Persists for as long as the entire construction phase or a portion of the operations phase.	NA
Changes to spending, income, industries, and public revenues	Magnitude or Intensity	Economic change that constitutes a market shift.	Effect that is *potentially significant*, but with mitigation is *less than significant*.	Indiscernible economic change.	No change to spending, income, industries, and public revenues.
	Geographic Extent	Regional impacts observed throughout the state/ territory.		Effects realized at one or multiple isolated cities/towns.	NA
	Duration or Frequency	Persists during or beyond the life of the project.		Persists for as long as the entire construction phase or a portion of the operations phase.	NA
Impacts to employment	Magnitude or Intensity	High level of job creation at the state or territory level.	Effect that is *potentially significant*, but with mitigation is *less than significant*.	Low level of job creation at the state/territory level.	No job creation due to project activities at the state/territory level.
	Geographic Extent	Regional impacts observed throughout the state/territory.		Effects realized at one or multiple isolated cities/towns.	NA

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
	Duration or Frequency	Persists during the life of the project.		Persists for as long as the entire construction phase or a portion of the operations phase.	NA
Changes in population number or composition	Magnitude or Intensity	Substantial increases in population, or changes in population composition (age, race, gender).	Effect that is *potentially significant*, but with mitigation is *less than significant*.	Minor increases in population or population composition.	No changes in population or population composition.
	Geographic Extent	Regional impacts observed throughout the state or territory.		Effects realized at one or multiple isolated locations.	NA
	Duration or Frequency	Persists during the life of the project.		Persists for as long as the entire construction phase or a portion of the operations phase.	NA

NA = Not Applicable

11.2.9.3. Description of Environmental Concerns

This section discusses at a high level the types of socioeconomic impacts that could result from deployment of the NPSBN. Socioeconomic impacts could be negative or positive. Subsections below address socioeconomic impacts in four general areas, following the breakdown of the significance rating criteria in the table above:

- Impacts to Real Estate;
- Economic Benefits or Adverse Impacts related to Changes in Spending, Income, Industries, and Public Revenues;
- Impacts to Employment; and
- Changes in Population Number or Composition.

In addition to the specific impacts noted below, the Proposed Action would likely have broad, beneficial impacts to all four areas in times of disaster, by improving the response of public safety personnel. Reduced damages and faster recovery would result. This would support property values; maintain corporate income, personal income, and government revenues; preserve jobs; and reduce disruptions to populations.

Impacts to Real Estate

Deployment of the NPSBN has the potential to improve property values in areas that have reduced property values due to below average public safety communication services. Improved services would reduce response times and improve responses. These effects would reduce the potential for economic losses and thus support investments in property and greater market value for property. Any increases in property values are most likely in areas that have low property values and below average public safety communication services. Increases are less likely in areas that already have higher property value. As discussed in Existing Environment, property values vary considerably across Montana. Median values of owner-occupied housing units in 2013 ($190,100) was higher than corresponding values for the Central region ($151,200). 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 emissions. 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, 2006). These service providers may obtain new taxable revenues from operation of components of the public safety broadband network. In such cases, public utility tax revenues may increase, but they could also remain the same or decrease if providers are granted tax breaks in return for operating portions of the network. Individual and corporate income taxes may change as FirstNet infrastructure development and operation creates new taxable income for involved companies and workers.

FirstNet's partner(s) may be given the right to use excess NPSBN capacity commercially. This would result in additional economic activity and generation of income. In turn, this could have revenue implications for federal and state governments, through taxes on sales and on corporate income generated by commercial use of the network.

FirstNet may have an additional, non-revenue benefit to the public sector. The network is likely to create operational cost savings and increased productivity for public safety personnel.

Impacts to Employment

Private companies and government organizations that receive income from deploying and operating the NPSBN would use portions of that income to hire the employees they need to provide their support to the network. This generation of new employment 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 gains are beneficial, and would be especially welcomed in areas that have high unemployment. As discussed in Affected Environment, unemployment rates (as shown by the unemployment rate map and selected economic indicators table) vary considerably across Montana. The average unemployment rate in 2014 was 4.7 percent, considerably lower than the national rate of 6.2 percent. The majority of counties had unemployment rates below the national average (that is, better employment performance). Only a few counties in the northwestern portion of the state, and one county near the Billings area, had unemployment rates above the national average.

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 be *less than significant* based on the criteria in Table 11.2.9-1 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.

11.2.9.4. Potential Effects of the Preferred Alternative

The following section assesses potential impacts associated with implementation of the Preferred Alternative, including deployment and operation activities.

Deployment Effects

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 they 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 11.2.9-1.

Activities Likely to Have No Effects at the Programmatic Level

- 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 Effects at the Programmatic Level

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;
- Economic Benefits or Adverse Impacts related to Changes in Spending, Income, Industries, and Public Revenues;
- Impacts to Employment; and
- Changes in Population Number or Composition.

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 or near 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., parked vehicles in new parking lots), 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* at the programmatic level. See Chapter 19, 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. At the programmatic level, the socioeconomic impacts of all activities considered together would also be *less than significant* as described above. 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 Effects

Activities with the Potential to Have Effects at the Programmatic Level

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* at the programmatic level, as they would occur within a limited distance of each site, and would be limited to a relatively small number of sites within the region and Montana. Chapter 19, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

11.2.9.5. Alternatives Effect 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 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 Effects

As explained above, all deployment activities represent economic activity and thus have socioeconomic impacts. These impacts would primarily be beneficial, such as generation of business income and employee wages, and creation or sustainment of jobs. The impacts would be small for each activity and therefore *less than significant* at the programmatic level.

Deployable technologies such as COWs, COLTs, and SOWs, along with aerial deployable technologies, would require storage, staging, and launch/landing areas. Development or enlargement of these facilities could have adverse impacts on nearby property values. The potential for such impacts is higher under this alternative than the Preferred Alternative because it is likely that these facilities would be implemented in greater numbers and over a larger geographic extent. These potential impacts are anticipated to be *less than significant* at the programmatic level, as described above. Chapter 19, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Effects

All operational activities represent economic activity and thus have socioeconomic impacts. These impacts would primarily be beneficial, and because they are small individually, overall impacts would be *less than significant* at the programmatic level.

The ongoing presence of facilities for housing and maintaining deployable technologies may have adverse aesthetic aspects (e.g., parked vehicles in new parking lots) or other aspects (e.g., noise and traffic) that could negatively affect the value of surrounding properties. The potential for such impacts is higher under this alternative than the Preferred Alternative because it is likely that these facilities would be more numerous, present over a larger geographic extent, and used with greater frequency and duration. These impacts, if they occur, would be *less than significant* at the programmatic level, as they would be limited to a relatively small number of sites within the region. Chapter 19, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

No Action Alternative

Under the No Action Alternative, the NPSBN would not be deployed. Therefore, there would be no associated 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 11.1.9, Socioeconomics.

11.2.10. Environmental Justice

11.2.10.1. Introduction

This section describes potential impacts to environmental justice in Montana associated with deployment and operation of the Proposed Action and alternatives. See Chapter 19, 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.

11.2.10.2. Impact Assessment Methodology and Significance Criteria

The impacts of the Proposed Action on environmental justice were evaluated using the significance criteria presented in Table 11.2.10-1. As described in Section 11.2, Environmental Consequences, the categories of impacts are defined at the programmatic level as *potentially significant*, *less than significant with mitigation measures 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 11.2.10-1: Impact Significance Rating Criteria for Environmental Justice at the Programmatic Level

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

11.2.10.3. 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 (Executive Office of the President, 1994), and guidance from CEQ, require federal agencies to evaluate potential human health and environmental effects on environmental justice populations. Specifically, "Such effects may include ecological, cultural, human health, economic, or social impacts on minority communities, low-income communities, or Indian tribes when those impacts are interrelated to impacts on the natural or physical environment" (CEQ, 1997). Thus, effects associated with other resource areas are of interest from an environmental justice perspective. This includes Human Health and Safety, Cultural Resources, Socioeconomics, Noise, Aesthetics and Visual Resources, and other resources.

Potential concerns noted in the impact analyses for these resources include dust, noise, traffic, and other adverse impacts of construction activities. New wireless communication towers sometimes have adverse impacts on nearby property values (Bond, Sims, & Dent, 2013). See Socioeconomics Environmental Consequences for additional discussion. The presence and operation of large storage, staging, and launch/landing areas for deployable technologies could raise environmental justice concerns as described below. Indian tribes are considered environmental justice populations (CEQ, 1997); thus, impacts on tribal cultural resources (for instance, due to construction) could be a concern from an environmental justice perspective.

Impacts are considered environmental justice impacts only if they are *both* "adverse" and "disproportionately high" in their incidence on environmental justice populations relative to the general population (CEQ, 1997). The focus in environmental justice impact assessments is always, by definition, on adverse effects. However, telecommunications projects, such as those proposed by FirstNet, could have beneficial effects. These effects may include better provision of police, fire, and emergency medical services; improvements in property values; and the generation of jobs and income. These impacts are considered in the Socioeconomics Environmental Consequences (see Section 11.2.9).

Construction impacts are localized, and property value impacts of wireless telecommunications projects rarely extend beyond 300 meters (984 feet) of a communications tower (Bond, Sims, & Dent, 2013). In addition, impacts related to deployment are of short duration. The potential for significant environmental justice impacts from the FirstNet deployment activities would be limited. Most, but not all, of the FirstNet operational activities have very limited potential for impacts, as these activities are limited in scale and short in their duration.

Site-specific analysis to evaluate environmental justice may be required depending on the site conditions, including the presence of low-income populations or minority populations, the type of deployment, or any other permits or permissions necessary to perform the work. Such analyses could tier-off the methodology and results of this Final PEIS. The areas shown in the environmental justice screening map of Affected Environment (Section 11.1.10.4) as having moderate potential or high potential for environmental justice populations would particularly warrant further screening. As discussed in Section 11.1.10.3, Environmental Setting: Minority and Low-Income Populations, Montana's population has considerably lower percentages of minorities than the region or the nation, and higher rates of poverty than the region or nation. Montana has many areas with high potential for environmental justice populations. The distribution of these high potential areas is fairly even across the state, and occurs both within and outside of the 10 largest population concentrations. This includes some of the state's most sparsely populated areas, such as the northeastern region north of Miles City, the central region east and south of Havre, and the area north and east of Kalispell. The distribution of areas with moderate potential for environmental justice populations is also fairly even across the state. Further analysis using the data developed for the screening analysis in Section 9.1.10.4, Environmental Justice Screening Results, may be useful. In addition, USEPA's EJSCREEN tool and USEPA's lists of environmental justice grant and cooperative agreement recipients may help identify local environmental justice populations (USEPA, 2015j) (USEPA, 2016g).

Site-specific analysis to evaluate environmental justice may be required depending on the site conditions, including the presence of low-income populations or minority populations, the type of deployment, or any other permits or permissions necessary to perform the work. This site-specific analysis would also evaluate whether an actual environmental justice impact on those populations would be likely to occur. Analysts could use the evaluation presented below under "Activities with the Potential to Have Impacts" as a starting point. Analysts should bear in mind that any such activities that are problematic based on the adverse impact criterion of environmental justice may also have beneficial impacts on those same environmental justice communities.

11.2.10.4. Potential Impacts of the Preferred Alternative

The following section assesses potential impacts associated with implementation of the Preferred Alternative, including deployment and operation activities.

Deployment Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, implementation of the Preferred Alternative could deploy various types of facilities or infrastructure. Depending on the physical nature and location of FirstNet facilities or infrastructure and the specific action, some activities would result in potential impacts to environmental justice communities and others would not. In addition, and as explained in this section, 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 at the Programmatic Level

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 communities, it is anticipated that this activity would have *no impact* on environmental justice issues.

Activities with the Potential to Have Impacts at the Programmatic Level

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 or near 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 Section 11.2.9, 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* at the programmatic level, 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, furthermore, site-specific analysis to evaluate environmental justice may be required depending on the site conditions, including the presence of low-income populations or minority populations, the type of deployment, or any other permits or permissions necessary to perform the work. BMPs and mitigation measures may be required to address potential impacts to environmental justice communities at the site-specific level. See Chapter 19, 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 primarily of routine maintenance and inspection of fixed infrastructure. It is anticipated that such activities would not result in environmental justice impacts, as the intensity of these activities would be low (low potential for objectionable effects such as noise and dust) and their duration would be very short. Routine maintenance and inspection would not adversely affect property values, for the same reasons. Any major infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the abovementioned deployment activities that involve construction.

Impacts are expected to be *less than significant* at the programmatic level. Chapter 19, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

11.2.10.5. 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 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, vibration, and dust could be generated temporarily, and traffic could be disrupted. If these effects occur disproportionately in environmental justice communities, they would be considered environmental justice impacts. Impacts are expected to be *less than significant* at the programmatic level because they would be temporary in nature. See Chapter 19, 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., parked vehicles in new parking lots) that could negatively affect the value of surrounding properties. In addition, equipment maintenance activities at such facilities may temporarily generate noise, and operational activities may generate traffic. These effects may be adverse in themselves, and may impact property values. If these effects occur disproportionately in environmental justice communities, they would be considered environmental justice impacts. Impacts are expected to be *less than significant* at the programmatic level, as operations are expected to be temporary in nature. See Chapter 19, 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 the No Action Alternative. Environmental conditions would therefore be the same as those described in Section 11.1.10, Environmental Justice.

11.2.11. Cultural Resources

11.2.11.1. Introduction

This section describes potential impacts to cultural resources in Montana associated with deployment and operation of the Proposed Action and alternatives. See Chapter 19, 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.

11.2.11.2. Impact Assessment Methodology and Significance Criteria

The impacts of the Proposed Action on cultural resources were evaluated using the significance criteria presented in Table 11.2.11-1. The categories of impacts are defined at the programmatic level as an *adverse effect; mitigated adverse effect; effect, but not adverse;* and *no effect*. These impact categories are comparable to those defined in *36 CFR § 800*, Secretary of Interior's Standards and Guidelines for Archaeology and Historic Preservation (NPS, 1983), and the United States (U.S.) National Park Service's *National Register Bulletin: How to Apply the National Register Criteria for Evaluation* (NPS, 2002). Characteristics of each impact type, including magnitude or intensity, geographic extent, and duration or frequency, were used to determine the impact significance rating associated with each potential impact.

Given the nature of this programmatic evaluation, and because the Proposed Action could potentially cover a wide variety of actions that would take place in various landscapes, the potential impacts to cultural resources addressed in this section are presented as a range of possible impacts.

Table 11.2.11-1: Effect Significance Rating Criteria for Cultural Resources at the Programmatic Level

Type of Effect	Effect Characteristics	Effect Level			
		Adverse Effect	Mitigated Adverse Effect[a]	Effect, but Not Adverse	No Effect
Physical damage to and/or destruction of historic properties[b]	Magnitude or Intensity	Effects to a contributing portion of a single or many historic properties.	*Adverse effect* that has been procedurally mitigated through Section 106 process.	Effects to a non-contributing portion of a single or many historic properties.	No direct effects to historic properties.
	Geographic Extent	Direct effects 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	Effect Level			
		Adverse Effect	Mitigated Adverse Effect[a]	Effect, but Not Adverse	No Effect
	Duration or Frequency	Long-term or permanent loss of character defining attributes of a single or many historic properties.		Infrequent, temporary, or short-term changes to character defining attributes of a single or many historic properties.	No direct or indirect effects to historic properties.
Loss of access to historic properties	Magnitude or Intensity	Effects to a contributing portion of a single or many historic properties.	*Adverse effect* that has been procedurally mitigated through Section 106 process.	Effects to a non-contributing portion of a single or many historic properties.	No segregation or loss of access to historic properties.
	Geographic Extent	Any area surrounding historic properties that would cause segregation or loss of access to a single or many historic properties.		Any area surrounding historic properties that could cause segregation or loss of access to a single or many historic properties.	No segregation or loss of access to historic properties.
	Duration or Frequency	Long-term or permanent segregation or loss of access to a single or many historic properties.		Infrequent, temporary, or short-term changes in access to a single or many historic properties.	No segregation or loss of access to historic properties.

[a] Whereas mitigation measures for other resources discussed in this Final PEIS may be developed to achieve an impact that is "Less than Significant with Mitigation Measures 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.

[b] Per NHPA, a "historic property" is defined as any district, archaeological site, building, structure, or object that is either listed or eligible for listing in the NRHP. Cultural resources present within a project's APE are not historic properties if they do not meet the eligibility requirements for listing in the NRHP. Sites of religious and/or cultural significance refer to areas of concern to 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.

11.2.11.3. 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 11.2.11-1, direct deployment impacts could be potentially adverse if FirstNet's deployment locations were in areas with moderate to high probabilities for archaeological deposits, within historic districts, or at historic properties. To the extent practicable, FirstNet would attempt to minimize activities in areas with archaeological deposits or within historic districts. However, given archaeological sites and historic properties are present throughout Montana, some deployment activities may be in these areas, in which case BMPs (see Chapter 19) 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 *adverse effects* from indirect effects would be from the deployment of equipment in areas that would cause adverse visual effects to historic properties. To the extent practicable, FirstNet would attempt to minimize activities in areas within or adjacent to historic districts or properties.

Loss of Character Defining Attributes of Historic Properties

Deployment of FirstNet equipment has the potential to cause the loss of character defining attributes of historic properties; such attributes are the features of historic properties that define their NRHP eligibility. Examples of such impacts would be the loss of integrity of archaeological sites through ground disturbing activities, and direct impacts to historic buildings from equipment deployment that adversely alter historic architectural features. *Adverse effects* such as these could be avoided or minimized through BMPs (see Chapter 19).

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 *adverse effect* would be from the deployment of equipment in secure areas that impact the access to sites of cultural importance to Native America Indians. 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.

11.2.11.4. Potential Impacts of the Preferred Alternative

The following section assesses potential impacts associated with implementation of the Preferred Alternative, including deployment and operation activities.

Deployment Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, implementation of the Preferred Alternative could result in the deployment of various types of facilities or infrastructure. Depending on the physical nature and location of the facility/infrastructure and the specific deployment requirements, some activities would result in potential impacts to cultural resources, while others would not. In addition, and as explained in this section, the same type of Proposed Action Infrastructure could result in a range of *no effect* to *effect, but not adverse* depending on the deployment scenario or site-specific conditions.

Activities Likely to Have No Effects at the Programmatic Level

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 effects* 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 effects* to cultural resources. If required, and if done in existing huts with no ground disturbance, installation of new associated equipment would also have *no effects* to cultural resources because there would be no ground disturbance and no perceptible visual changes.
- Satellites and Other Technologies
  - Satellite-Enabled Devices and Equipment: It is anticipated that the installation of permanent equipment on existing structures and the use of portable devices that use satellite technology would have *no effect* on 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 effect* on cultural resources.

Activities with the Potential to Have Effect at the Programmatic Level

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 or near bodies of water could impact cultural resources; shorelines and creek banks in Montana have the potential to contain prehistoric archaeological sites, as well as sites associated with the state's significant maritime history since European colonization, such as shipwrecks. Impacts to cultural resources could also potentially occur as a result of the construction of landings and/or facilities on shore or on the banks of water bodies that accept the submarine cable, which could result in the disturbance of archaeological and historical sites, and the associated network structures could have visual effects on historic properties (archaeological deposits tend to be associated with bodies of water).
  - 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 urban areas 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 at the programmatic level, as the potential *adverse effects* would be temporary and limited to the area near individual Proposed Action deployment site. Additionally, equipment proposed to be installed on or near properties that are listed or eligible for listing on the NRHP could potentially be removed. As appropriate, FirstNet would engage in consultation as required under Section 106 of the NHPA. Chapter 19, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Effects

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 effect but would not likely adversely effect, cultural resources at the programmatic level. In the event that maintenance and inspection activities occur off existing roads, FirstNet would engage in consultation as required under Section 106 of the NHPA. Chapter 19, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

11.2.11.5. 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 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 at the programmatic level, due to the limited amount of expected ground disturbing activities and the short-term nature of deployment activities. However, in the event that land/vegetation clearing is required, FirstNet would engage in consultation as required under Section 106 of the NHPA. Chapter 19, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

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, at the programmatic level, 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 at the programmatic level, 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 at the programmatic level associated with routine inspections of the Preferred Alternative, assuming that the same access roads used for deployment are also used for inspections. If usage of heavy equipment as part of routine maintenance or inspections occurs off established access roads or corridors, impacts to archaeological sites could occur, however, in the event that this is required, FirstNet would engage in consultation as required under Section 106 of the NHPA. Chapter 19, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

No Action Alternative

Under the No Action Alternative, the NPSBN would not be deployed; therefore, there would be no associated construction or installation of wired, wireless, deployable infrastructure or satellites and other technologies. As a result, there would be *no effects* to cultural resources as a result of the No Action Alternative. Environmental conditions would therefore be the same as those described in Section 11.1.11, Cultural Resources.

11.2.12. Air Quality

11.2.12.1. Introduction

This section describes potential impacts to Montana's air quality from deployment and operation of the Proposed Action and alternatives. See Chapter 19, 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.

11.2.12.2. Impact Assessment Methodology and Significance Criteria

The impacts of the Proposed Action on Montana's air quality were evaluated using the significance criteria presented in Table 11.2.12-1. As described in Section 11.2, Environmental Consequences, the categories of impacts are defined at the programmatic level as *potentially significant*, *less than significant with mitigation measures 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 Montana's air quality addressed in this section are presented as a range of possible impacts.

Table 11.2.12-1: Impact Significance Rating Criteria for Air Quality at the Programmatic Level

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

11.2.12.3. Description of Environmental Concerns

Increased Air Emissions

The Proposed Action has the potential to generate air pollutant emissions. These emissions could be above and beyond what is typically generated in a given area and may alter ambient air quality. Deployment activities may involve the use of vehicles, heavy equipment, and other equipment that could emit exhaust and create fugitive dust in localized areas. During operations, routine maintenance and other use of generators at tower facilities may emit exhaust for specific durations (maintenance) or unpredictable timeframes (if power is lost to a site, for example). Impacts are likely to be *less than significant* 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 Montana that are in maintenance or nonattainment for one or more criteria pollutants (Figure 11.1.12-1 and Section 11.1.12, Air Quality). Several counties in Montana are designated as maintenance areas for one or more of the following pollutants: PM, Lead, SO_2, and CO (Table 11.1.12-5); counties located in the northwestern portion of the state are designated nonattainment or maintenance for two NAAQS pollutants (Figure 11.1.12-1).

Based on the significance criteria presented in Table 11.2.12-1, air emission 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 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 Montana; however, NAAQS exceedances are not anticipated. Given that nonattainment areas are present throughout Montana (Figure 11.1.12-1), 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.

11.2.12.4. 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 at the Programmatic Level

Of the types of facilities or infrastructure deployment scenarios described in Section 2.1.2, Proposed Action Infrastructure, the following are likely to have *no impacts* to air quality under the conditions described below:

- Wired Projects
    - Use of Existing Conduit – New Buried Fiber Optic Plant: Activities associated with the installation of fiber optic cable in existing conduit would be limited to entry and exit points of the existing conduit. Gaining access to the conduit and installing the cable may result in minor disturbance at entry and exit points, however this activity would be temporary and infrequent, and is not expected to produce any perceptible changes in air emissions.
    - Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting up dark fiber would require no construction and have no short- or long-term emissions to air quality because it would create no new sources of emissions.
- Satellites and Other Technologies
    - Satellite Enabled Devices and Equipment: The duration of construction activities associated with installing permanent equipment on existing structures would most likely be short-term. It is anticipated that insignificant concentrations of criteria pollutants would be emitted during installment of this equipment from the use of machinery. Deployment and operation of satellite-enabled devices and portable equipment are expected to have minimal to *no impact* on ambient air quality concentrations.
    - Deployment of Satellites: FirstNet does not anticipate launching satellites as part of the deployment of the NPSBN; however, it may include equipment on satellites that are already being launched for other purposes. As adding equipment to an existing launch vehicle would be very unlikely to impact air quality resources, it is anticipated that this activity would have *no impact* on those resources.

Activities with the Potential to Impact at the Programmatic Level

Construction, deployment, and operation activities related to the Preferred Alternative could impact air quality by generating various quantities of criteria and air pollutant emissions. It is expected that such impacts would be *less than significant* due to the shorter duration and localized nature of the activities. The types of infrastructure deployment scenarios or deployment activities that could be part of the Preferred Alternative and result in potential impacts to air quality include the following:

- Wired Projects
    - New Build – Buried Fiber Optic Plant: Plowing (including vibratory plowing), trenching, or directional boring and the construction of POPs, huts, or other associated facilities or hand-holes to access fiber as well as land/vegetation clearing, excavation activities, and landscape grading could result in fugitive dust and products of combustion from the use of vehicles and heavy equipment.
    - New Build – Aerial Fiber Optic Plant: The use of heavy equipment during the installation of new poles and hanging cables, as well as constructing access roads, POP huts, or other

associated facilities to house plant equipment could result in products of combustion from the use of vehicles and machinery, as well as fugitive dust emissions from site preparation.

- Collocation on Existing Aerial Fiber Optic Plant: Excavation equipment used during pole replacement, and other heavy equipment used for structural hardening or reinforcement, could result in products of combustion from the use of vehicles and heavy equipment, as well as fugitive dust from site preparation.
- New Build – Submarine Fiber Optic Plant: The installation of cables in or near 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 or the banks of water bodies that accept the 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, structural hardening, and physical security measures required grading or excavation, then exhaust and fugitive dust from heavy equipment used for these activities could also result in increased air emissions.
  - Deployable Technologies: The type of deployable technology used would dictate the types of air pollutants generated. For example, mobile equipment deployed via heavy trucks could generate products of combustion from the internal combustion engines associated with the vehicles and onboard generators. These units may also generate fugitive dust depending on the type of road traveled during deployment (i.e., paved versus unpaved roads). Aerial platforms (e.g., UASs or other aircraft) would generate pollutants during all phases of flight.

In general, the pollutants of concern from the abovementioned activities would be products of combustion from burning fossil fuels in internal combustion engines and fugitive dust from site preparation activities and vehicles traveling on unpaved road surfaces. Any major infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the construction impacts. These impacts are anticipated to be *less than significant* at the programmatic level, due to the limited nature of the deployment. Chapter 19, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

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. At the programmatic level, 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* at the programmatic level, as they would still be limited in nature. Chapter 19, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

11.2.12.5. 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 construction associated with wired or wireless projects discussed above under the Preferred Alternative. Some limited construction could be associated with implementation such as land clearing or paving for parking or staging areas. The specific equipment associated with the Deployable Technologies Alternative could include heavy trucks with onboard generators, aerial vehicles (e.g., UASs or other aircraft), and ground support vehicles and other equipment for aerial deployment. The stand-alone Deployable Technologies Alternative differs from the Preferred Alterative in the number of mobile and aerial vehicles likely to deploy, the distances traveled from storage locations, and the duration of deployment. The potential impacts to air quality are as follows:

Deployment and Operation Impacts to Air Quality

Implementing deployable technologies could result in products of combustion from mobile equipment deployed via heavy trucks using internal combustion engines associated with the vehicles and onboard generators. While a single deployable vehicle may have an insignificant impact, multiple vehicles operating for longer periods, in close proximity, may have a greater cumulative impact, although this is expected to be *less than significant* at the programmatic level, based on the defined significance criteria, since activities would be temporary and short-term. These vehicles may also produce fugitive dust if traveling on unpaved roads. Some staging or landing areas (depending on the type of technology) may require excavation, site preparation, and paving. Heavy equipment used for these activities could emit products of combustion as a result of burning fossil fuels in internal combustion engines. The deployment and operation of aerial technology is anticipated to generate pollutants during all phases of flight, except for balloons. The 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.

No Action Alternative

Under the No Action Alternative, FirstNet would not deploy the NPSBN and there would be *no impact* to ambient air quality. By not deploying NPSBN, FirstNet would avoid generating emissions from construction, installation, or operation of wired, wireless, or deployable infrastructure or technologies, satellites, and other technologies.

11.2.13. Noise and Vibration

11.2.13.1. Introduction

This section describes potential noise impacts from construction, deployment, and operation of the Proposed Action and alternatives in Montana. See Chapter 19, 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.

11.2.13.2. Impact Assessment Methodology and Significance Criteria

The noise and vibration impacts of the Proposed Action were evaluated using the significance criteria presented in Table 11.2.13-1. As described in Section 11.2, Environmental Consequences, the categories of impacts are defined at the programmatic level as *potentially significant*, *less than significant with mitigation measures 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 and vibration impacts to Montana addressed in this section are presented as a range of possible impacts.

Table 11.2.13-1: Impact Significance Rating Criteria for Noise and Vibration at the Programmatic Level

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.

11.2.13.3. Description of Environmental Concerns

Increased Noise and Vibration Levels

The Proposed Action has the potential to generate noise and vibration during construction and operation of various equipment used for deployment. These noise and vibration levels could be above what is typically generated in a given area and may alter the ambient acoustical environment. If significant, the noise and vibration could cause impacts on residential areas, or other facilities that are sensitive to noise and vibration, such as churches, hospitals, or schools. The construction activities for deploying some of the various equipment evaluated under the Proposed Action could cause short-term impacts to nearby populations. However, it is likely that there would be less long-term effects from operational use of the proposed equipment (see Section 11.1.13, Noise and Vibration).

Based on the significance criteria presented in Table 11.2.13-1, noise and vibration 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 and vibration sources be deployed/operated long-term in the same area. Noise and vibration levels from deployment activities are not expected to exceed typical noise and vibration levels for short-term/temporary construction equipment or generators.

To the extent practicable, FirstNet would attempt to mitigate or minimize noise and vibration effects during construction or operation. BMPs and mitigation measures could be followed to limit impacts on nearby noise and vibration-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 and vibration impacts due to construction and operations at various receptors.

11.2.13.4. 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 and vibration 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 at the Programmatic Level

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 and vibration 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 and vibration 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 and vibration 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 and vibration would be emitted during installment of this equipment. Noise and vibration 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 and vibration 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 and vibration resources, it is anticipated that this activity would have *no impact* on those resources.

Activities with the Potential for Noise and Vibration Impacts at the Programmatic Level

Construction, deployment, and operation activities related to the Preferred Alternative could create noise and vibration impacts from either the construction or operation of the infrastructure. The types of infrastructure deployment scenarios or deployment activities that could be part of the Preferred Alternative and result in potential impacts to air quality include the following:

- Wired Projects
  - New Build – Buried Fiber Optic Plant: Plowing (including vibratory plowing), trenching, or directional boring and the construction of POPs, huts, or other associated facilities or hand-holes to access fiber as well as land/vegetation clearing, excavation activities, and landscape grading could result in high noise levels from the use of heavy equipment and machinery.
  - New Build – Aerial Fiber Optic Plant: The use of heavy equipment during the installation of new poles and hanging cables, as well as constructing access roads, POP huts, or other associated facilities to house plant equipment would be short-term and

could result in increased noise and vibration 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 and vibration levels from the use of heavy equipment and machinery.
- Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Installation of new associated huts or equipment, if required, could result in short-term and temporarily higher noise and vibration levels if the activity required the use of heavy equipment for grading or other purposes.
- New Build – Submarine Fiber Optic Plant: The installation of cables in or near bodies of water could generate noise and vibration if vessels are used to lay the cable. In addition, the construction of landings and/or facilities on shore or on the banks of water bodies that accept the submarine cable could result in short-term and temporarily increased noise and vibration levels to local residents and other noise and vibration sensitive receptors from heavy equipment used for grading, foundation excavation, or other ground disturbing activities.
- Installation of Optical Transmission or Centralized Transmission Equipment: Noise and vibration 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 and vibration emissions from optical networks are relatively low. Heavy equipment used to grade and construct access roads could generate increased levels of noise and vibration 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 and vibration. Operating vehicles, other heavy equipment, and generators would be used on a short-term basis and could increase noise and vibration 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 and vibration environment temporarily.
  - Deployable Technologies: The type of deployable technology used would dictate the types of noise and vibration generated. For example, mobile equipment deployed via heavy trucks could generate noise and vibration 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 and vibration during all phases of flight, including takeoff, landing, and flight operations over necessary areas that could impact the local noise and vibration environment.

In general, noise and vibration 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* at the programmatic level, due to the temporary duration of deployment activities. Additionally, pre-existing noise and vibration levels achieved after some months (typically less than a year but could be a few hours for linear activities such as pole construction). Chapter 19, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

Operation activities associated with the Preferred Alternative would be *less than significant* at the programmatic level 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 and vibration. 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 and vibration 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 and vibration impacts could result as explained above. Chapter 19, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

11.2.13.5. Alternatives Impact Assessment

The following section assesses potential noise and vibration 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 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 and vibration impacts are as follows:

Deployment Impacts

Implementing deployable technologies could result in noise and vibration from mobile equipment deployed via heavy trucks, including not only onboard generators, but also the vehicles themselves. While a single deployable vehicle may have a *less than significant* impact, multiple vehicles operating for longer periods, in close proximity, may increase noise and vibration levels. Several vehicles traveling together could also create short-term noise and vibration impacts on residences or other noise and vibration-sensitive receptors as they pass by. With the exception of balloons, the deployment of aerial technology is anticipated to generate noise and vibration during all phases of flight. Aerial technologies would have the highest level of noise and vibration impact if they are required to fly above residential areas, areas with a high concentration of noise and vibration-sensitive receptors (i.e., schools or churches), or over national parks or other areas where there is an expectation of quiet and serenity on their way to their final destinations. Residences near deployment areas for aerial technologies (i.e., airports or smaller airfields) could also be affected during takeoff and landing operations. Additionally, routine maintenance and inspections of the deployable technologies are anticipated to be *less than significant* at the programmatic level, given that these activities are expected to be of low-intensity and short duration. See Chapter 19, 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 and vibration in the area. However, deployable technologies could be deployed to areas with few existing facilities, so noise and vibration impacts could be minimal in those areas. Any major infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the abovementioned construction impacts. It is anticipated that potential noise and vibration 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 and vibration 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* at the programmatic level, short-term impacts on any residential areas or other noise and vibration-sensitive receptors under the flight path of these vehicles. However, once these operations cease, noise and vibration levels would quickly return to baseline levels. See Chapter 19, 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* to ambient noise and vibration. By not deploying the NPSBN, FirstNet would avoid generating noise and vibration from construction, installation, or operation of wired, wireless, deployable infrastructure or satellites and other technologies.

11.2.14. Climate Change

11.2.14.1. Introduction

This section describes potential impacts to climate and climate change-vulnerable resources in Montana associated with deployment and operation of the Proposed Action and alternatives. See Chapter 19, 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.

11.2.14.2. 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 11.2.14-1. The categories of impacts are defined at the programmatic level as *potentially significant*, *less than significant with mitigation measures 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 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, 2016).

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, 2016). 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 could provide useful information to the project planning to ensure these projects are resilient to the impacts of climate change.

Table 11.2.14-1: Impact Significance Rating Criteria for Climate Change at the Programmatic Level

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
Contribution to climate change through GHG emissions	Magnitude or Intensity	See discussion below in Section 11.2.14.5, Potential Impacts of the Preferred Alternative	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	NA		Global impacts observed.	NA
	Duration or Frequency	NA		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

11.2.14.3. Projected Future Climate

Climate model forecasts of future temperatures are highly dependent on emissions scenarios (low versus high), particularly in projections beyond 2050. For an average of seven days per year, maximum temperatures reach more than about 95 °F in the Northern Plains. These high temperatures are projected to occur much more frequently with days over 100 °F projected to double in number in the Northern Plains even in a low emissions scenario. Increases are also expected in the number of nights with minimum temperatures higher than 60 °F in the north part of the plains. These increases in extreme heat will have many negative consequences, including increases in surface water losses, heat stress, and demand for air conditioning. (USGCRP, 2014b)

Air Temperature

Figures 11.2.14-1 and 11.2.14-2 illustrate the anticipated temperature changes for low and high GHG emission scenarios for Montana from a 1969 to 1971 baseline.

Bsk – Figure 11.2.14-1 shows that by mid-century (2040 to 2059), temperatures in the Bsk region of Montana under a low emissions scenario would increase by approximately 4 °F, and by the end of the century (2080 to 2099) under a low emissions scenario temperatures in the Bsk region of Montana would increase by approximately 6° F. (USGCRP, 2009)

Figure 11.2.14-2 shows that under a high emissions scenario for the period (2040 to 2059), temperatures would increase by approximately 5 °F. Under a high emissions scenario for the period (2080 to 2099) in the Cfa region of Montana, temperatures would increase by approximately 9° F. (USGCRP, 2009)

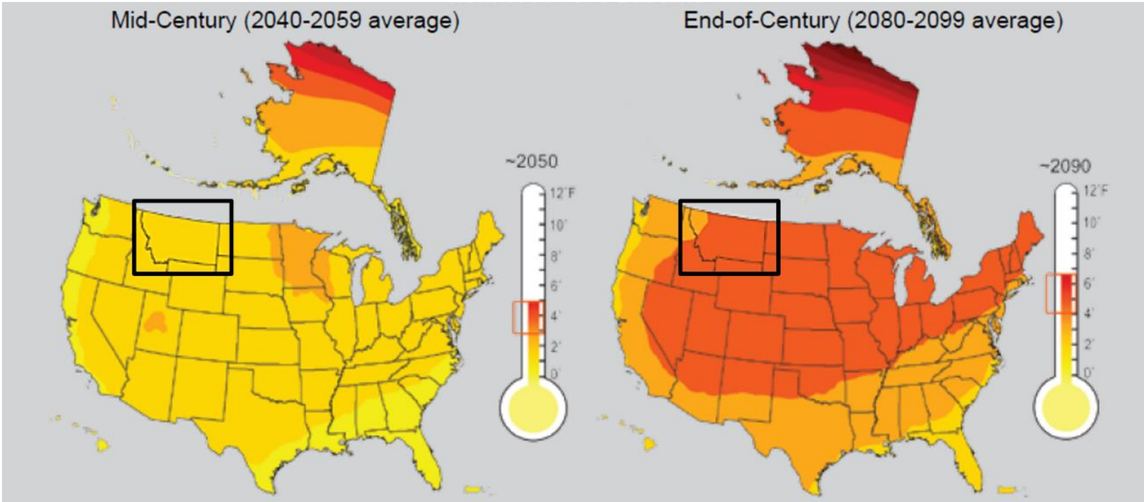
Dsb – Temperatures in the Dsb region of Montana are expected to increase by mid-century (2040 to 2059) under a low emissions scenario by approximately 4 °F and under the same emissions scenario by the end of the century (2080 to 2099) temperatures are expected to increase by approximately 5 °F. (USGCRP, 2009)

By mid-century, under a high emissions scenario, the Dsb regional temperatures are expected to increase by approximately 4 °F and by 8 °F at the end of the century. (USGCRP, 2009)

Dfb – Temperatures in this region are expected to increase by mid-century (2040 to 2059) under a low emissions scenario by approximately 4 °F, and by the end of the century (2080 to 2099, temperatures are projected to increase by either 5 °F or 6 °F depending on the section of the state in which the region falls. (USGCRP, 2009)

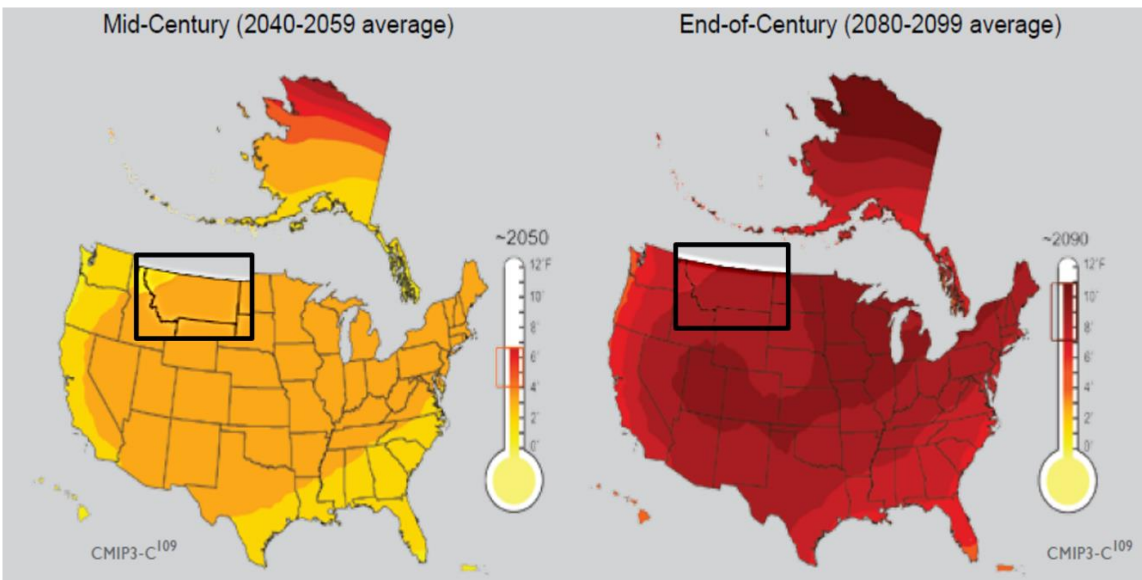
By mid-century temperatures under a high emissions scenario are expected to increase by either 8 °F or 9 °F depending on the section of the state in which the region falls. By the end of the century (2080 to 2099), under a high emissions scenario, temperatures in the Dfb region would increase by approximately 4 °F or 5 °F depending on the section of the state in which the region falls. (USGCRP, 2009)

Dfc – Temperatures in the Dfc region of Montana are expected to increase at the same rate as the Dsb region under both low and high emissions scenarios for the middle and end of the century.



Source: (USGCRP, 2009)

Figure 11.2.14-1: Montana Low Emission Scenario Projected Temperature Change



Source: (USGCRP, 2009)

Figure 11.2.14-2: Montana High Emission Scenario Projected Temperature Change

Precipitation

Winter and spring precipitation is projected to increase in the northern states of the Great Plains region relative to a 1971-2000 average. In central areas, changes are projected to be small relative to natural variations. Projected changes in summer and fall precipitation are also small except for summer drying in the central Great Plains. The number of days with heavy precipitation is expected to increase by mid-century, especially in the Northern Plains. (USGCRP, 2014b)

Total seasonal snowfall has generally increased in the northern Great Plains although snow is melting earlier in the year and more precipitation is falling as rain versus snow. Overall snow cover has decreased in the Northern Hemisphere, due in part to higher temperatures that shorten the time snow spends on the ground. (USGCRP, 2014c)

In Northern Montana, there is an expected decrease in the number of consecutive dry days while in Southern Montana, there is an expected increase in the number of consecutive dry days under high and low emissions scenarios by mid-century (2041 to 2070) as compared to the period (1971 – 2000). An increase in consecutive dry days can lead to drought. (USGCRP, 2014b)

Figure 11.2.14-3 shows predicted seasonal precipitation change for an approximate 30-year period of 2071 to 2099 compared to a 1970 to 1999 approximate 30-year baseline. Figure 11.2.14-3 show 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, 2014d)

Figure 11.2.14-3 shows a high emissions scenario, which assumes continued increases in emissions, with associated large increases in warming and major precipitation changes. (Note: white areas in the figures indicate that the changes are not projected to be larger than could be expected from natural variability.) (USGCRP, 2014d)

Bsk - Figure 11.2.14-3 shows that in a low emissions scenario in the 30-year period for 2071 to 2099, precipitation would increase by 10 percent in winter for the Bsk region of Montana. In spring, a portion of the Bsk region's precipitation would increase by 10 percent and another portion of the region's precipitation would increase by 20 percent. There are no expected increases in precipitation in summer or fall other than fluctuations due to natural variability. (USGCRP, 2014d)

Figure 11.2.14-3 shows that if emissions continue to increase, winter and spring precipitation could increase 20 or 30 percent over the period 2071 to 2099 depending on the portion of the state where the region falls. In summer, precipitation in this scenario could decrease between 10 or 20 percent in the Bsk region in Montana depending on the portion of the state where the region falls. Precipitation in fall is expected to increase by 10 percent in a portion of this region while in the remainder of the region there is no significant change to fall precipitation. (USGCRP, 2014d)

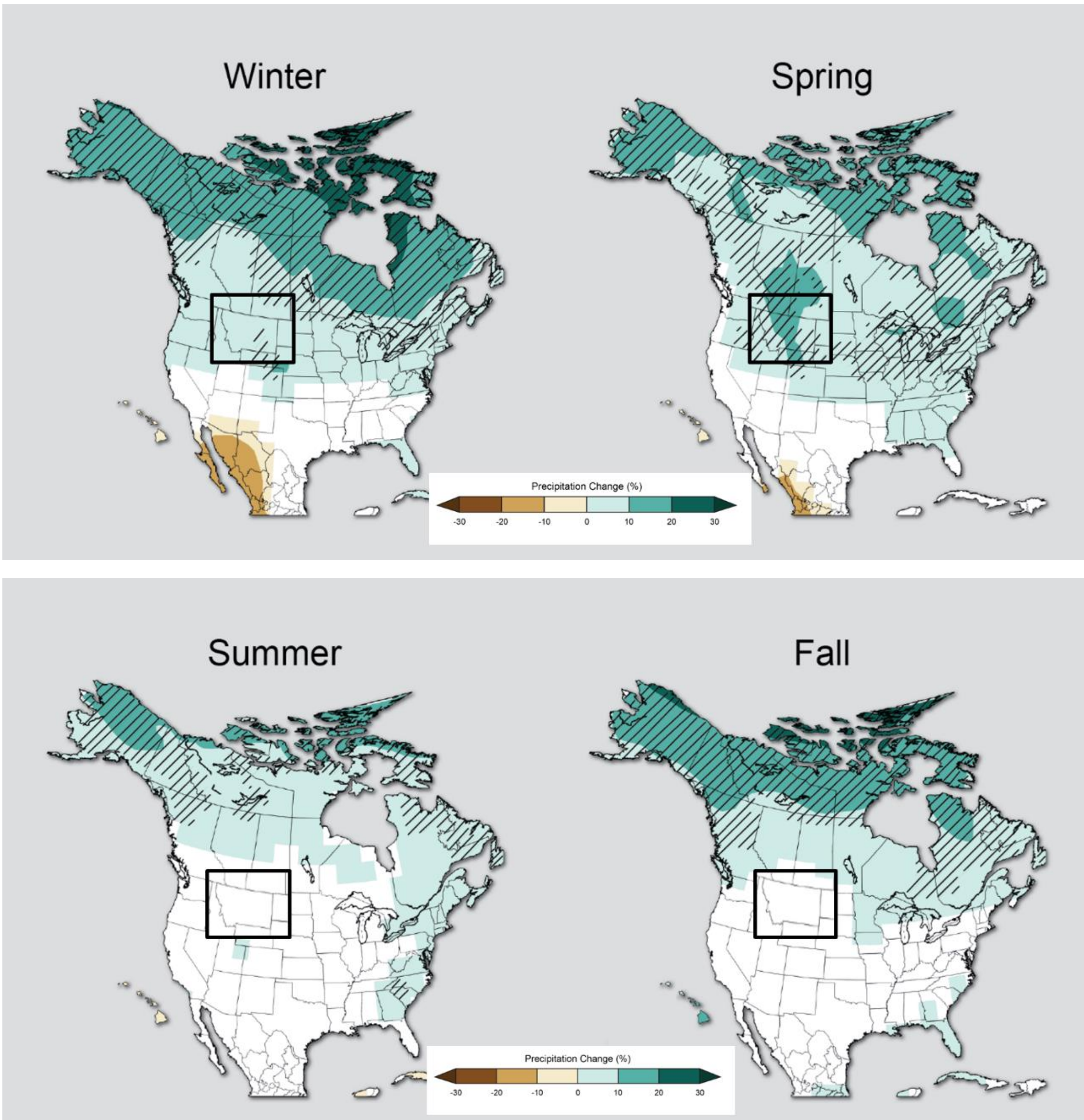
Dsb – Precipitation changes for the Dsb region are consistent with projected changes for the Bsk region of Montana in a low GHG emissions scenario for winter, summer, and fall. In spring, precipitation is expected to increase 10 percent in this region under a low emissions scenario.

Under a high emissions scenario, precipitation would increase by 20 percent in winter and spring for the Dsb region of Montana. Precipitation in summer is expected to decrease by approximately 20 percent under this emissions scenario while fall precipitation will increase by 10 percent.

Dfb – Precipitation changes for the Dfb region are consistent with projected changes for the Bsk and Dsb region of Montana in a low GHG emissions scenario for winter, summer and fall. In spring, a portion of the Dfb region's precipitation would increase by 10 percent and another portion of the region's precipitation would increase by 20 percent.

Under a high emissions scenario, precipitation is expected to change at the same rate as in the Dfb region as in the Bsk region for winter, spring, summer and fall.

Dfc – Precipitation changes for the Dfc region are consistent with projected changes for the Dsb region of Montana in both low and high emissions scenarios.



Source: (USGCRP, 2014d)

Figure 11.2.14-3: Predicted Seasonal Precipitation Change for 2071 to 2099 Compared to 1970 to 1999 Baseline in a Low Emissions Scenario

Severe Weather Events

It is difficult to forecast the impact of climate change on severe weather events such as winter storms and thunderstorms. Trends in thunderstorms 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. 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)

11.2.14.4. 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 11.2.14-1, 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. 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.

Climate Change

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. The severity and length of droughts is expected to increase in Montana as snow pack is reduced and temperatures rise. This in turn may contribute to more frequent and larger wildland fires (USGCRP, 2014e) as well as increased fuel load in the form of dead trees caused by invasive bark beetles (USFS, 2015l), which will have negative, transformative effects on forest ecosystems (State of Montana, 2005).

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. For areas of Montana at risk for flooding, climate change is projected to increase the frequency and severity of torrential downpours, which in turn may increase the potential for flash floods. Climate change may expose areas of Montana increased intensity and duration of heat waves (USGCRP, 2014f). Montana does not have large population centers with significant urban heat islands that would greatly magnify these effects, extended periods of extreme heat may increase general demand on the electric grid in the Midwest, and impede its operation (DOE, 2015), and potentially overwhelm the capacity of on-site equipment to keep microwave and other transmitters cool. Based on the impact significance criteria presented in Table 11.2.14-1, climate change effects on FirstNet installations and infrastructure would be significant if they negatively affected the operation of these facilities.

11.2.14.5. Potential Impacts of the Preferred Alternative

Greenhouse Gas Emissions

Given this assessment is programmatic and does not include any site-specific locations or deployment technology, it is impossible to determine the actual GHG emissions associated with any of the action alternatives. This information could only be captured once the site-specific information is determined. However, an assessment of potential impacts is provided in this section based on the potential emissions associated with the various activities that could occur as a result of the implementation of the Preferred Alternative in Montana, 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 at the Programmatic Level

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- or long-term emissions. This would create no perceptible change in GHG emissions.

- 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 at the Programmatic Level

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.
- Wireless Projects
  - New Wireless Tower Construction: Installation of new wireless towers and associated structures (generators, equipment sheds, fencing, security and aviation lighting, electrical

feeds, and concrete foundations and pads) or access roads could result in short-term, temporary GHG emissions from vehicles and construction equipment. Long-term, permanent or temporary increases in GHG emissions would result from the electricity requirements of the towers (both grid-provided and 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 if operated in large numbers over the long-term. However, this would be highly dependent on their size, number, and the frequency and duration of their use.

    Emissions associated with the deployment and maintenance of a complete network solution of this type may be significant if large numbers of piloted or unmanned aircraft were used for a sustained period of time (i.e., months to years). Emissions would depend on the type of platforms used, their energy consumption, and the duration of the network's operation.

Potential climate change impacts associated with deployment activities as a result of implementation of the Preferred Alternative include increased GHG emissions. GHG emissions would arise from the combustion of fuel used by equipment during construction and changes in land use. Emissions occurring as a result of soil disturbance and loss of vegetation are expected to be *less than significant* at the programmatic level, due to the limited and localized nature of deployment activities. Chapter 19, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

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. FirstNet installations should be evaluated in the design and planning phase through tiering to this analysis, in the context of their local geography and anticipated climate hazards to ensure they are properly hardened or there is sufficient redundancy to continue operations in a climate-affected environment. 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.

11.2.14.6. 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 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* at the programmatic level, 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* at the programmatic level. 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* at the programmatic level due the limited duration of deployment activities.

Additionally, routine maintenance and inspections of the deployable technologies are anticipated to be *less than significant* at the programmatic level, given that these activities are of low-intensity and short duration.

Climate Change Impacts on FirstNet Deployable Infrastructure or Operations

Climate change effects have the most noticeable impacts over a long period of time. 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. I 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 11.1.14.

11.2.15. Human Health and Safety

11.2.15.1. Introduction

This section describes potential impacts to human health and safety in Montana associated with deployment of the Proposed Action and alternatives. See Chapter 19, 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.

11.2.15.2. 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 11.2.15-1. As described in Section 11.2, Environmental Consequences, the categories of impacts are defined at the programmatic level as *potentially significant*, *less than significant with mitigation measures 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 11.2.15-1: Impact Significance Rating Criteria for Human Health and Safety at the Programmatic Level

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. 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 Manmade Disasters	Magnitude or Intensity	Exposure to concentrations of chemicals above regulatory limits, or USEPA chemical screening levels protective of the public. Site contamination conditions could preclude development of sites for the proposed use. Physical and biologic hazards. Loss of medical, travel, and utility infrastructure.	Effect is *potentially significant*, but with mitigation is *less than significant*.	No exposure to chemicals above health-protective screening levels. Hazardous or toxic materials or wastes could be safely and adequately managed in accordance with all applicable regulations and policies, with limited exposures or risks. No exposure to unsafe conditions. No loss of medical, travel, or utility infrastructure.	No exposure to chemicals, unsafe conditions, or other safety and exposure hazards.
	Geographic Extent	Regional impacts observed ("regional" assumed to be at least a 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

11.2.15.3. Description of Environmental Concerns

Worksite Physical Hazards, Hazardous Materials, and Hazardous Waste

The human health and safety concern having the greatest likelihood to occur during FirstNet deployment activities is occupational injury to telecommunication workers. The nature of telecommunication work requires workers to execute job responsibilities that are inherently dangerous. Telecommunication work activities present physical and chemical hazards to workers. The physical hazards have the potential to cause acute injury, long-term disabilities, or in the most extreme incidents, death. Other occupational activities such as handling hazardous materials and hazardous waste often do not result in acute injuries, but may compound over multiple exposures, resulting in increased morbidity. Based on the impact significance criteria presented in Table 11.2.15-1, occupational injury impacts could be *potentially significant* if the FirstNet deployment locations require performing occupational activities that have the highest relative potential for physical injury and/or chemical exposure. Examples of activities that may present increased risk and higher potential for injury include working from heights (i.e., from towers and roof tops), ground-disturbing activities like trenching and excavating, confined space entry, operating heavy equipment, and the direct handling of hazardous materials and hazardous waste. Predominately, these hazards are limited to occupational workers, but may impact the general public if there are trespassers or if any physical of chemical hazard extends beyond the restricted access of proposed FirstNet work sites. 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 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 (OSHA, 2015b).

- 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,[182] 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

[182] Trench boxes are framed metal structures inserted into open trenches to support trench faces, to protect workers from cave-ins and similar incidents. (OSHA, 2016b)

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 (OSHA, 2015b). To the extent practicable, FirstNet partner(s) would likely implement and abide by work practice controls through employee safety training and by developing site-specific health and safety plans (HASP). The HASPs would identify all potential hazardous materials and hazardous wastes, potential physical hazards, and applicable mitigation steps. Other components of a HASP identifying appropriate PPE for each task and the location of nearby medical facilities. Safety Data Sheets (SDS) describing the physical and chemical properties of hazardous materials used during FirstNet deployment and maintenance activities, as well as the physical and health hazards, routes of exposure, and precautions for safe handling and use would be kept and maintained at all FirstNet project sites. In addition to HASPs and SDSs, standard operating procedures (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 (OSHA, 2015b). 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 MTDLI is authorized by OSHA to administer a state program to oversee employee safety in public or private sector workplaces. Therefore, MTDLI 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 and mine lands 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 11.2.15-1, human health impacts could be *potentially significant* if

FirstNet deployment sites are near contaminated properties or abandoned or active mine lands. Prior to the start of any FirstNet deployment project, potential site locations should be screened for known environmental contamination and/or mining activities using federal resources such as the USEPA Cleanups in My Community database and U.S. Department of Interior's Abandoned Mine Lands inventory, through the MDEQ, or through an equivalent commercial resource.

By screening sites for environmental contamination, mining activities, and reported environmental liabilities, the presence of historic contamination and unsafe ground conditions could be evaluated and may influence the site selection process. In general, the lower the density of environmental contamination or mining activities, the more favorable the site will be for FirstNet deployment projects. If sites containing known environmental contamination (or mine lands) are selected for proposed FirstNet deployment activities it may be necessary to implement additional controls (e.g., engineering, work practice, administrative, and/or PPE) to ensure workers, and the general public, are not unnecessarily exposed to the associated hazards. Additionally, for any proposed FirstNet deployment site, it is possible undocumented environmental contamination is present.

During FirstNet deployment activities, if any soil or groundwater is observed to be stained or emitting an unnatural odor, it may be an indication of environmental contamination. When such instances are encountered, it may be necessary to stop work until the anomaly is further assessed through record reviews or environmental sampling. Proposed FirstNet deployment would attempt to avoid known contaminated sites. However in the event that FirstNet is unable to avoid a contaminated site, then site analysis and remediation would be required under RCRA, CERCLA (Superfund), and applicable Montana 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, the MDEQ 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 11.2.15-1, human health impacts could be *potentially significant* if FirstNet deployment sites are located in areas that are directly impacted by natural and manmade disasters that could lead to exposure to hazardous wastes, hazardous materials, and occupational hazards. FirstNet's emphasis on public safety-grade communications infrastructure may result in a *less than significant* beneficial impact, 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.

11.2.15.4. 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 at the Programmatic Level

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 at the Programmatic Level

Potential deployment-related impacts to human health and safety as a result of implementation of the Preferred Alternative would encompass a range of impacts that occur as a result of ground disturbance activities, construction activities, equipment upgrade activities, management of hazardous materials and/or hazardous waste, and site selection. The types of infrastructure development scenarios or deployment activities that could be part of the Preferred Alternative and result in potential impacts to human health and safety include the following:

- Wired Projects
  - New Build – Buried Fiber Optic Plant: Plowing (including vibratory plowing), trenching, or directional boring and the construction of POPs, huts, or other associated facilities or hand-holes to access fiber would require the use of heavy equipment and hazardous materials. The additional noise and activity at the site would require workers to demonstrate a high level of situational awareness. Failure to follow OSHA and industry controls could result in injuries. Excavation of soil at proposed sites known to contain environmental contamination has the potential to expose workers to harmful chemicals or releases that could impact the general public in the immediate vicinity. Additionally, some of this work would likely be performed along road ROWs, increasing the potential

for vehicle traffic to collide with site workers or equipment. If a proposed deployment activity involves the operation of heavy equipment, managing hazardous materials and hazardous waste management, or other site location challenges, there could be potential human health and safety impacts to consider.

- New Build – Aerial Fiber Optic Plant: Installation of new poles and fiber optic lines could require excavation activities, working from heights, use of hazardous materials, and site locations in ROWs. Hazards associated with the site work include injury from heavy equipment, fall hazards, chemical hazards, and the potential for vehicle traffic to collide with site workers or equipment. Excavation of soil at proposed sites known to contain environmental contamination has the potential to expose workers to harmful chemicals or releases that could impact the general public in the immediate vicinity. If a proposed deployment activity involves the operation of heavy equipment, hazardous materials and hazardous waste management, or other site location challenges, there could be potential human health and safety impacts to consider.
- Collocation on Existing Aerial Fiber Optic Plant: Installation of overhead fiber optic lines would require work from height. In some instances, new poles would be installed requiring excavation activities with heavy equipment. Hazards associated with the site work include injury from heavy equipment, fall hazards, chemical hazards, and the potential for vehicle traffic to collide with site workers or equipment. Excavation of soil at proposed sites known to contain environmental contamination has the potential to expose workers to harmful chemicals or releases that could impact the general public in the immediate vicinity. If a proposed deployment activity involves the operation of heavy equipment, hazardous materials and hazardous waste management, or other site location challenges, there could be potential human health and safety impacts to consider.
- New Build – Submarine Fiber Optic Plant: The installation of fiber optic cables in or near 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 or the banks of water bodies that accept the 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 Project could include injury from site preparation and operating heavy equipment, construction activities, falling/overhead hazards/falling objects, exposure and release of hazardous chemicals and hazardous waste. It is anticipated that potential health impacts associated with human exposure to environmental hazardous materials in air, water, or soil, the risk of road traffic, workplace accidents and injuries, noise exposure, and risk of infectious disease transmission would be *less than significant* at the programmatic level, due to the small scale of likely FirstNet activities that would be temporary and of short duration. Chapter 19, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, operation activities associated with the Preferred Alternative would consist of routine maintenance and inspection of the facilities. Any major infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the abovementioned construction impacts. At the programmatic level, it is anticipated that there would be *less than significant* impacts to human health and safety associated with routine inspections of the Preferred Alternative, 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* at the programmatic level due to the small scale of likely FirstNet activities that would be temporary and of short duration. See Chapter 19, 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.

11.2.15.5. 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 construction associated with wired or wireless projects discussed above under the Preferred Alternative. Some limited construction could be associated with implementation such as land clearing or paving for parking or staging areas. The specific infrastructure associated with the Deployable Technologies Alternative would be the same as the deployable technologies implemented as part of the Preferred Alternative but would likely be implemented in greater numbers, over a larger geographic extent, and used with greater frequency and duration. Therefore, potential impacts to human health and safety as a result of implementation of this alternative could be as described below.

Deployment Impacts

As explained above, implementation of deployable technologies could result in *less than significant* impacts to human health and safety at the programmatic level. The largest of the land-based deployable technologies may require site preparation work or stabilization work to ensure the self-contained trailers are stable. Heavy equipment may be necessary to complete the site preparation work. However, in general, the deployable technologies are small mobile units that could be transported as needed. While in operation, the units are parked and operate off electrical generators or existing electrical power sources. Connecting deployable technology to a power supply may present increased electrocution risk during the process of connecting power. If the power source is an electrical generator, then there would also likely be a need to manage hazardous materials (fuel) onsite.

At the programmatic level, 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 19, 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* at the programmatic level because of the small scale of likely FirstNet activities; activities associated would routine maintenance, inspection, and deployment of deployable technologies would be temporary and often of limited duration. See Chapter 19, 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. Therefore, there would be *no impacts* to human health and safety as a result of the No Action Alternative. Environmental conditions would therefore be the same as those described in Section 11.1.15, Human Health and Safety.

MT APPENDIX A – WATER RESOURCES

Table A-1: Characteristics of Montana's Administrative Basins, as Defined by MT DNRC

Watershed / Size Land Area within MT (square miles)	Major Surface Waterbodies	Major Water Quality Concerns
Columbia / Clark Fork and Kootenai Basin (46,433)	Clark Fork River Bitterroot River Blackfoot River Flathead River Kootenai River Fisher River Yaak River Tobacco River Flathead Lake Georgetown Lake Noxon Reservoir Cabinet Gorge Reservoir Little Bitterroot Lake Ashley Lake Lake McDonald Whitefish Lake Swan Lake Lake Koocanusa	• Superfund site from past resource extraction/processing. • Dams and other developments altering flow and connectivity. • Nonpoint source pollution.
Upper Missouri (33,300)	Gallatin River Madison River Ruby River Beaverhead-Red Rock Rivers Big Hole River Jefferson River Smith River Sun River Missouri River Teton River Marias River Lake Frances Lake Elwell Bynum Reservoir Holter Lake Hauser Lake Canyon Ferry Lake Ennis Lake Clark Canyon Reservoir Hebgen Lake Lima Reservoir	• Dams and other developments altering flow and connectivity. • Nonpoint source pollution.

Watershed / Size Land Area within MT (square miles)	Major Surface Waterbodies	Major Water Quality Concerns
Lower Missouri (34,958)	Milk River Middle Missouri River Musselshell River Lower Missouri River Fresno Reservoir Fort Peck Lake Nelson Reservoir Medicine Lake Deadman's Basin Reservoir	• Dams and other developments altering flow and connectivity. • Nonpoint source pollution.
Yellowstone (69,803)	Yellowstone River Bighorn River Tongue River Powder River Bighorn Lake	• Developments altering flow and connectivity. • Nonpoint source pollution. • Salinity, iron, sediment, nutrients.

Source: (MT DNRC, 2014e) (MT DNRC, 2014d) (MT DNRC, 2014c) (MT DNRC, 2014b)

MT APPENDIX B – BIOLOGICAL RESOURCES

Table B-1: MNHP S1 Ranked Terrestrial Communities of Concern in Montana

Vegetative Community Type	USEPA Ecoregion(s)	Description	Distribution
Mixed Salt Desert Scrub	Wyoming Basin and Middle Rockies	Shrub dominated community found in arid regions, typically receiving 12 in. or less of annual precipitation. Occurs at elevations of 3,500 to 4,000 ft. on steep erodible badlands in Carbon County. Saltbrush species such as shadscale saltbrush (*Atriplex confertifolia*) or fourwing saltbrush (*Atriplex canescens*) are typically the dominant shrub species.	This community has a very limited distribution within Montana, but is more abundant at the national scale.
Rocky Mountain Conifer Swamp	Northern Rockies, Middle Rockies, and Canadian Rockies	A coniferous swamp often found near wet meadows, fens, and lakes. Vegetation includes temporarily or seasonally flooded forests of Engelmann spruce (*Picea engelmannii*), subalpine fir (*Abies lasiocarpa*), western hemlock (*Tsuga heterophylla*), and western red cedar (*Thuja plicata)*. Typical understories species include American lady fern (*Athyrium filix-femina*), wood fern (*Dryopteris*species), and skunk cabbage (*Lysichiton americanus*).	Limited occurrence within Montana.

Sources: (MFWP and MNHP, 2015) (USEPA, 2015h)

% = percent, in. = inches, ft. = feet

ACRONYMS

Acronym	Definition
AARC	Average Annual Rate of Change
ACS	American Community Survey
AGL	Above Ground Level
AIM	Aeronautical Information Manual
AML	Abandoned Mine Lands
APE	Area of Potential Effect
AQCR	Air Quality Control Region
ARPA	Archaeological Resources Protection Act
ASL	Above Sea Level
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
BNSF	Burlington Northern and Santa Fe Railway
CAA	Clean Air Act
CCD	Common Core of Data
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CGP	Construction General Permit
CIMC	Cleanups in My Community
CIO	Chief Information Officer
CO	Carbon Monoxide
CO2	Carbon Dioxide
COLT	Cell On Light Truck
COLT	Cell On Light Trucks
COW	Cell On Wheels
CRS	Community Rating System
CWA	Clean Water Act
CWS	Community Water Systems
DEQ	Department of Environmental Quality
DMV	Department of Motor Vehicles
DNR	Department of Natural Resources
DOE	Department of Energy
EDACS	Enhanced Digital Access System
EIA	Energy Information Agency
EMS	Emergency Medical Services

Acronym	Definition
EPCRA	Emergency Planning and Community Right to Know Act
FCC	Federal Communication Commission
FEMA	Federal Emergency Management Agency
FGDC	Federal Geographic Data Committee
FLM	Federal Land Manager
FLPMA	Federal Land Policy and Management Act of 1976
FSDO	Flight Standards District Offices
FSS	Flight Service Station
GHG	Greenhouse Gas
HAP	Hazardous Air Pollutant
HASP	Health and Safety Plans
HHRA	Human Health Risk Assessment
IFR	Instrument Flight Rules
IPCC	Intergovernmental Panel On Climate Change
LBS	Locations-Based Services
LID	Low Impact Development
LMR	Land Mobile Radio
LRR	Land Resource Regions
LTE	Long Term Evolution
MBTA	Migratory Bird Treaty Act
MDA	Montana Department of Agriculture
MDEQ	Montana Department of Environmental Quality
MDI	Methylene Diphenyl Diisocyanate
MDT	Montana Department of Transportation
MHI	Median Household Income
MLRA	Major Land Resource Areas
MMT	Million Metric Tons
MSL	Mean Sea Level
MTDLI	Montana Department of Labor and Industry
MT DNRC	Montana Department of Natural Resources and Conservation
MTDPHHS	Montana Department of Public Health and Human Services
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
NEPA	National Environmental Policy Act
NESCA	Nongame and Endangered Species Conservation Act

Acronym	Definition
NFIP	National Flood Insurance Program
NHA	National Heritage Area
NHL	National Historic Landmarks
NHPA	National Historic Preservation Act
NIH	National Institute of Health
NIST	National Institute of Standards and Technology
NM	Nautical Miles
NNL	National Natural Landmarks
NOTAM	Notices To Airmen
NOX	Oxides of Nitrogen
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NPS	National Park Service
NRC	National Response Center
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSA	National Security Areas
NSHS	Nebraska State Historical Society
NTFI	National Task Force On Interoperability
NTNC	Non-Transient Non-Community
NWI	National Wetlands Inventory
NWR	National Wildlife Refuges
OCIO	Office of the CIO
OE/AAA	Obstruction Evaluation and Airport Airspace Analysis
ORION	Omaha Regional Interop Network
OSHA	Occupational Safety and Health Administration
OTR	Ozone Transport Region
PEIS	Programmatic Environmental Impact Statement
PEM	Palustrine Emergent Wetlands
PGA	Peak Ground Acceleration
POP	Points of Presence
PPE	Personal Protective Equipment
PSCR	Public Safety Communications Research
PSD	Prevention of Significant Deterioration
RACOM	Radio Communications
RCRA	Resource Conservation and Recovery Act
RF	Radio Frequency
SAA	Sense and Avoid

Acronym	Definition
SASP	State Aviation System Plan
SCEC	State Climate Extremes Committee
SDS	Safety Data Sheets
SHPO	State Historic Preservation Office
SIP	State Implementation Plan
SOC	Standard Occupational Classification
SOP	Standard Operating Procedures
SOW	System On Wheels
SPL	Sound Pressure Level
SRS	Statewide Radio System
STARCOMM	Siouxland Tristate Area Radio Communications
SUA	Special Use Airspace
SWPPP	Stormwater Pollution Prevention Plan
THPO	Tribal Historic Preservation Office
TNC	Transient Non-Community Systems
TRI	Toxics Release Inventory
TWA	Time Weighted Average
UA	Unmanned Aircraft
UAS	Unmanned Aircraft Systems
UHF	Ultra-High Frequency
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VFR	Visual Flight Rules
VHF	Very High Frequency
VOC	Volatile Organic Compounds
WMA	Wildlife Management Areas
WMD	Wetland Management District
WONDER	Wide-Ranging Online Data For Epidemiologic Research
WWI	World War I
WWII	World War II

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