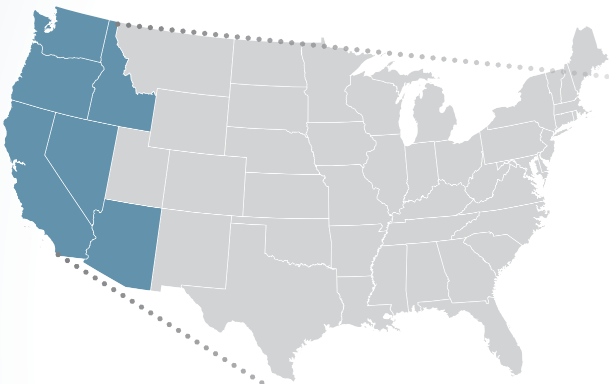
FirstNet®

Nationwide Public Safety Broadband Network

Draft Programmatic Environmental Impact Statement for the Western United States

VOLUME 4 - CHAPTER 6



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First Responder Network Authority

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Nationwide Public Safety Broadband Network

Draft Programmatic Environmental Impact Statement for the Western United States

VOLUME 4 - CHAPTER 6

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Cooperating Agencies
Federal Communications Commission
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U.S. Department of Agriculture—Rural Utilities Service
U.S. Department of Agriculture—U.S. Forest Service
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U.S. Department of Defense—Department of the Air Force
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6. NEVADA

Nevada was populated for centuries by American Indians with a rich cultural history. American settlement in Nevada started in the early 1850s. In 1861, Nevada was made into a United States' Territory; three years later, in 1864, Nevada entered the Union as the 36th state (Nevada Legislative Council Bureau, 2013). Nevada is bordered by Oregon and Idaho to the north, California to the west and south, and Utah and Arizona to the east. This chapter provides details about the existing environment of Nevada as it relates to the Proposed Action.

General facts about Nevada are provided below:

- **State Nickname:** The Silver State
- **Area:** 109,781 square miles; **U.S. Rank:** 7 (U.S. Census Bureau, 2015a) (U.S. Census Bureau, 2015b)
- **Capital:** Carson City
- **Counties:** 17 (U.S. Census Bureau, 2015c)
- **2014 Estimated Population:** Over 2.8 million people (U.S. Census Bureau, 2015a); **U.S. Rank:** 35 (U.S. Census Bureau, 2015c)
- **Most Populated Cites:** Las Vegas, Henderson, Reno, and North Las Vegas (U.S. Census Bureau, 2015c)
- **Main Rivers:** Carson River, Colorado River, Humboldt River, Truckee River, and Walker River
- **Bordering Waterbodies:** Colorado River, Lake Mead, Lake Tahoe
- **Mountain Ranges:** Toiyabe Mountains, Monitor Mountains, Schell Creek Mountains, and a portion of the Sierra Nevada Mountains
- **Highest Point:** Boundary Peak (13,140 ft.) (Thompson, J., 2015)

6.1. AFFECTED ENVIRONMENT

6.1.1. Infrastructure

6.1.1.1. Definition of the Resource

This section provides information on key Nevada 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 6.1.1.3 provides an overview of the traffic and transportation infrastructure in Nevada, including road and rail networks and airport facilities. Nevada 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 Nevada are presented in more detail in Section 6.1.1.4. Section 6.1.1.5 describes specific public safety communications infrastructure and commercial telecommunications infrastructure in Nevada. An overview of utilities in Nevada, such as power, water, and sewer, are presented in Section 6.1.1.6.

6.1.1.2. Specific Regulatory Considerations

Multiple Nevada laws and regulations pertain to the state's public utility and transportation infrastructure and its public safety community. Table 6.1.1-1 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.

Table 6.1.1-1: Relevant Nevada Infrastructure Laws and Regulations

State Law/Regulation	Regulatory Agency	Applicability
Nevada Code: Title 40 Public Health and Safety	Department of Public Safety (DPS)	Assists with development of comprehensive plans for responding to emergencies.

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

State Law/Regulation	Regulatory Agency	Applicability
Nevada Code: Title 58 Energy, Public Utilities, and Similar Entities (Chapter 703-707)	Public Utilities Commission of Nevada	Supervises and regulates rates, property rights, equipment, facilities, service territories, and franchises of public utilities (natural gas, electric, water, wastewater, and telecommunications); constructs and maintains telephone lines; enhances 9-1-1 services.
Nevada Code: Title 22, 35, 44 Transportation	Nevada Department of Motor Vehicles	Establishes, maintains, and operates airports and air navigation facilities; improve, and classifies county roads; constructs, reconstructs, maintains, protects, and improves all public highways and roads.

6.1.1.3. Transportation

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

The Nevada Department of Transportation (NevadaDOT) has jurisdiction over freeways and major roads, airports, and railroads in the state; local counties have jurisdiction for smaller streets and roads. The NevadaDOT is "responsible for the planning, construction, operation, and maintenance of the 5,400 miles of highway and over 1,000 bridges which make up the state highway system. The department is divided into three districts, with a district engineer and assistant engineers in each. The districts are responsible for supervising all state transportation activities within their local areas. Transportation no longer means highways alone, but rather an integration of travel by rail, bike, air, or bus" (NevadaDOT, 2015a).

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

- 40,139 miles of public roads (FHWA, 2014) and 1,898 bridges (FHWA, 2015a);
- 1,085 miles of main line rail network that includes passenger rail and freight (NevadaDOT, 2012a);
- 126 aviation facilities, including airstrips and heliports (FAA, 2015a); and
- No major harbors or ports.

Road Networks

As identified in Figure 6.1.1-1, the major urban centers of the state are Reno-Carson City-Fallon in the northwest and Las Vegas-Henderson in the south-central section of the state (USDOC, 2013a). Nevada has two major interstates connecting its major metropolitan areas to other states. Travel outside the major metropolitan areas is conducted on interstates, and state and county roads.

Table 6.1.1-2 lists the interstates and their start/end points in Nevada. 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 6.1.1-2: Nevada Interstates

Interstate	Southern or western terminus in NV	Northern or eastern terminus in NV
I-15	CA line at Primm	AZ line at Mesquite
I-80	CA line near Verdi	UT line at West Wendover

In addition to the Interstate System, Nevada has both National Scenic Byways and State Scenic Byways. National and State Scenic Byways are roads that are recognized for one or more archaeological, cultural, historic, natural, recreational, and scenic qualities (FHWA, 2013). Figure 6.1.1-1 illustrates the major transportation networks, including roadways, in Nevada. Section 6.1.8, Visual Resources, describes the National and State Scenic Byways found in Nevada from an aesthetic perspective.

National Scenic Byways are roads with nationwide interest; the byways are designated and managed by the U.S. Department of Transportation's Federal Highway Administration (FHWA). Nevada has four National Scenic Byways:

- City of Las Vegas, Las Vegas Boulevard,
- Lake Tahoe – Eastshore Drive,
- Las Vegas Strip, and
- Pyramid Lake Scenic Byway (FHWA, 2016).

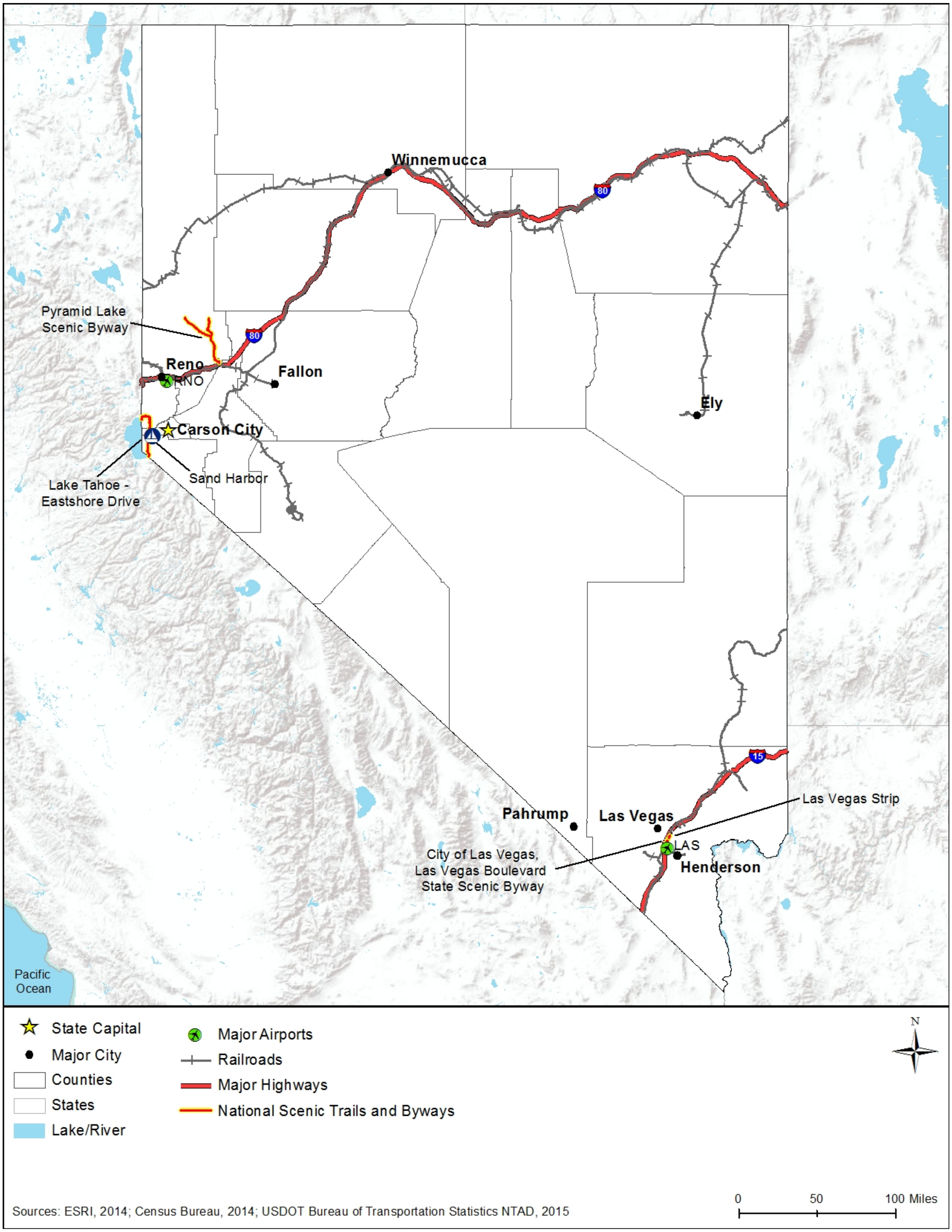

Figure 6.1.1-1: Nevada Transportation Networks

State Scenic Byways are roads with statewide interest. Some State Scenic Byways may be designated on portions of National Scenic Byways. State Scenic Byways are designated and managed by NevadaDOT. Nevada has 19 State Scenic Byways that crisscross the entire state (NevadaDOT, 2015b):[2]

- US 50 (Carson City),
- SR 28 (North Shore Road),
- SR 156 (Mt. Charleston/Lee Canyon Road),
- SR 157 (Kyle Canyon Road),
- SR 158 (Deer Creek Road),
- SR 159 (Red Rock Road),
- Valley of Fire Road (State Park),
- White Domes Road (Valley of Fire State Park),
- North Las Vegas Strip,
- South Las Vegas Strip,
- US 50 (Douglas),
- SR 231 (Angle Lake Road),
- Lamoille Canyon Road,
- US 93 (Lincoln),
- SR 445 (Pyramid Lake Road),
- SR 446 (Sutcliffe/Nixon Road),
- SR 447 (Gerlach Road),
- US 6/US 50/US 93, and
- US 93 (White Pine).

Airports

Air service to the state is provided by two major international airports:

- McCarran International Airport (LAS) serves the City of Las Vegas and southern Nevada. It is owned by Clark County and operated by the Clark County Department of Aviation (LAS, 2015). In 2014, the airport facilitated 219,437 departing aircraft and 21,224,639 enplaned passengers (LAS, 2014). That same year, the airport also handled 104,101 tons of cargo (LAS, 2014).
- Reno/Tahoe International Airport (RNO) serves the City of Reno, the Lake Tahoe region, and northwestern Nevada. It is owned and operated by the Reno-Tahoe Airport Authority (RNO, 2015). Serving 3,298,915 passengers in 2014 (RNO, 2014), it is the 66th busiest commercial airport in the U.S. (RNO, 2015). In 2014, the airport also handled 129,089,232 pounds of cargo (RNO, 2014).

Figure 6.1.1-1 illustrates the major transportation networks, including airports, in the state. Section 6.1.7, Airspace, provides more detail on airports and airspace in Nevada.

Rail Networks

Nevada is connected to a network of passenger rail (Amtrak) and freight rail. Figure 6.1.1-1 illustrates the major transportation networks, including rail lines, in Nevada.

Amtrak runs one line through Nevada. The California Zephyr line runs daily between Chicago and the San Francisco Bay area for a total of 2,438 miles; 427 of those miles are in Nevada (NevadaDOT, 2012a). In 2011, 70,673 passengers embarked or disembarked an Amtrak train in Nevada (NevadaDOT, 2012a). Table 6.1.1-3 provides information on the Amtrak route that runs through Nevada.

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

Table 6.1.1-3: Amtrak Train Routes Serving Nevada

Route	Starting Point	Ending Point	Length of Trip	Cities Served in Nevada
California Zephyr	Chicago, IL	Emeryville, CA	51 hours 20 minutes	Elko, Winnemucca, Reno

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

Two Class I railroad companies operate in Nevada: the Union Pacific Railroad (UPRR) and BNSF Railway (BNSF). In 2009, these 2 railroads moved approximately 190 million tons of freight through Nevada (NevadaDOT, 2012a). The UPRR is the larger of the 2 railroads and owns the bulk (1,085 miles) of mainline track in Nevada (NevadaDOT, 2012a). At 96 percent, the majority of goods traveling via freight rail in Nevada are pass-through traffic and most of it is going to or from California (NevadaDOT, 2012a). Also in 2009, the UPRR and BNSF moved 1.6 million tons of freight that originated in Nevada and terminated outside the state (NevadaDOT, 2012a). There are major freight rail facilities in the following Nevada cities: Arden, Carlin, Elko, Fernley, Las Vegas, Sparks, and Tahoe/Reno (NevadaDOT, 2012a).

Additionally, Nevada has four excursion railroads (Nevada Northern Railway, Virginia & Truckee Railroad Company, the Nevada State Railroad Museum, and the Nevada Southern Railway) that cover 32.5 miles of track and transport over 100,000 passengers each year along historic routes and to historic locations within the state (NevadaDOT, 2012a).

Harbors and Ports

Nevada has little in the ways of large bodies of water. The landlocked state is home to parts of Lake Tahoe and the Colorado River, as well as Lake Mead. Nevada has no access to the ocean, and there are no true harbors or ports. Sand Harbor is located in the Lake Tahoe Nevada State Park, on the northeast shore of Lake Tahoe, is a recreation area easily reachable via nearby State Route 28. Along with swimming and scuba diving, Sand Harbor offers boat access to Lake Tahoe. As a means of protecting Lake Tahoe's biodiversity, all watercraft must undergo an inspection to ensure that no invasive species will be transported inadvertently. The 55 acres of beach property at Sand Harbor are owned by the state (Nevada State Parks, 2015a).

6.1.1.4. Public Safety Services

Nevada public safety services generally consist of public safety infrastructure and first responder personnel aligned with the demographics of the state. Table 6.1.1-4 presents Nevada'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 6.1.9, Socioeconomics; however, these demographics are key to understanding the breadth of public safety services throughout the state.

Table 6.1.1-4: Key Nevada Indicators

Nevada Indicators	
Estimated Population (2014)	2,839,099
Land Area (square miles) (2010)	109,781
Population Density (persons per sq. mile) (2010)	24.6
Municipal Governments (2013)	19

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

Table 6.1.1-5 presents Nevada's public safety infrastructure, including fire and police stations. Table 6.1.1-6 identifies first responder personnel including dispatch, fire and rescue, law enforcement, and emergency medical personnel in the state.

Table 6.1.1-5: Public Safety Infrastructure in Nevada by Type

Infrastructure Type	Number
Fire and Rescue Stations [a]	305
Law Enforcement Agencies [b]	76
Fire Departments [c]	86

[a] Data collected by the U.S. Fire Administration in 2015.
[b] Number of 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.
[c] Data collected by the U.S. Fire Administration in 2015.

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

Table 6.1.1-6: First Responder Personnel in Nevada by Type

First Responder Personnel	Number
Police, Fire and Ambulance Dispatchers [a]	600
Fire and Rescue Personnel [b]	4,596
Law Enforcement Personnel [c]	10,097
Emergency Medical Technicians and Paramedics [d e]	1,300

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

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

6.1.1.5. Telecommunications Resources

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

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

Figure 6.1.1-2 presents a typical wireless configuration including both a narrowband public safety land mobile radio network (traditional radio network) and a commercial broadband access network (wireless technology); backhaul (long-distance wired or wireless connections), core, and commercial networks including a long term evolution (LTE) evolved packet core (modern broadband cellular networks); and network applications (software) delivering voice, data, and video communications (FCC, 2016a).

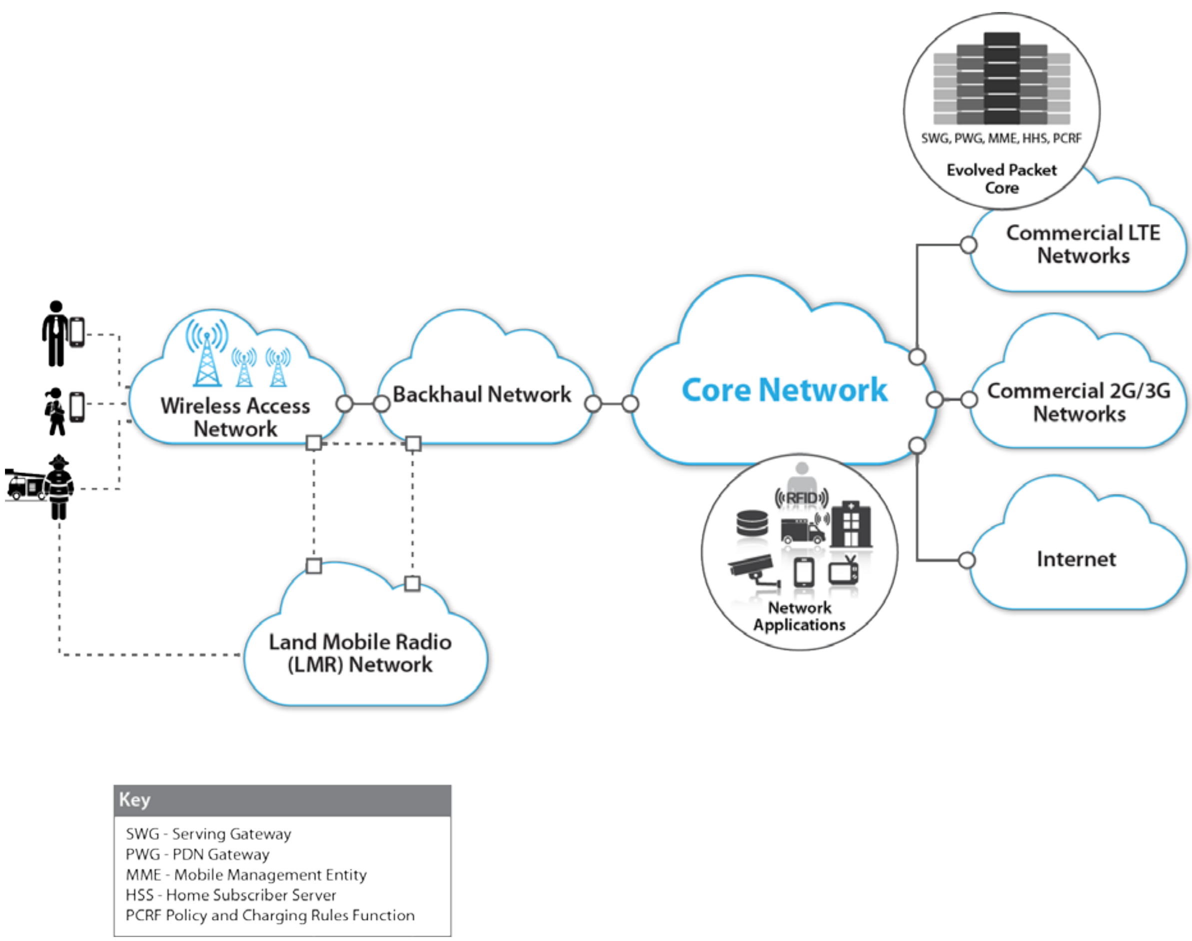

Figure 6.1.1-2: Wireless Network Configuration

Prepared by: Booz Allen Hamilton

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

Nevada's mountainous topography, large land mass, and a large number of rural, isolated areas has led to the current situation where no statewide, common radio network exists in Nevada. As Nevada's Statewide Communications Interoperability Plan (SCIP) observed summarizing its LMR situation, "Approximately 70% of the population resides in Clark County, the State's only Urban Area. Vast areas of the state (>87%) are uninhabited and/or federally controlled. Nineteen recognized American Indian tribes operate within the State, although some extend into adjacent states. Temperatures and conditions range from intense heat and dry conditions in the southern desert during summer, to the bitter cold of the northern winters. Natural hazards include wildfires (particularly in the north), earthquakes, and severe weather. Designing systems covering and connecting these diverse, often isolated, and extreme environments is difficult. No one system provides universal two-way communications coverage statewide." (State of Nevada, 2013)

Nevada's public safety LMR network environment is in transition and reflects frequency diversity, combined with a number of consortium regional networks (State of Nevada, 2013).

Nevada is similar to most other states as it has improved LMR network interoperability through incremental upgrades and improvements to its analog legacy systems, as well as adoption of digital technologies such as Project 25 (P-25). The majority of Nevada's legacy networks are analog and dominated by Very High Frequency (VHF)[3] frequency systems (State of Nevada, 2013). Nevada has instituted a number of LMR modernization efforts including its intent to move to P-25 Phase 2 as the preferred LMR technology for Public Safety network voice/data standardization, increased deployment of cross-band repeater infrastructure, as well as increased capital equipment deployment of IP network infrastructure (NevadaDOT, 2015c).

The government agency with the lead role for public safety LMR interoperability in Nevada is the DPS, Division of Emergency Management and Homeland Security (NDEM). In addition, Nevada has formed a number of groups to address governance needs concerning LMR modernization, technology, and Public Safety network policy including the Nevada Communications Steering Committee (NCSC) and the State of Nevada Network (SoNNet) (State of Nevada, 2013).

Statewide/Multi-County Public Safety Networks

To support the implementation of greater interoperability, Nevada has created Nevada CORE (NCORE), which was initiated with five networks:

- The Nevada Shared Radio System (NSRS),
- Washoe County Regional Communications System (WCRCS),
- Southern Nevada Area Communications Council (SNACC),
- Las Vegas Metro Police Open Sky System,[4] and
- Northern Nevada Area Communications Consortium. (NNACC) (State of Nevada, 2013)

The NSRS, consisting of NevadaDOT, NV Energy, and the County of Washoe, is an 800 MHz system based on the Enhanced Digital Access Communication System (EDACS) technology. However, the state is moving toward the adoption of Phase 2 P-25, as its standard system, given that the Nevada EDACS systems have reached their end of life (NevadaDOT, 2015c). The current NSRS tower system is depicted in Figure 6.1.1-3.

The WCRCS serves the Reno metropolitan area Public Safety agencies as well as municipal users as well as the Reno Airport (RadioReference.com, 2015a).

The SNACC network serves Clark County where Las Vegas is located. Clark County Fire, Police utilize VHF, Ultra High Frequency (UHF),[5] and 800 Megahertz (MHz) frequencies, as do multiple county agencies who also use SNACC's network; EMS operates on SNACC in the UHF frequency band (RadioReference.com, 2015b). The former Las Vegas Police Open Sky System is no longer "monitorable by current scanner technology," and the organization now utilizes a Phase 2 P-25 system (RadioReference.com, 2016a).

[3] VHF band covers frequencies ranging from 30 MHz to 300 MHz (NTIA, 2005).
[4] In 2012, the Las Vegas Police upgraded to a Motorola Phase 2 P-25 system.
[5] UHF band covers frequencies ranging from 300 MHz to 3000 MHz (NTIA, 2005).

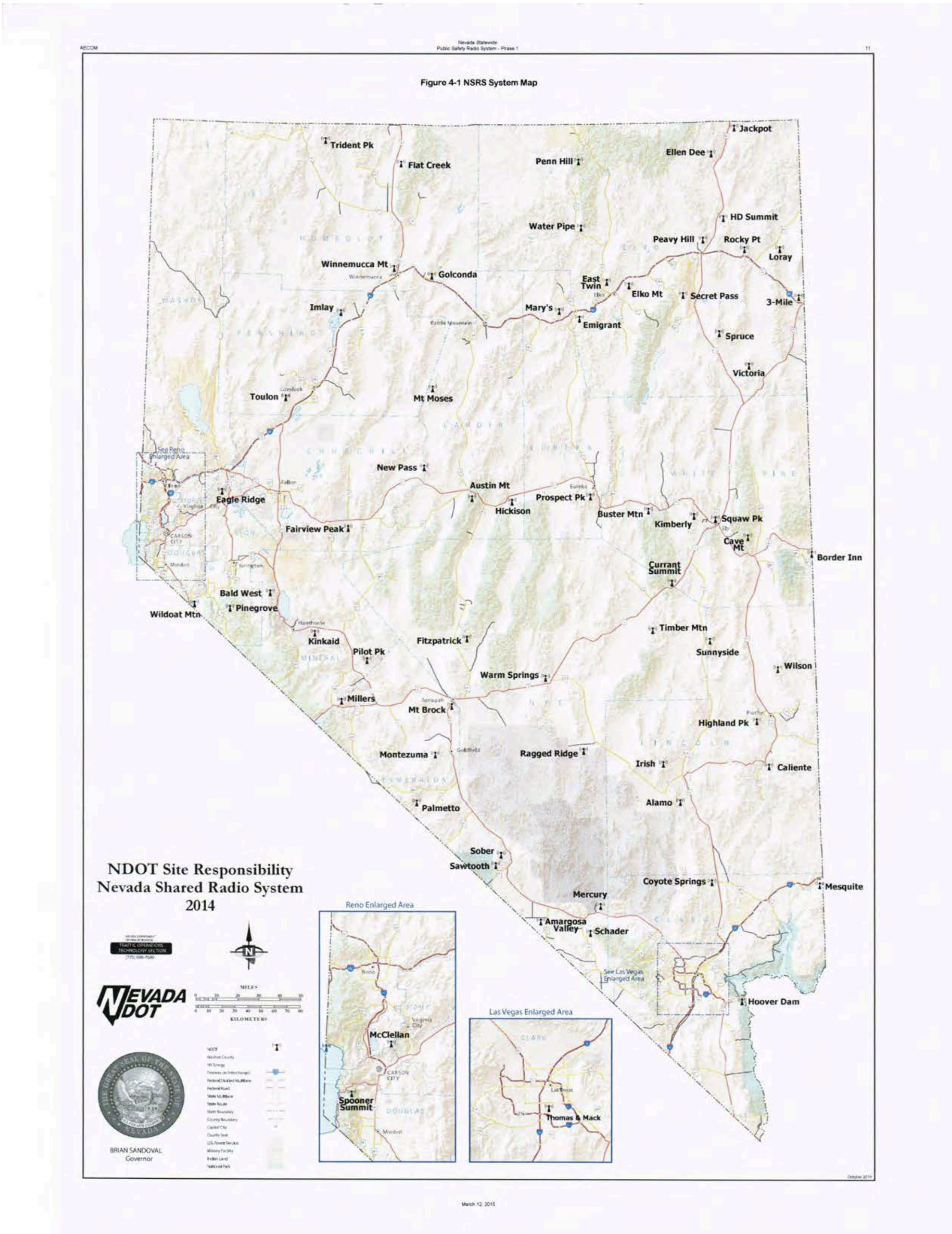

Figure 6.1.1-3: NevadaDOT Tower Locations Supporting the NSRS Network

Source: (NevadaDOT, 2015c)

The Nevada Department of Public Safety networks operate statewide on 800 MHz to support Law Enforcement, Fire, and Air-to-Ground Speed Enforcement with DPS Statewide Mutual Aid operating on VHF (RadioReference.com, 2015c).

The NNACC is "a regional consortium of rural counties" that links capabilities and interoperability efforts. As of 2010, six counties had executed interoperable communications agreements under the NNACC. (State of Nevada, 2013)

City and County Public Safety Networks

In addition to the statewide NSRS system, to which Nevada County Public Safety agencies have access, counties in southern Nevada, for example, have additional communication network channels and capabilities available to them via additional networks (SNACC—Clark County/Nye County) (RadioReference.com, 2015b). In some Nevada counties, public safety agencies have access to adjacent county standalone public safety networks. This is the case, for example, with Esmerelda County where access to Nye County's network is available (RadioReference.com, 2016b). In addition, as the NSRS modernizes and its coverage expands, local communities will be encouraged to migrate to participation in the Phase 2 P-25 NSRS network (NevadaDOT, 2015c).

Public Safety Answering Points (PSAPs)

According to the Federal Communication Commission's (FCC) Master PSAP registry, there are 36 PSAPs in Nevada serving Nevada's 16 counties and 1 independent city (FCC, 2016b).

Carriers, Coverage, and Subscribers

Nevada'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 6.1.1-7 presents the number of providers of switched access[6] lines, Internet access,[7] and mobile wireless services including coverage. (FCC, 2014a) (FCC, 2014b) (NTIA, 2014)

Table 6.1.1-8 shows the wireless providers in Nevada with their geographic coverage. The following three maps, Figure 6.1.1-4, Figure 6.1.1-5, and Figure 6.1.1-6, show the combined coverage for the top two providers, Sprint and Commnet Wireless Inc., and the coverage of all other providers with less than 5 percent coverage area, respectively.[8]

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[6] "A service connection between an end user and the local telephone company's switch; the basis of plain old telephone services (POTS)" (FCC, 2014b).

[7] Internet access includes Digital Subscriber Line (DSL), cable modem, fiber, satellite, and fixed wireless providers.

[8] 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 "Nevada Other Fiber Providers". All Wireless providers were mapped as well; those with areas under 5% were merged and mapped as "Nevada Other Wireless Providers". Providers under 5% were denoted in their respective tables.

Table 6.1.1-7: Telecommunications Access Providers and Coverage in Nevada as of December 31, 2013

Commercial Telecommunications Access Providers	Number of Service Providers	Coverage of Households
Switched access lines [a]	195	98% of households [b]
Internet access [c]	62	58% of households
Mobile wireless [d]	29	96% of population

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

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

Table 6.1.1-8: Wireless Telecommunications Coverage by Providers in Nevada

Wireless Telecommunications Providers	Coverage
AT&T Mobility LLC	52.31%
Verizon Wireless	46.09%
Commnet Wireless, Inc.	32.44%
Sprint	6.84%
Other[a]	16.04%

Source: (NTIA, 2014)

[a] Other: Provider with less than 5 percent coverage area. Providers include: T-Mobile; WUE, Inc.; Atmosplash LLC; Highlands Wireless Inc.; High Desert Internet Service; Digis; Cricket Wireless; Metro PCS Wireless Inc.; PC Internet; High Speed Networks; Hot Spot Broadband; Iv.net; VegasWiFi Communications; Tele-NET.net; InfoWest; Avant Wireless; Express Internet; Great Basin Internet Service; amargosavalley.com; EzzNet; Mt Wheeler Power; Oasis; nvhispeed; Quicknet; Mighty Moose; and Schat.net.

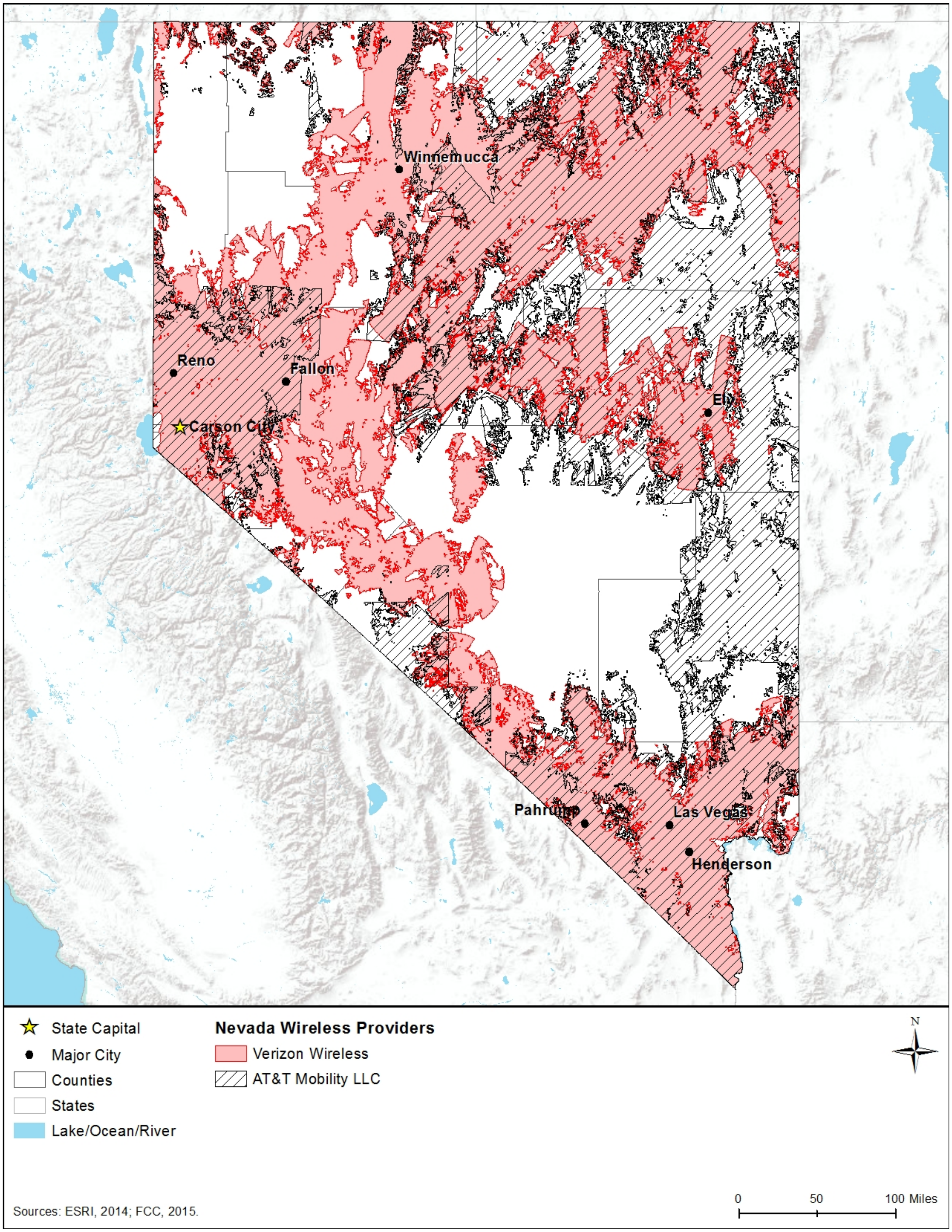

Figure 6.1.1-4: AT&T and Verizon Wireless Availability in Nevada

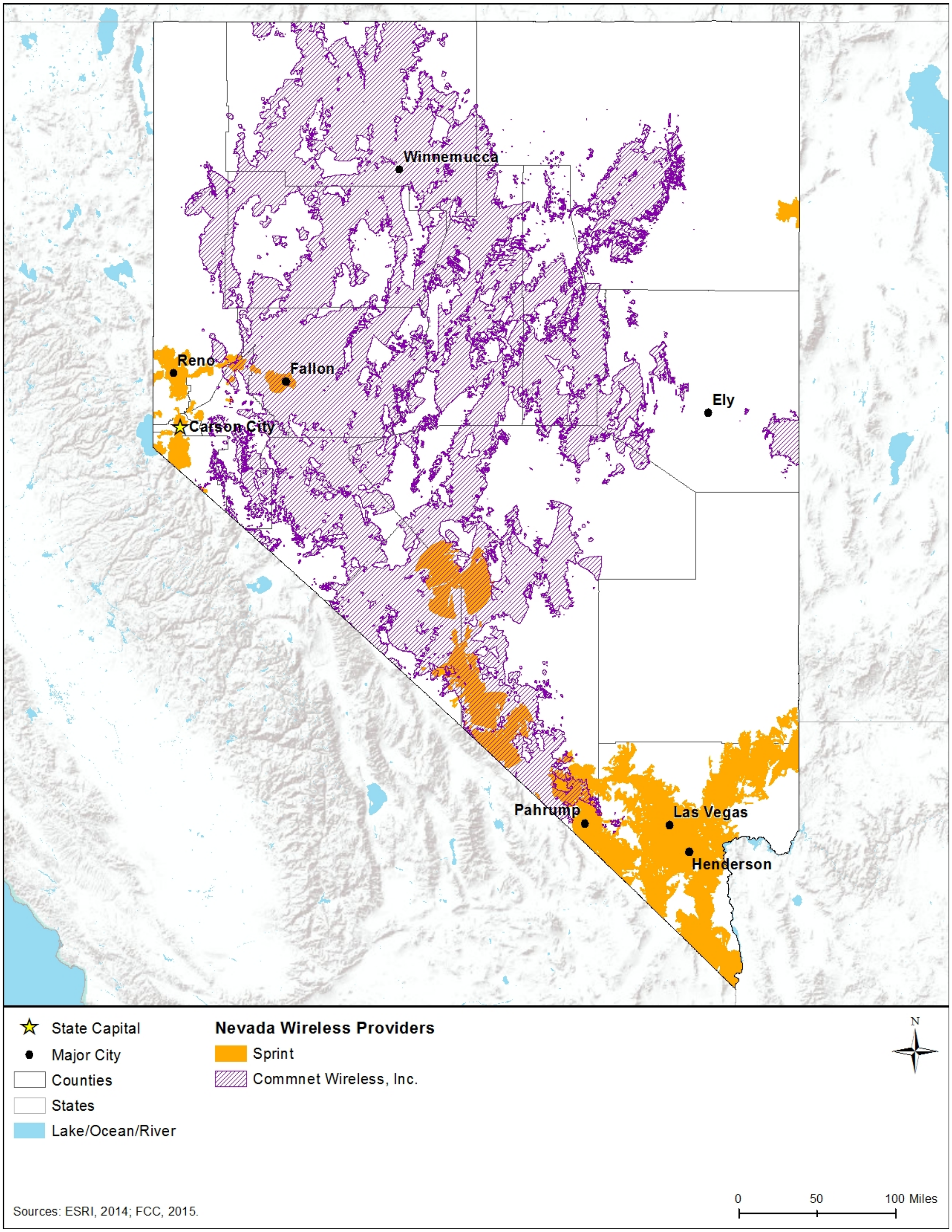

Figure 6.1.1-5: Sprint and Commnet Wireless, Inc. Availability in Nevada

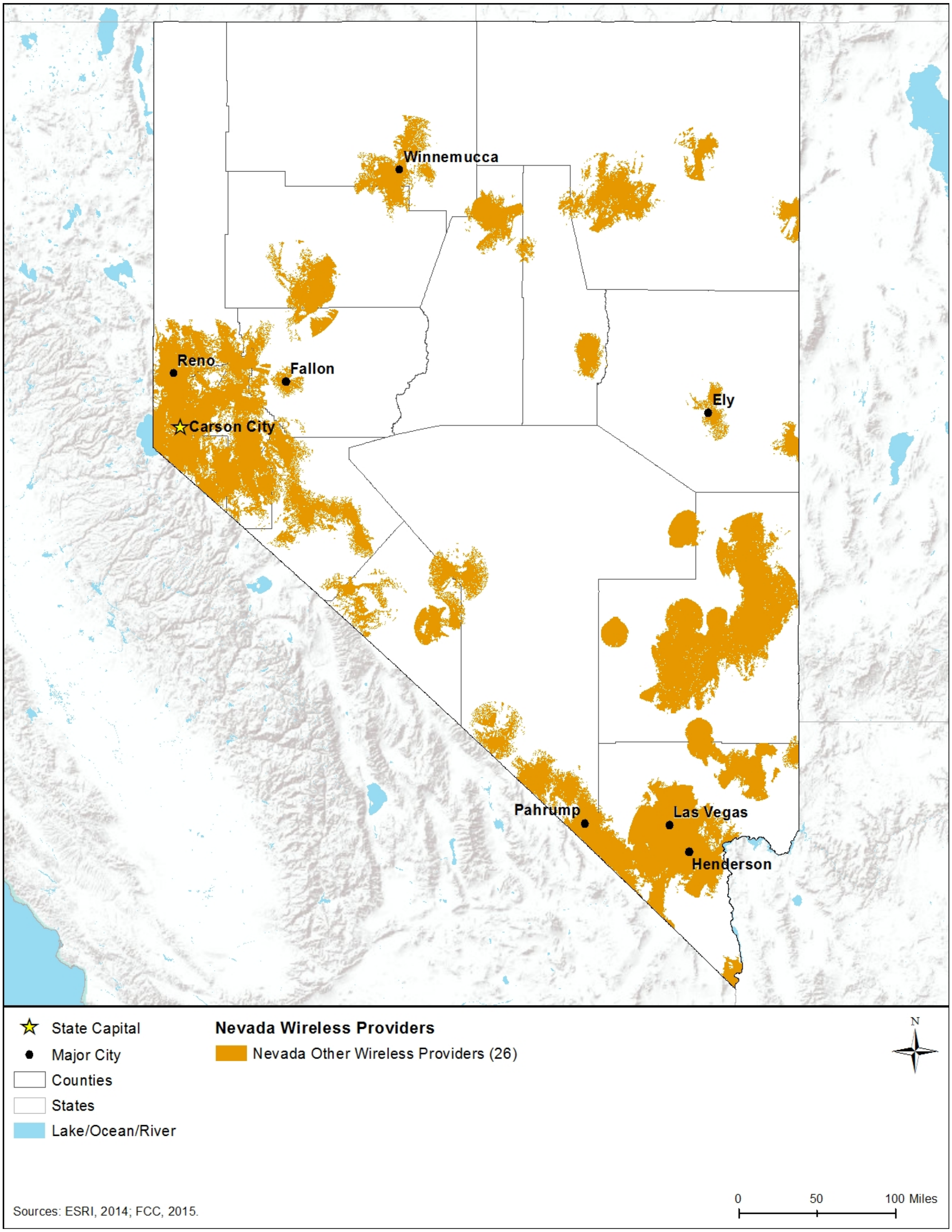

Figure 6.1.1-6: Other Wireless Providers in Nevada

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 6.1.1-7 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 6.1.1-7: Types of Towers

Telecommunications tower infrastructure proliferates throughout Nevada, although tower infrastructure is concentrated in the higher and more densely populated areas of Nevada: Reno, Carson City, Fallon, Winnemucca, Pahrump, Las Vegas, and Henderson. Owners of towers and some types of antennas are required to register those infrastructure assets with the Federal Communications Commission (FCC, 2016c).[9] Table 6.1.1-9 presents the number of towers

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

(including broadcast towers) registered with the FCC in Nevada, by tower types, and Figure 6.1.1-8 presents the location of those structures,[10] as of June 2016.

Table 6.1.1-9: Number of Commercial Towers in Nevada by Type

Constructed[a] Towers[b]		Constructed Monopole Towers	
100 ft. and over	13	100 ft. and over	0
75 ft. – 100 ft.	26	75 ft. – 100 ft.	0
50 ft. – 75 ft.	37	50 ft. – 75 ft.	0
25 ft. – 50 ft.	123	25 ft. – 50 ft.	17
25 ft. and below	203	25 ft. and below	35
Subtotal	**402**	**Subtotal**	**52**
Constructed Guyed Towers		**Buildings with Constructed Towers**	
100 ft. and over	1	100 ft. and over	1
75 ft. – 100 ft.	2	75 ft. – 100ft.	0
50 ft. – 75 ft.	1	50 ft. – 75ft.	1
25 ft. – 50 ft.	1	25 ft. – 50ft.	0
25 ft. and below	1	25 ft. and below	0
Subtotal	**6**	**Subtotal**	**2**
Constructed Lattice Towers		**Multiple Constructed Structures[c]**	
100 ft. and over	0	100 ft. and over	0
75 ft. – 100 ft.	2	75 ft. – 100 ft.	0
50 ft. – 75 ft.	13	50 ft. – 75 ft.	0
25 ft. – 50 ft.	12	25 ft. – 50 ft.	0
25 ft. and below	9	25 ft. and below	0
Subtotal	**36**	**Subtotal**	**0**
Constructed Tanks[d]			
Tanks	2		
Subtotal	**2**		
Total All Tower Structures			**500**

Source: (FCC, 2015)

[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, 2015)
[b] Self standing or guyed (anchored) structure used for communication purposes. (FCC, 2012)
[c] Multiple constructed structures per antenna registration. (FCC, 2016d)
[d] Any type of tank – water, gas, etc. with a constructed antenna. (FCC, 2016d)

[10] Figure 6.1.1-8 map data only shows buildings, objects, sites, and structures (point data), but does not show districts or area features.

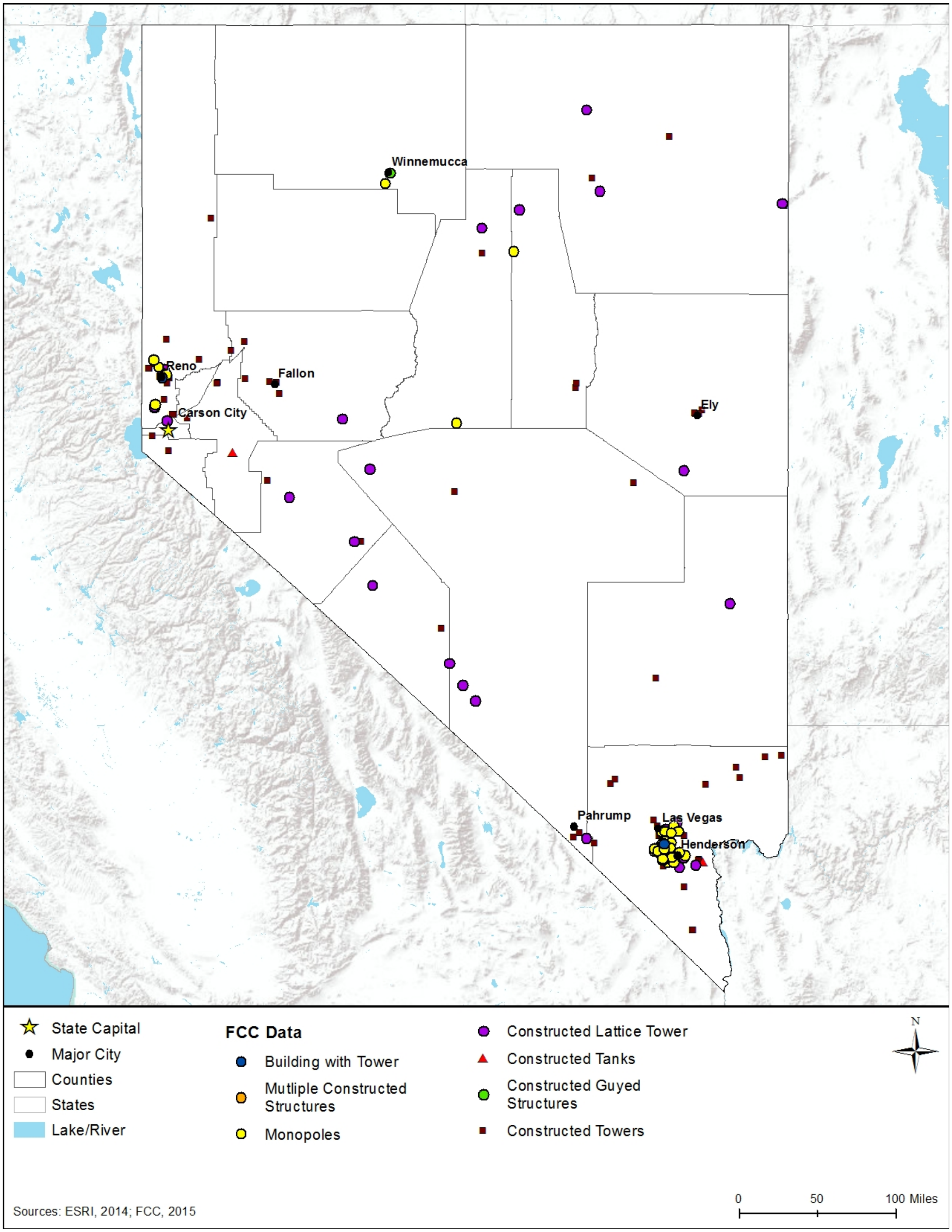

Figure 6.1.1-8: FCC Tower Structure Locations in Nevada

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 6.1.1-9. The network also may include a middle mile component (shorter distance cables linking the core network between central offices or network nodes across a region) and a long haul network component (longer distance cables linking central offices across regions) (FCC, 2000).

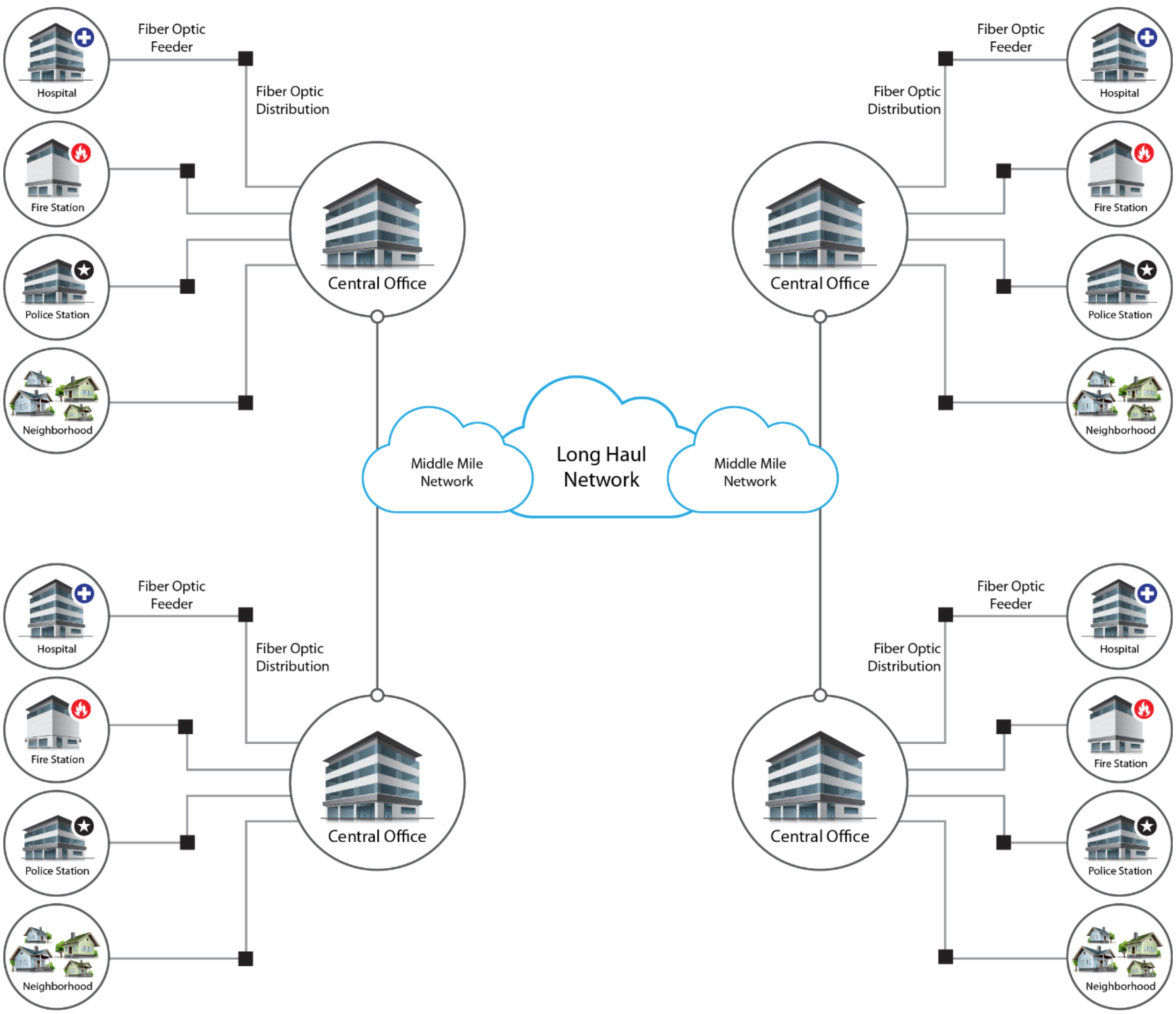

Figure 6.1.1-9: Typical Fiber Optic Network in Nevada

Source: (ITU-T, 2012)

Prepared by: Booz Allen Hamilton

Last Mile Fiber Assets

In Nevada, fiber access networks are concentrated in the highest population centers as shown in the Figures 6.1.1-10 through Figure 6.1.1-12. There are 27 fiber providers that offer service in Nevada (Table 6.1.1-10). Figure 6.1.1-10 shows coverage for the top providers, with AT&T's coverage depicted in Figure 6.1.1-11, and all other providers with less than 5 percent coverage area depicted in Figure 6.1.1-12.

Table 6.1.1-10: Fiber Provider Coverage in Nevada

Fiber Provider	Coverage
Charter Communications, Inc.	0.80%
Lincoln County Telephone System	0.60%
Humboldt Telephone Company	0.49%
CenturyLink	0.43%
Cox Communications	0.42%
AT&T Inc.	0.41%
Other[a]	1.50%

Source: (NTIA, 2014)

[a] Other: Provider with less than 5 percent coverage area. Providers include: MegaPath Corporation; Citizens Telecommunications Company of Nevada; CC Communications; Advanced Telecom, Inc.; Frontier Communications of the Southwest Inc.; Beehive Broadband; Reliance Connects; Satview; MVDSL; Rural Telephone Company; NewWave Communications; Level 3 Communications; Filer Mutual Telephone Company; CalNeva Broadband; TDS Telecommunications Corporation; TW Telecom of Nevada LLC; Mt Wheeler Power; Fort Mojave Telecommunications, Inc.; Express Internet; and Cogent Communications, Inc.

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.

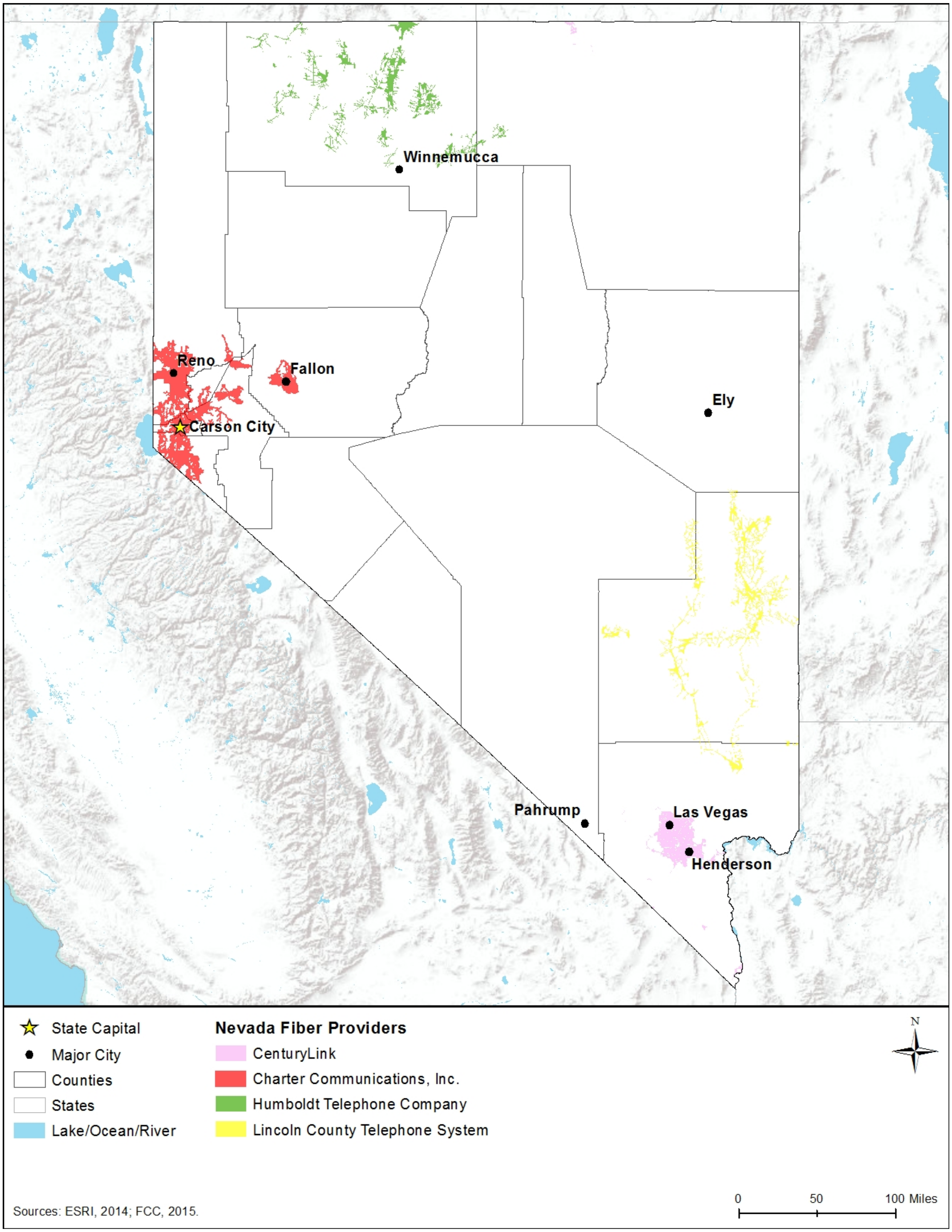

Figure 6.1.1-10: Fiber Availability in Nevada for Top Providers

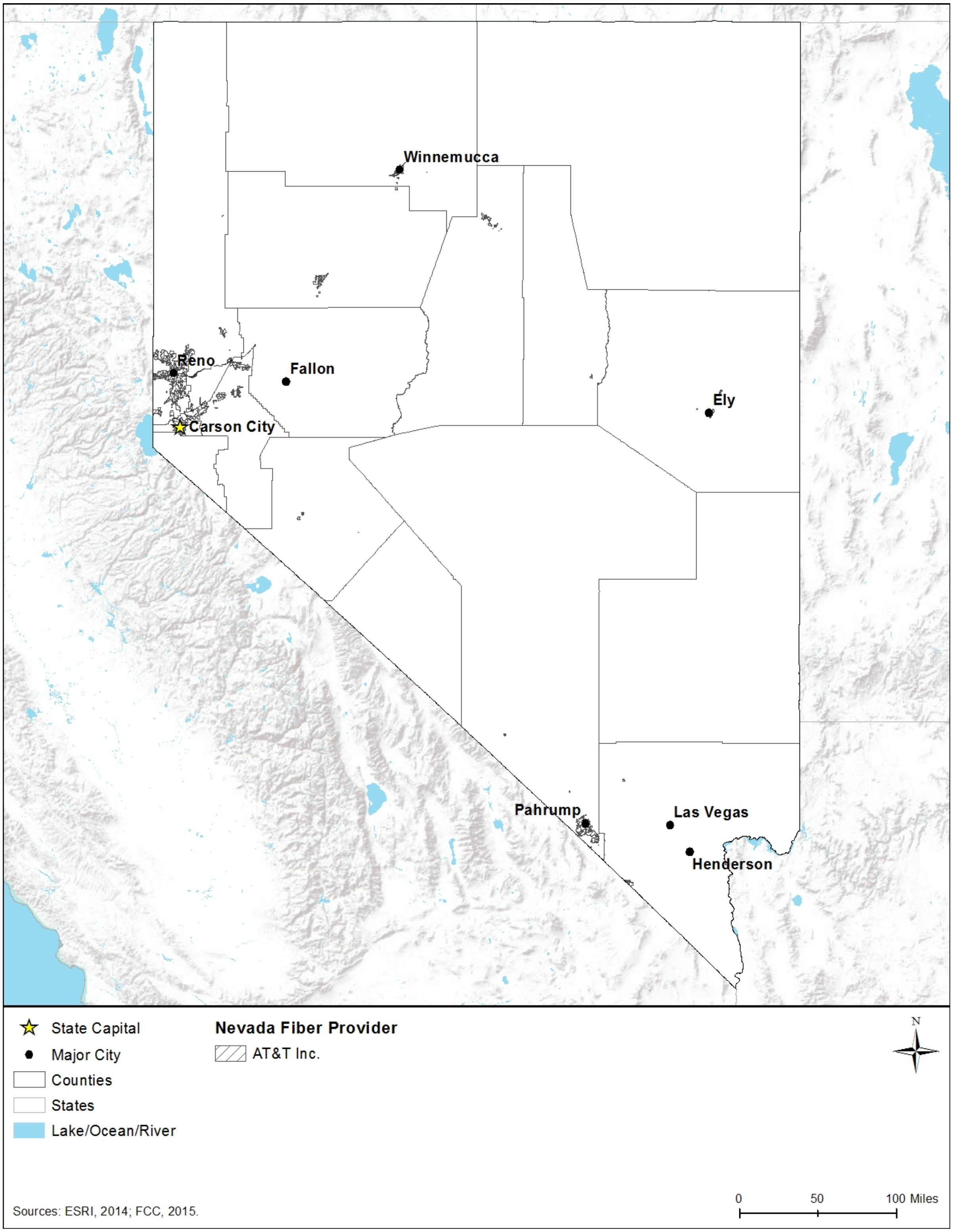

Figure 6.1.1-11: AT&T Inc. Fiber Availability in Nevada

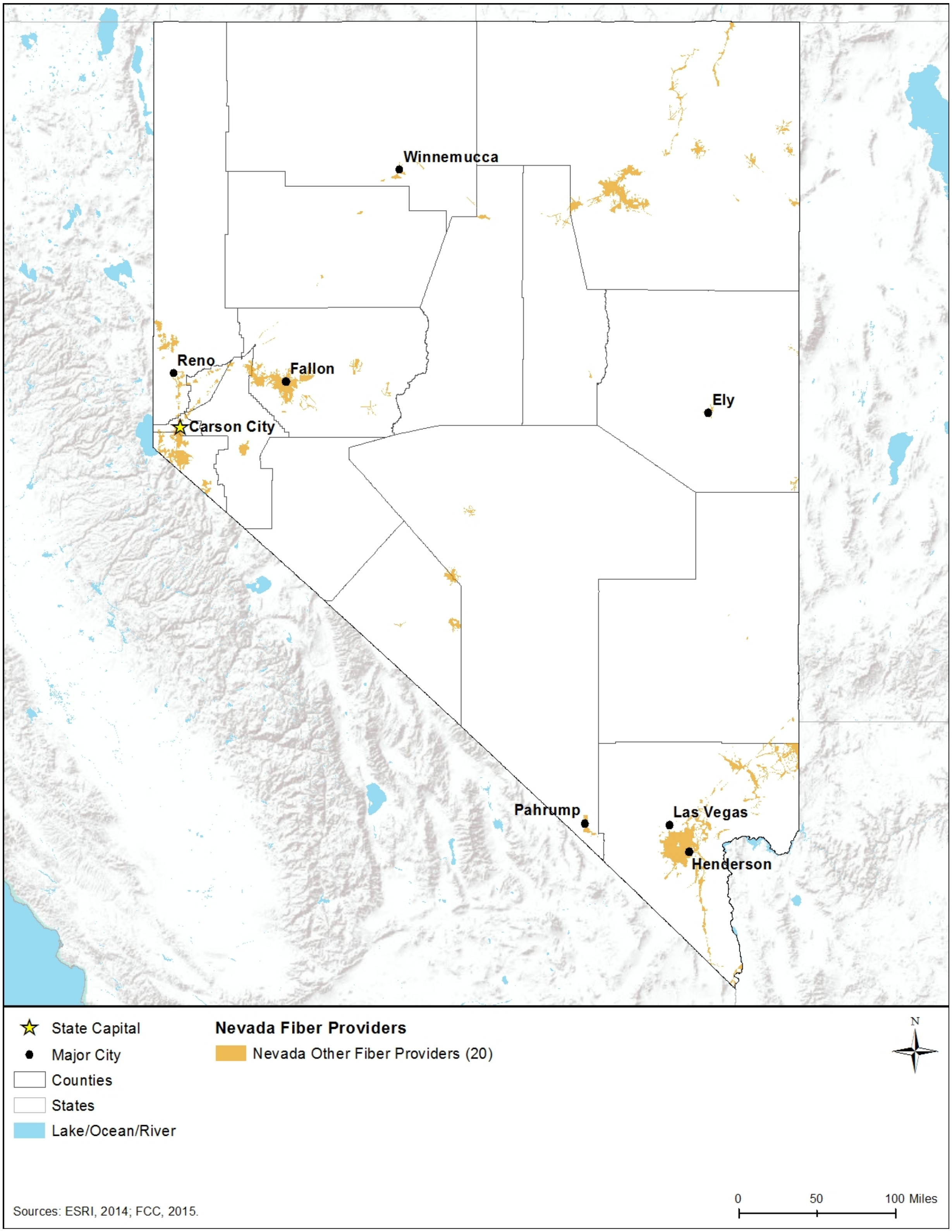

Figure 6.1.1-12: Fiber Availability for all Other Providers in Nevada

6.1.1.6. 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 6.1.4, Water Resources, describes the potable water sources in Nevada.

Electricity

Nevada's investor-owned utilities companies are overseen by the Public Utilities Commission of Nevada (PUCN). This organization regulates the rates of utilities and ensures reliable and efficient service. The rates of municipal-owned utilities are not regulated by the PUCN (PUCN, 2015a). Regarding electric utilities, it is the PUCN's responsibility to ensure compliance with renewable energy programs, issue some types of construction permits, and evaluate plans for the generation and transmission of electricity to customers (PUCN, 2015b). Nine electric companies fall under the jurisdiction of the PUCN although two of them, Nevada Power Company and Sierra Pacific Power Company, conduct business under the name NV Energy (PUCN, 2015c). These utilities are required to submit an annual report to the PUCN, which includes financial information and the number of customers served, among other things (PUCN, 2015d). In addition to the nine investor owned utilities, the state is also home to five new electricity generation plants. There are an additional 16 plants in various stages of construction, development, and permitting with 8 plants expected to come online before the end of 2016, 1 in 2017, 2 in 2019, and 5 in future years (PUCN, 2015e).

The majority of the electricity generated in the state comes from natural gas. In 2012, 2013, 2014, and 2015 natural gas accounted for 73 percent, 68 percent, 64 percent, and 73 percent of Nevada's generation respectively (EIA, 2015a). In 2015, this meant that of the 38,839,785 megawatthours[11] of power generated, 28,353,043 megawatthours was produced by electricity plants using natural gas. Aside from natural gas, other major sources of electricity are coal, geothermal energy and hydroelectric with coal representing the largest production capacity. In 2015, coal accounted for 7 percent of the total, with geothermal energy and hydroelectric power representing 9 percent and 6 percent respectively (EIA, 2015a). The expansion of these renewable energy sources is helping Nevada to reach its target of producing 25 percent of the state's electricity sales from renewable resources by 2025. In 2015, 20 percent of "net electricity generation came from geothermal, solar, wind, and hydroelectric power sources" (EIA, 2015a). As of November 19, 2015, the state was ranked "second in the nation in utility-scale net electricity generation from geothermal energy and third in utility-scale net generation from solar energy." Although Nevada's renewable energy sources are expanding and natural gas remains a staple, almost 90 percent of the energy consumed in the state comes from external sources (EIA, 2015b).

[11] One megawatthour is defined as "one thousand kilowatt-hours or 1 million watt-hours." 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, 2015j)

Water

The PUCN oversees the rates, territory, and service of the state's investor-owned water utilities. In doing so, the PUCN supervises the environmental compliance and the financial performance of its utilities. It governs the territories (though not the rates or service) of utilities controlled by non-investor bodies "such as a co-op or homeowner's association, "but not those controlled by government or political subdivisions. Examples of this includes the "Southern Nevada Water Authority, the Las Vegas Valley Water District, and the Truckee Meadows Water Authority" (PUCN, 2015f). The Public Utilities Commission lists 29 regulated water/wastewater utilities, without making distinction between those that provide both services and those that may provide only one (PUCN, 2015g). While the PUCN regulates rates and service, the regulation of water quality falls to government agencies such as the Nevada Division of Environmental Protection (NDEP). The Bureau of Safe Drinking Water within the NDEP oversees the quality and reliability of public water systems (NDEP, 2015a). These public systems are broken into two groups, the community water systems and non-community water systems. The community water systems are those that have "15 or more service connections" or "regularly serves 25 or more persons." Non-community systems are those that do not fit this description (PUCN, 2015h). Water quality standards are mandated by the Safe Drinking Water Act. In compliance with this Nevada has implemented the Nevada Safe Drinking Water, currently enforced by the NDEP's Bureau of Safe Drinking Water. While NDEP enforced the regulations set forth by the Bureau, system owners and operators are tasked with meeting the requirements of the Safe Drinking Water Act (NDEP, 2015b). The Bureau also operates a Source Water Assessment Program designed to "delineate the areas that are sources of public drinking water, identify potential contaminant sources within the delineated area, assess the water systems' susceptibility to contamination, and to inform the public of the results." The Program keeps a public record of public water systems that have completed their source assessments. Reports for water systems with completed assessments can be accessed at the Bureau of Safe Drinking Water headquarters (NDEP, 2015c).

Wastewater

PUCN identifies 29 regulated water/wastewater utilities, without making distinction between those that provide both services and those that may provide only one (PUCN, 2015g). Nevada regulations require wastewater treatment facilities to be run by a certified operator. The NDEP Wastewater Certification Program is designed to accommodate this need, and NDEP has contracted out the certification of its operators to the non-profit Nevada Water Environment Association, Inc. (NWEA) (NDEP, 2015d). NWEA is a non-profit organization "dedicated to providing education and training for its members and general information to the public on the subject pertaining to management of our water resources" (NWEA, 2015). The NWEA operates the Wastewater Certification Program by reviewing applications and administering tests to applicants. They also report back to NDEP regarding received applications and the status of new certifications (NDEP, 2015d).

Solid Waste Management

Nevada's solid waste is handled by the state's Bureau of Waste Management, which is a subdivision of NDEP. The Bureau is divided into programs dedicated to handling specific types of waste including solid and hazardous waste, along with recycling programs (NDEP, 2015e). It is the responsibility of the NDEP to oversee permitting for solid waste management facilities in the state, with the exception of Clark and Washoe Counties that handle permitting within their own respective jurisdictions (NDEP, 2015f). Regarding landfilling, the states "two metropolitan areas of Reno and Las Vegas are served by large municipal solid waste landfills (MSWLFs)" (NDEP, 2015g). Humboldt and Mineral Country are also served by large regional landfills (NDEP, 2015g). Nevada has 41 solid waste landfills, of which 8 are classified as "Not Operating" or "Post Closure." The remaining 33 facilities are in operation, with 7 operating in Clark County. These landfills are divided by class, a factor that is based on size, risk of groundwater contamination and whether or not they accept industrial waste. In addition to the landfills, the state also has one waste tire facility and eight compost facilities (NDEP, 2015f). There are also seven facilities dedicated to the treatment, storage, and disposal of Nevada's hazardous waste. These are permitted and operated separately from the rest of the state's waste facilities (NDEP, 2015h).

While much of the state's municipal waste is landfilled or disposed of, a 25 percent recycling rate was set as a long-term goal in 1992. This goal was reached in 2011 and 2012, with rates of 25.3 percent and 28.8 percent respectively (NevadaRecycles, 2015a). In 2014, Nevada recycled 23.4 percent of its municipal waste; 863,195.43 tons out of the 3,695,809.43 tons of solid waste generated. The largest portions of this recycled material came from metals and paper. Respectively, these accounted for approximately 35.8 percent and 30.1 percent of recycled materials. Organic materials accounted for approximately a further 20.8 percent of the total (NevadaRecycles, 2015b). Many types of electronic waste can be recycled through the original retailer or online-buyback programs (NevadaRecycles, 2015c).

6.1.2. Soils

6.1.2.1. Definition of the Resource

The Soil Science Society of America defines soil as:

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

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

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

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

6.1.2.2. Specific Regulatory Considerations

The Proposed Action must meet the requirements of 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 Appendix C, Environmental Laws and Regulations. A list of applicable state laws and regulations is included in Table 6.1.2-1.

Table 6.1.2-1 Relevant Nevada Soils Laws and Regulations

State Law/Regulation	Regulatory Agency	Applicability
Soil erosion and sediment control (e.g., Las Vegas Valley Construction Site Best Management Practice [BMP] Guidance Manuals and Carson City, Chapter 12.18 - Erosion and Sediment Control)	City and County Agencies (including Carson City, Las Vegas, North Las Vegas, Henderson, and Clark County)	Require BMPs to control soil erosion and sedimentation for city and county agencies.

6.1.2.3. Environmental Setting

Nevada is composed of one Land Resource Region (LRR),[12] the Western Range and Irrigated Region, as defined by the National Resources Conservation Service (NRCS) (NRCS, 2006). Within and among Nevada's single LRR 10 Major Land Resource Areas (MLRA),[13] which are characterized by patterns of soils, climate, water resources, land uses, and type of farming (NRCS, 2006). The locations and characteristics of Nevada's MLRAs are presented in Figure 6.1.2-1 and Table 6.1.2-2, respectively.

Soil characteristics are an important consideration for FirstNet insomuch as soil properties could influence the suitability of sites for network deployment. Soil characteristics can differ over

[12] Land Resource Region: "A geographical area made up of an aggregation of [MLRA] with similar characteristics." (NRCS, 2006)
[13] Major Land Resource Area: "A geographic area, usually several thousand acres in extent, that is characterized by a particular pattern of soils, climate, water resources, land uses, and type of farming." (NRCS, 2006)

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

[14] The flora and fauna of a region.

[15] Expansive soils are characterized by "the presence of swelling clay minerals" that absorb water molecules when wet and expand in size or shrink when dry leaving "voids in the soil" (Rogers, Olshansky, & Rogers, 2004).

[16] Rutting is indentations in soil from operating equipment in moist conditions or soils with lower bearing strength (USFS, 2009b).

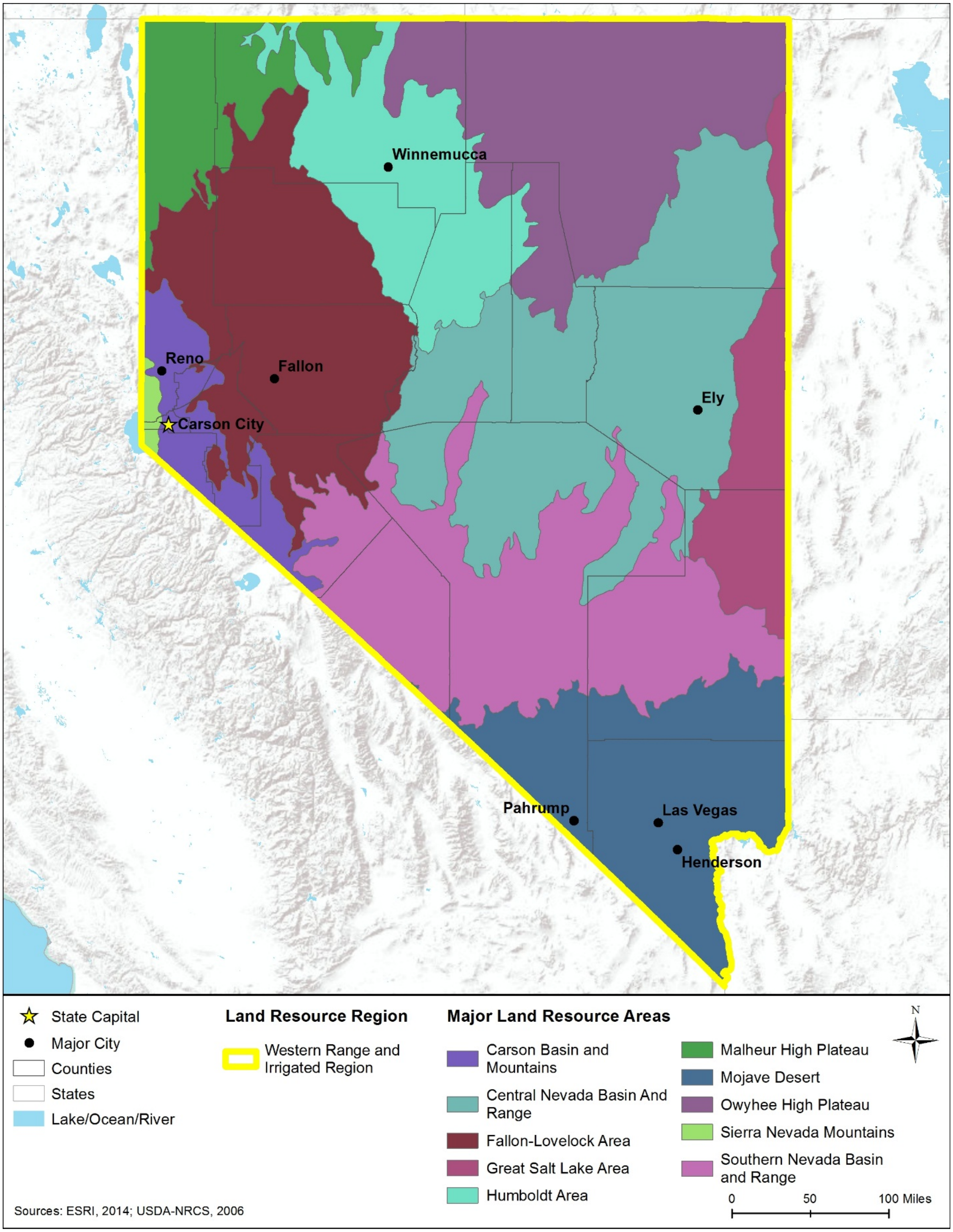

Figure 6.1.2-1: Locations of Major Land Resource Areas in Nevada

Table 6.1.2-2 Characteristics of Major Land Resource Areas in Nevada

MLRA Name	Region of State	Soil Characteristics
Carson Basin and Mountains	Southwestern Nevada	Aridisols[a] and Mollisols[b] are the dominant soil orders. These well-drained soils range from moderately deep to very shallow, and are clayey or loamy[c] and usually skeletal.
Central Nevada Basin and Range	Central Nevada	Aridisols, Entisols,[d] and Mollisols are the dominant soil orders. These typically well-drained soils range from shallow to very deep, and are loamy or loamy-skeletal.
Fallon-Lovelock Area	Western Nevada	Aridisols and Entisols are the dominant soil orders. These soils range from shallow to very deep, and are typically well drained. They are loamy or sandy and often skeletal.
Great Salt Lake Area	Eastern Nevada	Aridisols, Entisols, and Mollisols are the dominant soil orders. These very deep soils are well drained to somewhat excessively drained, and are loamy or loamy skeletal.
Humboldt Area	Northwestern Nevada	Aridisols, Entisols, Inceptisols,[e] and Mollisols are the dominant soil orders. These soils are typically "well drained, loamy, and very deep."
Malheur High Plateau	Northwestern Nevada	Aridisols and Mollisols are the dominant soil orders. These very deep soils typically range from poorly drained to well drained, and are loamy or clayey.
Mojave Desert	Southern Nevada	Aridisols and Entisols are the dominant soil orders. These soils range from shallow to very deep, and are well drained or excessively drained. They are loamy-skeletal or sandy-skeletal.
Owyhee High Plateau	Northeastern Nevada	Aridisols and Mollisols are the dominant soil orders. These well-drained soils range from shallow to moderately deep, and are clayey or loamy.
Sierra Nevada Mountains	Southwestern Nevada	Alfisols,[f] Entisols, Inceptisols, Mollisols, and Ultisols[g] are the dominant soil orders. These soils are loamy or sandy, and range from shallow to very deep. They are typically well drained or somewhat excessively drained.
Southern Nevada Basin and Range	Southern Nevada	Aridisols and Entisols are the predominant soil orders, with Mollisols are prominent in mountainous areas. These soils are loamy-skeletal or sandy-skeletal, and are well drained or somewhat excessively drained. They range from very shallow to very deep.

[a] Aridisols: "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." (NRCS, 2015e)
[b] Mollisols: "Soils that have a dark colored surface horizon relatively high in content of organic matter. They are base rich throughout and quite fertile. Mollisols form under grass in climates that have a moderate to pronounced seasonal moisture deficit." (NRCS, 2015e)
[c] Loamy Soil: "[A soil] that combines [sand, silt, and clay] in relatively equal amounts." (Purdue University Consumer Horticulture, 2006)
[d] Entisols: "Soils that show little to no pedogenic horizon development. They occur in areas of recently deposited parent materials or in dunes, steep slopes, or flood plains where erosion or deposition rates are faster than rate of soil development. They make up nearly 16% of the world's ice-free land surface." (NRCS, 2015e)
[e] Inceptisols: "Soils found in semiarid to humid environments that exhibit only moderate degrees of soil weathering and development. They have a wide range of characteristics, can occur in a wide variety of climates, and make up nearly 17% of the world's ice-free land surface." (NRCS, 2015e)
[f] Alfisols: "Soils found in semiarid to moist areas that are formed from weathering processes that leach clay minerals and other constituents out of the surface layer and into the subsoil. They are productive for most crop, are primarily formed under forest or mixed vegetative cover, and make up nearly 10% of the world's ice-free land surface." (NRCS, 2015e)
[g] Ultisols: "Soils found in humid environments that are formed from fairly intense weathering and leaching processes. This results in a clay-enriched subsoil dominated by minerals. They have nutrients concentrated in the upper few inches and make up 8% of the world's ice-free land surface." (NRCS, 2015e)

Source: (NRCS, 2006)

6.1.2.4. 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[17]; there are 12 soil orders in the world and they are characterized by both observed and inferred[18] properties, such as texture, color, temperature, and moisture regime. Soil suborders are the next level down, and are differentiated within an order by soil moisture and temperature regimes, as well as dominant physical and chemical properties (NRCS, 2015b). The STATSGO2[19] soil database identifies eighteen different soil suborders in Nevada (NRCS, 2015c). Figure 6.1.2-2 depicts the distribution of the soil suborders, and Table 6.1.2-3 provides a summary of the major physical-chemical characteristics of the various soil suborders found.

[17] "A formal representation of relationships between items in a hierarchical structure." (USEPA, 2013a)
[18] "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, 2015f).
[19] STATSGO2 is the Digital General Soil Map of the United States that shows general soil association units across the landscape of the nation. Developed by the National Cooperative Soil Survey, STATSGO2 supersedes the State Soil Geographic (STATSGO) dataset.

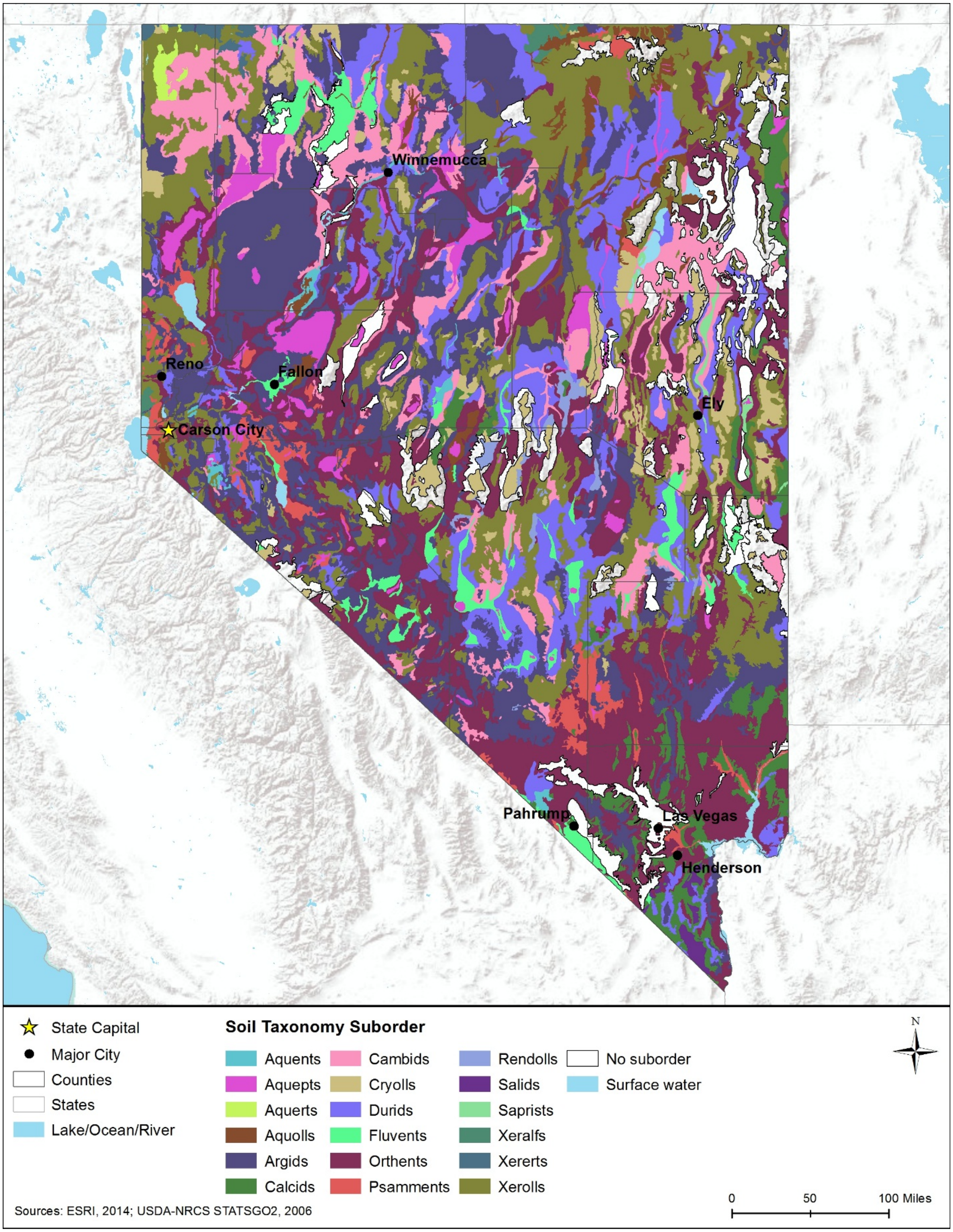

Figure 6.1.2-2: Nevada Soil Taxonomy Suborders

Table 6.1.2-3: Major Characteristics of Soil Suborders[a] Found in Nevada, as depicted in Figure 6.1.2-2

Soil Order	Soil Suborder	Ecological Site Description	Soil Texture	Slope (%)	Drainage Class	Hydric Soil[b]	Hydrologic Group[c]	Runoff Potential	Permeability[d]	Erosion Potential	Compaction and Rutting Potential
Entisols	Aquents	Widely distributed, with some forming in sandy deposits, and most forming in recent sediments. Aquents support vegetation that tolerates either permanent or periodic wetness, and are mostly used for pasture, cropland, forest, or wildlife habitat.	Clay, silt loam, stratified silt loam to silty clay loam, very fine sandy loam	0-2	Very poorly drained to poorly drained	No	B, C	Medium	Moderate, Low	Medium	Low
Inceptisols[e]	Aquepts	Aquepts have poor or very poor natural drainage. If these soils have not been artificially drained, groundwater is at or near the soil surface at some time during normal years (although not usually in all seasons). They are used primarily for pasture, cropland, forest, or wildlife habitat. Many Aquepts have formed under forest vegetation, but they can have almost any kind of vegetation.	Clay loam, fine sandy loam, loam, silt loam, silty clay loam, stratified gravelly very fine sandy loam to silt loam, stratified silt loam to clay loam, stratified very fine sandy loam to silty clay loam	0-4	Poorly drained to somewhat poorly drained	No	B, C, D	Medium, High	Moderate, Low, Very Low	Medium to High, depending on slope	Low
Vertisols[f]	Aquerts	Aquerts are wet soils, with prolonged moisture at or near the soil surface. Their natural vegetation includes savanna, grass, and forest. They are used as forest, rangeland, and cropland, although drainage for cropland can be difficult because the saturated hydraulic conductivity of aquerts is very low (NRCS, 2016a).	Silty clay	0-2	Very poorly drained to poorly drained	Yes	D	High	Very Low	High	High, due to hydric soil and poor drainage conditions
Mollisols	Aquolls	Aquolls support grass, sedge, and forb[g] vegetation, as well as some forest vegetation. However, most have been artificially drained and utilized as cropland.	Clay, clay loam, extremely cobbly loamy sand, gravelly sand, loam, silt loam, silty clay, silty clay loam, stratified gravelly coarse sandy loam to gravelly loam, stratified loam to silty clay loam, stratified sandy loam to clay, variable, very gravelly loamy sand	0-4	Very poorly drained to poorly drained	No, Yes	C, D	Medium, High	Low, Very Low	Medium to High, depending on slope	High, due to hydric soil and poor drainage conditions

Soil Order	Soil Suborder	Ecological Site Description	Soil Texture	Slope (%)	Drainage Class	Hydric Soil[b]	Hydrologic Group[c]	Runoff Potential	Permeability[d]	Erosion Potential	Compaction and Rutting Potential
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, clay loam, coarse sand, coarse sandy loam, cobbly loam, extremely cobbly sandy loam, extremely gravelly clay loam, extremely gravelly loamy sand, extremely stony loam, extremely stony sandy clay loam, fine sandy loam, gravelly clay, gravelly clay loam, gravelly fine sandy loam, gravelly loam, gravelly loamy fine sand, gravelly sandy clay loam, gravelly sandy loam, loam, sandy loam, silty clay, silty clay loam, stony sandy clay, stratified extremely gravelly sand to very gravelly sandy loam, stratified gravelly loamy sand to sandy loam, stratified sandy loam to loam, stratified silty clay loam to clay, stratified very gravelly loamy sand to very cobbly sandy loam, unweathered bedrock, very cobbly loam, very cobbly very fine sandy loam, very fine sandy loam, very gravelly clay loam, very gravelly coarse sandy loam, very gravelly fine sandy loam, very gravelly loam, very gravelly sandy loam, very stony clay loam, weathered bedrock,	0-75	Moderately well drained to well drained	No	B, C, D	Medium, High	Moderate, Low, Very Low	Medium to High, depending on slope	Low
Aridisols	Calcids	Calcids are found in the western United States, and used primarily as wildlife habitat or rangeland, although some have been utilized as irrigated cropland. They have high levels calcium carbonates that persist due to insufficient precipitation.	Coarse sandy loam, extremely gravelly loam, fine sand, fine sandy loam, gravelly loam, gravelly sandy loam, indurated, sandy loam, stratified extremely gravelly coarse sandy loam to very gravelly loam, stratified extremely gravelly loamy sand to gravelly loam, very gravelly loam, very gravelly sandy loam	0-30	Somewhat excessively drained to somewhat poorly drained	No	B, C, D	Medium, High	Moderate, Low, Very Low	Medium to High, depending on slope	Low
Aridisols	Cambids	Cambids are found in the western United States, with little soil development.[h] They are primarily used as wildlife habitat or rangeland, although some can also be used as cropland, if irrigated.	Coarse sandy loam, extremely gravelly loam, fine sandy loam, gravelly fine sandy loam, gravelly sandy loam, loam, loamy fine sand, loamy sand, loamy very fine sand, sandy loam, silt loam, stratified coarse sand to fine sandy loam, stratified extremely gravelly coarse sand to very gravelly sandy loam, stratified fine sandy loam to silt loam, stratified gravelly sandy loam to clay loam, stratified very gravelly loamy coarse sand to extremely gravelly sandy loam, stratified very gravelly sandy loam to gravelly sandy loam, very fine sandy loam, very gravelly sand, very gravelly sandy loam, weathered bedrock	0-15	Well drained to somewhat excessively drained	No	B	Medium	Moderate	Medium	Low
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.	Clay loam, coarse sandy loam, extremely cobbly loam, extremely gravelly loam, extremely stony loam, fine sandy loam, gravelly clay loam, gravelly loam, loam, very cobbly loam, very gravelly loam, very gravelly sandy loam, very gravelly silt loam,	2-65	Well drained	No	B, C, D	Medium, High	Moderate, Low, Very Low	Medium to High, depending on slope	Low

Soil Order	Soil Suborder	Ecological Site Description	Soil Texture	Slope (%)	Drainage Class	Hydric Soil[b]	Hydrologic Group[c]	Runoff Potential	Permeability[d]	Erosion Potential	Compaction and Rutting Potential
Aridisols	Durids	Durids are found in the western United States, with the majority found in Nevada and Idaho. A few areas are used as irrigated cropland, but most are utilized as wildlife habitat or rangeland. They are characterized by a soil subsurface horizon cemented by silica (duripan).	Cemented, clay, fine sandy loam, gravelly clay, gravelly clay loam, gravelly loam, gravelly sandy loam, gravelly silt loam, gravelly very fine sandy loam, indurated, loam, loamy fine sand, silt loam, stratified extremely gravelly coarse sand to extremely gravelly sandy loam, stratified gravelly sand to loam, stratified sandy loam to extremely gravelly sandy loam, very cobbly loam, very cobbly very fine sandy loam, very fine sandy loam, very gravelly coarse sandy loam, very gravelly loam, very gravelly sandy clay loam, very gravelly sandy loam	0-50	Poorly drained to well drained	No	C, D	Medium, High	Low, Very Low	Medium to High, depending on slope	Low
Entisols	Fluvents	Fluvents are mostly freely drained soils that form in recently deposited sediments on flood plains, fans, and deltas located along rivers and small streams. Unless protected by dams or levees, these soils frequently flood. Fluvents are normally utilized as rangeland, forest, pasture, or wildlife habitat, with some also used for cropland.	Loam, loamy coarse sand, sandy loam, silt loam, stratified coarse sand to silt loam, stratified loam to clay, very fine sandy loam	0-2	Somewhat poorly drained to somewhat excessively 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
Entisols	Orthents	Orthents are commonly found on recent erosional surfaces and are used primarily as rangeland, pasture, or wildlife habitat.	Clay, clay loam, cobbly clay loam, cobbly loam, extremely gravelly fine sandy loam, extremely gravelly loam, fine sandy loam, gravelly clay loam, gravelly fine sandy loam, gravelly loam, gravelly loamy sand, gravelly sandy loam, gravelly very fine sandy loam, loamy sand, sandy loam, silt loam, silty clay loam, stratified cobbly coarse sand to extremely gravelly sandy loam, stratified extremely gravelly coarse sand to gravelly fine sandy loam, stratified extremely gravelly coarse sand to very gravelly loamy sand, stratified extremely gravelly loamy coarse sand to gravelly loam, stratified extremely gravelly sand to extremely gravelly sandy loam, stratified fine sandy loam to silt loam, stratified gravelly coarse sandy loam to very fine sandy loam, stratified sandy loam to silt loam, stratified silt loam to clay, stratified silty clay loam to clay, stratified very gravelly coarse sand to extremely gravelly sandy loam, stratified very gravelly loamy coarse sand to gravelly coarse sandy loam, unweathered bedrock, very cobbly loam, very cobbly sandy loam, very fine sandy loam, very gravelly fine sandy loam, very gravelly loam, very gravelly loamy coarse sand, very gravelly loamy sand, very gravelly sand, very gravelly sandy loam, very gravelly very fine sandy loam, weathered bedrock	0-75	Somewhat poorly drained to excessively drained	No	A, B, C, D	Low, Medium, High	High, Moderate, Low, Very Low	Low to High, depending on slope	Low

Soil Order	Soil Suborder	Ecological Site Description	Soil Texture	Slope (%)	Drainage Class	Hydric Soil[b]	Hydrologic Group[c]	Runoff Potential	Permeability[d]	Erosion Potential	Compaction and Rutting Potential
Entisols	Psamments	Psamments are sandy in all layers. In some arid and semi-arid climates, they are among the most productive rangeland soils, and are primarily used as rangeland, pasture, or wildlife habitat. Those Psamments that are nearly bare are subject to wind erosion and drifting, and provide good support for wheeled vehicles.	Coarse sand, fine sand, gravelly coarse sand, gravelly fine sand, gravelly loamy coarse sand, gravelly loamy fine sand, loamy sand, sand, stratified sand to very fine sandy loam	0-50	Somewhat excessively drained to excessively drained	No	A, C, D	Low, Medium, High	High, Low, Very Low	Low to High, depending on slope	Low
Mollisols	Rendolls	Rendolls are found in areas that are more humid. They are formed under grass and shrubs or forest vegetation in highly calcareous parent materials. Most of these soils are used for pasture or cropland, although some are used for forest or rangeland.	Very gravelly loam, very gravelly silt loam	15-75	Well drained	No	B, D	Medium, High	Moderate, Very Low	Medium to High, depending on slope	Low
Aridisols	Salids	Salids are primarily found in Nevada and Utah, and commonly located in depressions (playas). They have a saline horizon[i] that makes them unsuitable for agricultural use unless they are leached of salts. Therefore, most of these soils are utilized for wildlife habitat or rangeland.	Clay loam	0-2	Poorly drained	No	D	High	Very Low	High	Low
Histosols	Saprists	Saprists have organic materials that are well decomposed, many support natural vegetation and are used as woodland, rangeland, or wildlife habitat. Some Saprists, particularly those with a mesic or warmer temperature regime, have been cleared, drained, and used as cropland.	Stratified muck to silt loam	0-2	Very poorly drained	Yes	D	High	Very Low	High	High, due to hydric soil and poor drainage conditions
Alfisols	Xeralfs	Xeralfs support warm-weather and dry 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, clay loam, coarse sandy loam, gravelly clay loam, indurated, loam, sandy loam, very cobbly clay	0-50	Well drained to somewhat poorly drained	Yes, No	B, D	Medium, High	Moderate, Very Low	Medium to High, depending on slope	High, due to hydric soil and poor drainage conditions
Vertisols	Xererts	Xererts are found in Mediterranean-type climates with cool and wet winters and warm, dry summers. The soils become very dry in the summer, and moist in the winter, which can cause significant damage to roads and structures. They are mostly used for cropland or rangeland, and native vegetation is mainly forbs and grasses.	Very cobbly clay	0-8	Well drained	No	D	High	Very Low	High	Low

Soil Order	Soil Suborder	Ecological Site Description	Soil Texture	Slope (%)	Drainage Class	Hydric Soil[b]	Hydrologic Group[c]	Runoff Potential	Permeability[d]	Erosion Potential	Compaction and Rutting Potential
Mollisols	Xerolls	Xerolls are more or less freely drained soils of regions with a Mediterranean-type climate, such as California, Idaho, Nevada, wester Utah, and the Pacific Northwest. Xerolls are dry for extended periods of time in summer but contain moisture in the winter. Vegetation in xerolls consists of bunchgrass, shrubs or trees in mesic or frigid temperature climates. Xerolls support irrigated crops where the temperature is thermic or mesic. Gentle and moderate sloped xerolls are used as cropland whereas steep soils may be used as rangeland or forest.	Clay, clay loam, extremely cobbly clay, extremely cobbly loam, extremely gravelly loam, extremely gravelly silt loam, fine sandy loam, gravelly clay, gravelly clay loam, gravelly fine sandy loam, gravelly loam, gravelly loamy coarse sand, gravelly sandy loam, gravelly silt loam, gravelly silty clay, gravelly silty clay loam, indurated, loam, loamy coarse sand, sandy loam, silt loam, silty clay, silty clay loam, stony clay, unweathered bedrock, very cobbly clay, very cobbly clay loam, very cobbly loam, very cobbly silt loam, very cobbly silty clay loam, very gravelly clay, very gravelly clay loam, very gravelly loam, very gravelly loamy coarse sand, very stony sandy loam, weathered bedrock	0-75	Excessively drained to poorly drained	No	A, B, C, D	Low, Medium, High	High, Moderate, Low, Very Low	Low to High, depending on slope	Low

[a] Soil suborders constitute a broad range of soil types. Within each suborder, the range of soil types may have a range of properties across the state, which result in multiple values being displayed in the table for that suborder.
[b] Hydric Soil: "A soil that formed under conditions of saturation, flooding or ponding long enough during the growing season to develop anaerobic conditions in the upper part" (NRCS, 2015g). Soil suborders constitute a broad range of soil types. Within each soil suborder, some specific soil types are hydric while others are not.
[c] Hydrologic Group: Soils are classified into hydrologic groups "to indicate the minimum rate of infiltration obtained for bare soil after prolonged wetting." These groups "are A, B, C, and D, are one element used in determining runoff curve numbers." (Wetland Studies and Solutions, Inc., 2012)
[d] Based on Runoff Potential, described in Section 6.1.2.5.
[e] Inceptisols: "Soils found in semiarid to humid environments that exhibit only moderate degrees of soil weathering and development. They have a wide range of characteristics, can occur in a wide variety of climates, and make up nearly 17 percent of the world's ice-free land surface." (NRCS, 2015e)
[f] Vertisols: Soils that "have a high content of expanding clay minerals. They undergo pronounced changes in volume with changes in moisture. Because they swell when wet, vertisols transmit water very slowly and have undergone leaching. They tend to be fairly high in natural fertility." (NRCS, 2015e)
[g] Forb: "Vascular plant without significant woody tissue above or at the ground." (NRCS, 2016b)
[h] "Soil forms layers or horizons, roughly parallel to the earth's surface, in response to five soil forming factors. The whole soil, from the surface to its lowest depths, develops naturally as a result of these five factors. The five factors are: 1) parent material, 2) relief or topography, 3) organisms (including humans), 4) climate, and 5) time. If a single parent material is exposed to different climates then a different soil individual will form. If any one of the five factors is changed but the remaining four factors remain the same, a new soil will form. This process is called "soil genesis." (NRCS, 2016c)
[I] "Salinization occurs in warm and dry locations where soluble sales precipitate from water and accumulate in the soil." (City of Wenatchee, 2016)

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

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6.1.2.5. Runoff Potential

The Natural Resources Conservation Service (NRCS) uses four Hydrologic Soil Groups (A, B, C, and D) that are based on a soil's runoff potential.[20] Group A generally has the smaller runoff potential, whereas Group D generally has the greatest (Purdue University, 2015). Table 6.1.2-3 (above) provides a summary of the runoff potential for each soil suborder in Nevada.

Group A. **Sand, loamy sand or sandy loam soils.** This group of soils has "low runoff potential and high infiltration rates[21] 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). Orthents, Psamments, and Xerolls fall into this category in Nevada.

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. Aquents, Aquepts, Argids, Calcids, Cambids, Cryolls, Fluvents, Orthents, Rendolls, Xeralfs, and Xerolls fall into this category in Nevada.

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, Aquepts Argids, Aquolls, Calcids, Cryolls, Durids, Fluvents, Orthents, Psamments, and Xerolls fall into this category in Nevada.

Group D. **Clay loam, silty clay loam, sandy clay, silty clay, or clay soils.** This group of soils "has the highest runoff potential. They have very low infiltration rates when thoroughly wetted and consist chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with a claypan or clay layer at or near the surface and shallow soils over nearly impervious material" (Purdue University, 2015). Aquepts, Aquerts, Aquolls, Argids, Calcids, Cryolls, Durids, Fluvents, Orthents, Psamments, Rendolls, Salids, Saprists, Xeralfs, Xererts, and Xerolls fall into this category in Nevada.

6.1.2.6. Soil Erosion

"Soil erosion [is] the breakdown, detachment, transport, and redistribution of soil particles by forces of water, wind, or gravity" (NRCS, 2015d). 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

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

[21] 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 6.1.2-3 provides a summary of the erosion potential for each soil suborder in Nevada. Soils with the highest erosion potential in Nevada include those in the Aquents, Aquepts, Aquerts, Aquolls, Argids, Calcids, Cambids, Cryolls, Durids, Fluvents, Orthents, Psamments, Rendolls, Salids, Saprists, Xeralfs, Xererts, and Xerolls suborders, which are found throughout the state (Figure 6.1.2-2).

6.1.2.7. 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 in 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 6.1.2-3 provides a summary of the compaction and rutting potential for each soil suborder in Nevada. Soils with the highest potential for compaction and rutting in Nevada include those in the Aquerts, Aquolls, Fluvents, Saprists, and Xeralfs suborders, which are found throughout the state (Figure 6.1.2-2).

6.1.3. Geology

6.1.3.1. Definition of the Resource

The U.S. Geological Survey (USGS) is the primary government organization responsible for the nation’s geological resources. USGS defines geology as an interdisciplinary science with a focus on the following aspects of earth sciences: geologic hazards and disasters, climate variability and change, energy and mineral resources, ecosystem and human health, and ground-water availability. Several of these elements are discussed in other sections of this PEIS, including Water Resources (Section 6.1.4.7), Human Health and Safety (Section 6.1.15), and Climate Change (Section 6.1.14).

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

- Section 6.1.3.3, Environmental Setting: Physiographic Regions and Provinces;[22, 23]
- Section 6.1.3.4, Surface Geology;
- Section 6.1.3.5, Bedrock Geology;[24]
- Section 6.1.3.6, Paleontological Resources;[25]
- Section 6.1.3.7, Fossil Fuel and Mineral Resources; and
- Section 6.1.3.8, Potential Geologic Hazards.[26]

6.1.3.2. 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 6.1.3-1.

Table 6.1.3-1 Relevant Nevada Geology Laws and Regulations

State Law/Regulation	Regulatory Agency	Applicability
Nevada Revised Statues, Chapter 383 – Historic Preservation and Archeology	Nevada State Historic Preservation Office (SHPO)	For state agencies, any excavations or other similar work on any kind of property, or when any artifact has been discovered, must notify the SHPO.
Nevada Building Codes	Local Agencies	Check county, city, and other local agencies for seismic guidelines in building codes, including Clark County Building Codes.

6.1.3.3. Environmental Setting: Physiographic Regions and Provinces

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

Nevada is almost entirely within the Intermontane Plateau Region and the Basin and Range Province; a small portion of northeastern Nevada is within the Columbia Plateau Province within the Intermontane Plateau Region. In addition, a small area near Carson City and Lake Tahoe

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

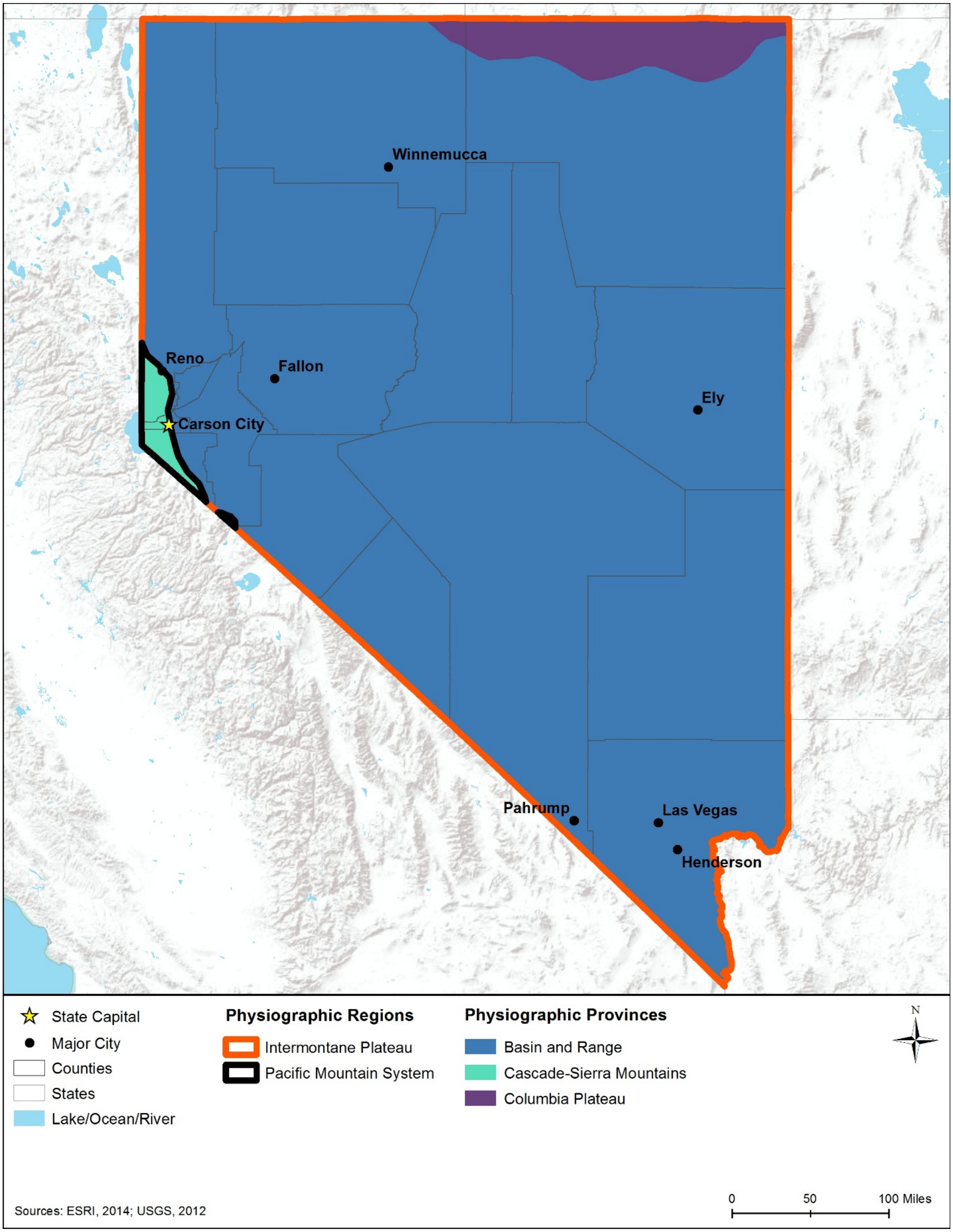

Figure 6.1.3-1: Physiographic Regions, Provinces, and Sections of Nevada

falls within the Pacific Mountain System Region and Cascade-Sierra Mountains Province (Figure 6.1.3-1).

Intermontane Plateau Region

The Intermontane Plateau Region describes the area between the Rocky Mountains and the Sierra Nevada and Cascade Ranges. The Intermontane Plateau Region dates to 80 million years ago (MYA) and predates the younger Rocky Mountain System to the east (which was created roughly 60 MYA).[27] The region is characterized by interspersed higher-elevation plateaus and mountains and lower-lying basins. The Colorado Plateau and Columbia Plateau are the major elevated areas, while the Basin and Range geologic province includes the region's lowest elevations. (Lew, 2004)

Basin and Range Province

The Basin and Range Province includes the majority of Nevada, with the exception of two relatively smaller areas in the state. These two areas are the Colombia Plateau Province in northeastern Nevada, and the Cascade-Sierra Mountains Province east of Carson City. Within Nevada, the Basin and Range Province is characterized by north-south trending mountains and valleys that were created as the landscape in the region underwent extension[28] over the past 30 million years (NPS, 2014a). This tectonic activity has thinned the Earth's crust and created large faults that have resulted in the "distinctive alternating pattern of linear mountain ranges and valleys" (USGS, 2014a). The region is noted for its abundance of normal faults,[29] which have created topographic relief that exceeds 10,000 feet in some instances. As topography became elevated, mountains eroded and buried the valley floor beneath the eroded sediments (USGS, 2014a).

Columbia Plateau Province

The Columbia Plateau Province includes a small portion of northeastern Nevada. The Columbia Plateau is noted for containing widespread Miocene basalt[30] fields that date to within the last 17 million years (NPS, 2014a). The line of basalt that passes through northern Nevada, near the town of Winnemucca, is an indicator of the movement of the North American tectonic plate[31] over the Yellowstone Hot Spot (USFS, 2015a).[32] The portion of the Columbia Plateau that

[27] For consistency, this PEIS uses the University of California Berkeley Geologic Time Scale for all of the FirstNet PEIS state documents. Time scales differ among universities and researchers; FirstNet utilized a consistent time scale throughout, which may differ slightly from other sources. (University of California Museum of Paleontology, 2011)
[28] Extension: "In geology, the process of stretching the Earth's crust. Usually cracks (faults) form, and some blocks sink, forming sedimentary basins." (USGS, 2015h)
[29] Normal Fault: "A fault that drops rock on one side of the fault down relative to the other side." (USGS, 2015h)
[30] Basalt: "A dark, fine-grained, extrusive (volcanic) igneous rock with a low silica content (40% to 50%), but rich in iron, magnesium and calcium." (USGS, 2015h)
[31] Tectonic Plate: "A slab of rigid lithosphere (crust and uppermost mantle) that moves over the asthenosphere." (USGS, 2015h)
[32] Hot Spot: "An area of concentrated heat in the mantle that produces magma that rises to the Earth's surface to form volcanic islands." (USGS, 2015h)

passes through Nevada is referred to as the Snake River Plain (USFS, 2015a). This area is a flat, low-lying landscape with basalt flows infused with rhyolite[33] (NPS, 2014a).

Pacific Mountain System

The Pacific Mountain System spans the entire West Coast of the United States and is one of the most tectonically active areas of the country. The Pacific Mountain System includes the Cascade Mountains in Washington and Oregon, and the Sierra Nevada Mountains in California and Nevada. Mountains throughout the region formed during the Mesozoic Era (251 to 66 MYA). (USGS, 2014b)

Cascade-Sierra Mountains

Within Nevada, the Sierra Nevada Mountains include a relatively small area of land surrounding Lake Tahoe in the western portion of the state. They are composed of Mesozoic granitic[34] rocks, though the present-day mountain range did not begin to take shape until 5 MYA. The Sierra Mountains were formed "through a combination of uplift of the Sierran block and down-dropping of the area to the east" (USGS, 2014b). The Lake Tahoe Basin separates the Sierra Nevada Mountains to the west from the Carson Range (and start of the Basin and Range Province) to the east (USGS, 2012a).

6.1.3.4. 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, W., 2015)

While alpine glaciers helped to shape the mountains of the Basin and Range Province of Nevada during the most recent Ice Age, continental glaciers that covered the entire landscape were limited to areas of the Columbia Plateau in northeastern Nevada (NPS, 2015a). Nevada's Ruby Mountains, which are northeast of Elko, were sculpted by glacial activity (USFS, 2015b).

[33] Rhyolite: "A volcanic rock chemically equivalent to granite; usually light colored, very fine-grained or glassy-looking. May have tiny visible crystals of quartz and/or feldspar dispersed in a glassy white, green, or pink groundmass." (USGS, 2015h)
[34] Granite: "A general term for intrusive igneous rocks that look similar to granite but may range in composition from quartz-diorite to granite. All granitic rocks are light colored; feldspar and quartz are visible in hand specimen." (USGS, 2015h)
[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)

Alluvial[38] deposits, often emanating from hot spring, landslides, and historic volcanic eruptions, are pervasive throughout the modern Nevada landscape (Crafford, 2007). For example, along Lake Mead (on the state's southeastern border with Arizona), alluvial deposits are extensive along the edges and within broad basins of the lake, or near "deltas that formed at the mouths of the Colorado River and its tributaries, including the Virgin and Muddy Rivers" (NPS, 2015b). It is estimated that alluvial deposits cover 44 percent of the area within Lake Mead (NPS, 2015b). Elsewhere in Nevada, Quaternary (2.6 MYA to present) surface deposits, including boulder to sand-size sediments, along with eolian sand dunes (with grain sizes ranging from 0.05 mm to 0.5 mm) are observed near Yucca Mountain, about 100 miles northeast of Las Vegas (Mahan, Paces, & Peterman, 1996). Figure 6.1.3-2 displays a generalized illustration of the surface geology for Nevada.

6.1.3.5. Bedrock Geology

Bedrock geology analysis, and "the study of distribution, position, shape, and internal structure of rocks" (USGS, 2015a) reveals important information about a region's surface and subsurface characteristics (i.e., 3-dimensional geometry), including dip (slope of the formation),[39] rock composition, and regional tectonism.[40] 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).

The majority of the Basin and Range Province in western and central Nevada is underlain by volcanic rocks dating to between 43 and 6 MYA. The eastern portion of the Basin and Range contains much older Paleozoic carbonate[41] rocks along with volcanic and sedimentary assemblages. Bedrock throughout the entire Basin and Range Province is often underlain by Quaternary (2.6 MYA to present) alluvial and playa[42] deposits. In Northern Nevada, the Columbia Plateau Province is composed of volcanic bedrock dating to between 17 and 6 MYA. (Nevada Bureau of Mines and Geology, 1999)

For more information on bedrock in specific locations throughout Nevada, refer to the Geologic Map of Nevada at http://pubs.nbmg.unr.edu/Generalized-geologic-map-of-Nev-p/e030.htm (Nevada Bureau of Mines and Geology, 1999). Figure 6.1.3-3 displays the general bedrock geology for Nevada.

[38] Alluvial Deposits: "Sand, gravel, and silt deposited by rivers and streams in a valley bottom." (USGS, 2015h)
[39] 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)
[40] Tectonisms: "Structure forces affecting the deformation, uplift, and movement of the earth's crust." (USGS, 2015h)
[41] Carbonate Rocks: "A sedimentary rock made mainly of calcium carbonate ($CaCO_3$)." (USGS, 2015h)
[42] Playa: "Shallow, short-lived lakes that form where water drains into basins with no outlet to the sea and quickly evaporates. Playas are common features in arid (desert) regions and are among the flattest landforms in the world." (USGS, 2015h)

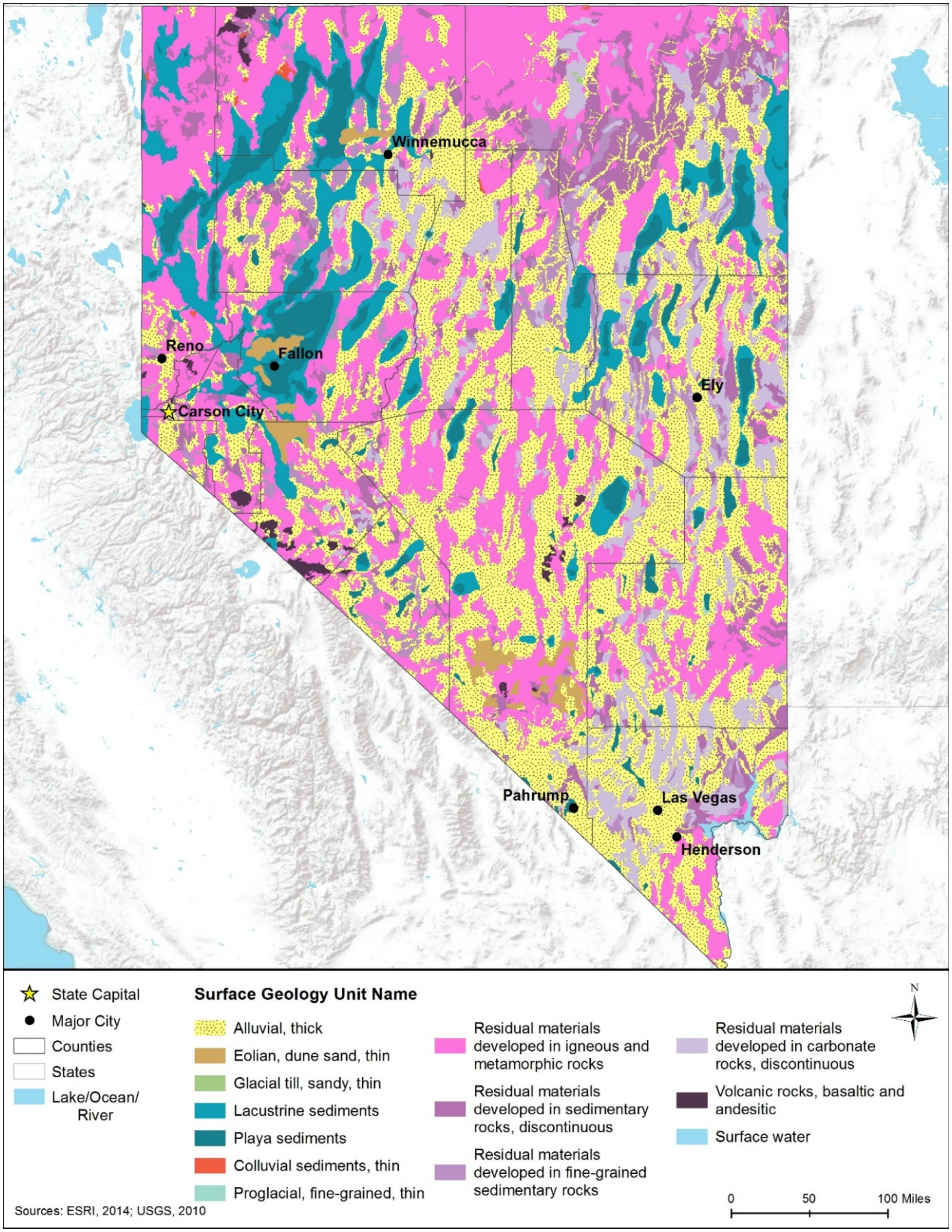

Figure 6.1.3-2: Generalized Surface Geology for Nevada

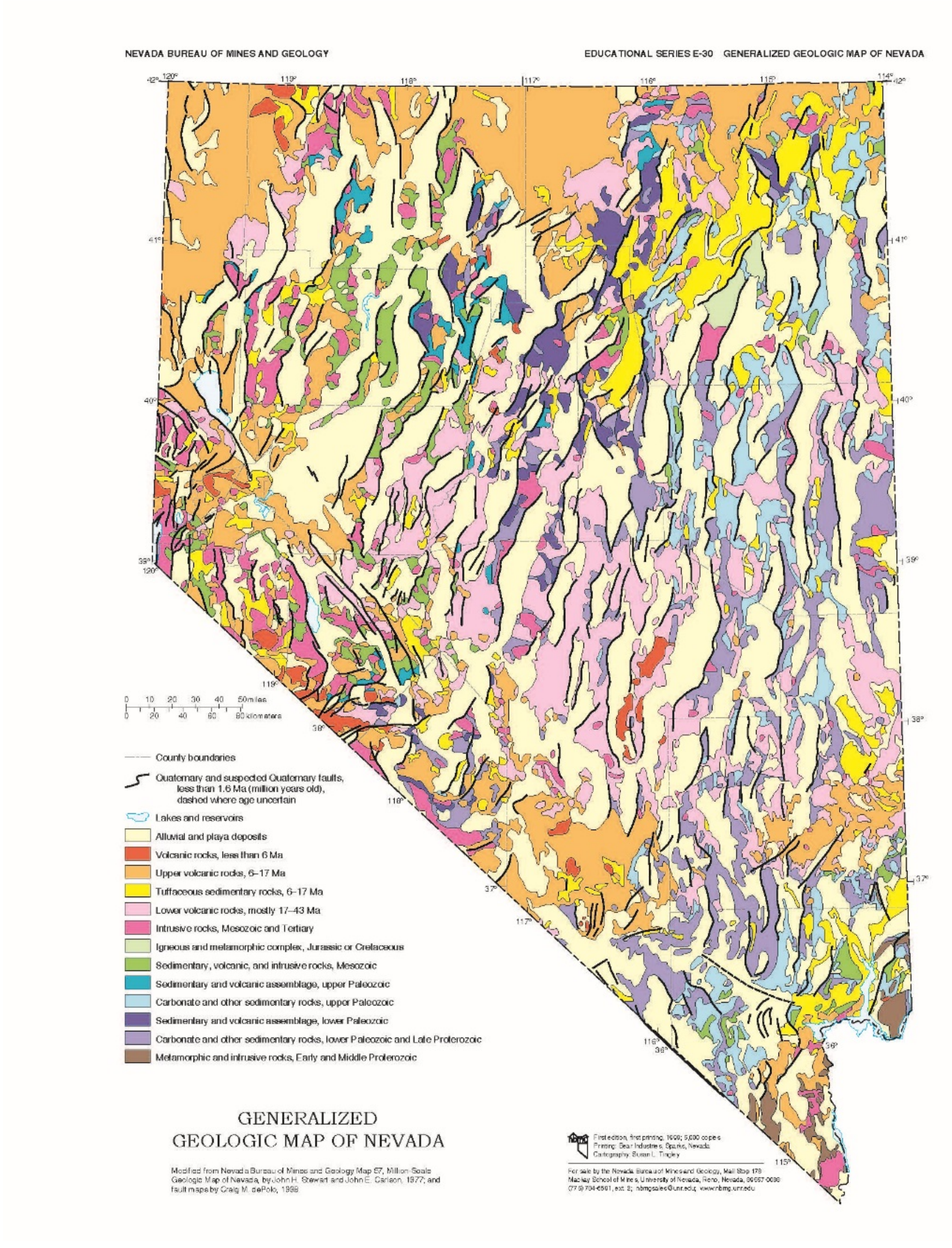

Figure 6.1.3-3: Generalized Bedrock Geology for Nevada

Source: (Nevada Bureau of Mines and Geology, 1999)

6.1.3.6. Paleontological Resources

During portions of the Paleozoic Era (542 to 251 MYA), Nevada was covered by warm shallow seas, as indicated by marine fossils found throughout the state. Eastern Nevada was dry by the Permian Period (299 to 251 MYA), as evidenced by plant fossils from this time. By the Mesozoic Era (251 to 66 MYA), the oceans receded from Nevada except for central and western parts of the state. Marine fossils from deep-water environments have been recorded in northwestern Nevada, while fossils from shallow marine environments have been located in central Nevada. Mesozoic terrestrial fossils have been found in the southern and eastern portions of the state; dinosaur fossils have been recorded from the Triassic Period (251 to 200 MYA). However, Cenozoic Era (66 MYA to present) fossils from terrestrial animals have been recorded throughout the state. (Paleontology Portal, 2015)

Nevada State Fossil:
Ichthyosaur

Source: (Nevada Legislative Council Bureau, 2013)

Marine fossils from the Paleozoic Era include deepwater organisms such as graptolites[43] and other floating organisms. Shallow water marine organisms include sponges, crinoids,[44] brachiopods,[45] bryozoans,[46] and nautiloids. Plant fossils from later in the Paleozoic Era have also been recorded, along with marine invertebrate fossils in the north and northeast, and plankton fossils from the chert and shale in the northwest part of the state. Fossils from the Mesozoic Era include Triassic fossils of ammonites and ichthyosaurs. The Great Basin in central Nevada has been the location for many ammonite recordings (Paleontology Portal, 2015). A complete skeleton of the 55 foot long Ichthyosaur was found within the Berlin-Ichthyosaur State Park (Figure 6.1.3-4). This state park contains the highest concentration of Ichthyosaur fossils in North America (Nevada State Parks, 2015b). Designated the state fossil of Nevada, the Ichthyosaur was a predatory reptile that lived in the ocean (Nevada Legislative Council Bureau, 2013). Jurassic Period (200 to 146 MYA) fossils include ammonites, oysters, and pectens, while Cretaceous Period fossils include twigs from sequoia trees in Eureka County. Fossils from the Cenozoic Era recorded include mammoths, rhinos, horses, camels, and giant ground sloths (Paleontology Portal, 2015).

[43] Graptolite: "Any member of the Graptolithina, a class of extinct marine invertebrate animals. Graptolites are believed to have been planktonic and are especially prevalent in Ordovician and Silurian rocks." (Smithsonian Institution, 2016)
[44] Crinoid: "The common name for any echinoderm of the class Crinoidea, including sea lilies, feather stars, etc. Crinoids are common fossils in the Paleozoic and persist to the present. Many species have stalks and radiating arms and feed on particles in the water column." (Smithsonian Institution, 2016)
[45] Brachiopod: "Any member of a phylum of marine invertebrate animals called Brachiopoda. Brachiopods are sessile, bivalved organisms, but are more closely related to the colonial Bryozoa than the bivalved mollusks. Brachiopod diversity peaked in the Paleozoic, but some species survive." (Smithsonian Institution, 2016)
[46] Bryozoan: "Common name for any member of the phylum Bryozoa. Bryozoans are invertebrate aquatic organisms most commonly found in large colonies." (Smithsonian Institution, 2016)

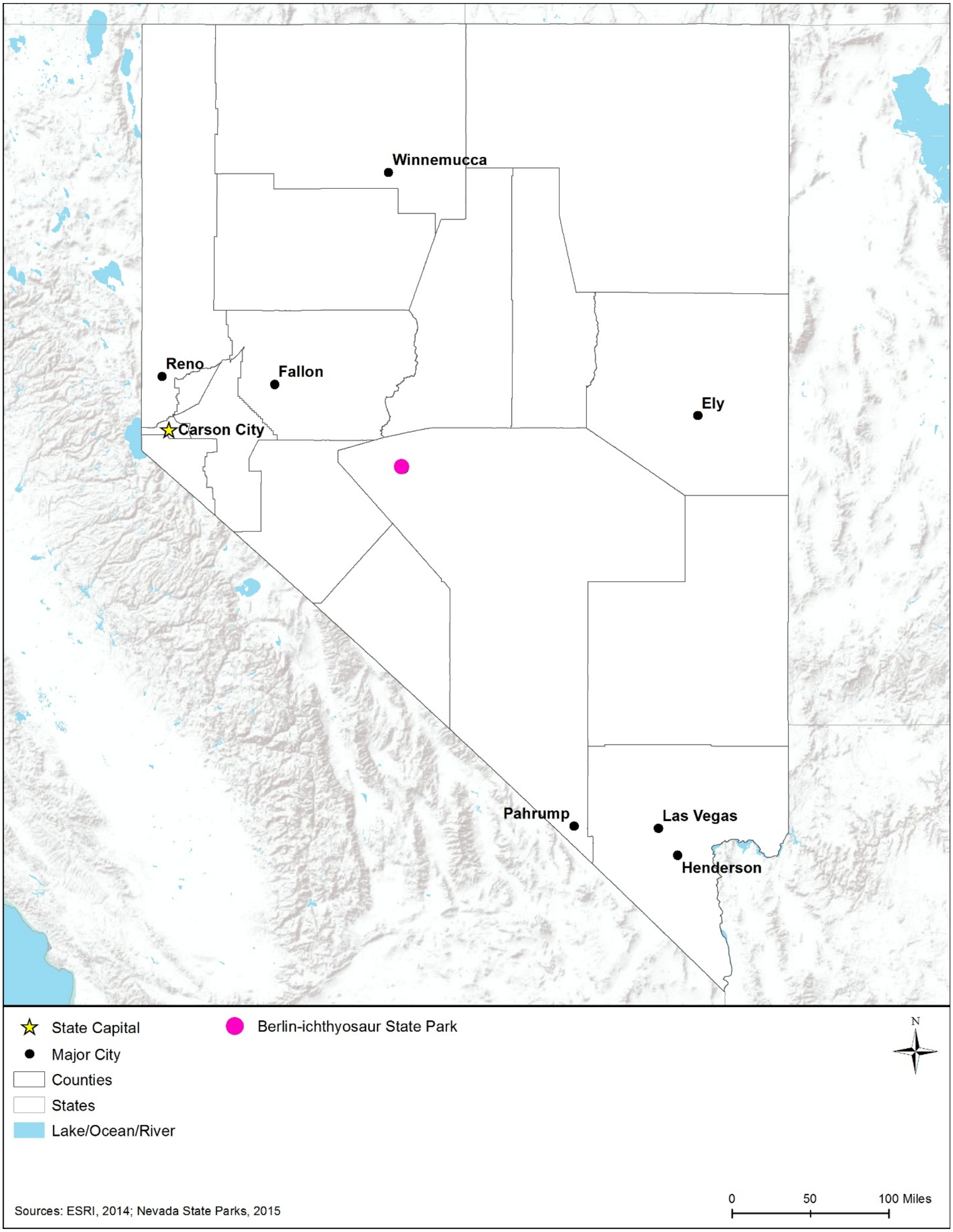

Figure 6.1.3-4: Berlin-ichthyosaur State Park

6.1.3.7. Fossil Fuel and Mineral Resources

Oil and Gas

Nevada is a minimal producer of both crude oil and natural gas. In 2015, Nevada produced 281 thousand barrels of crude oil (EIA, 2015c), accounting for 0.2 percent of total production nationwide for that year (EIA, 2015d). Throughout 2015, Nevada ranked among the five lowest crude oil producing states in the country (EIA, 2016). In 2014, Nevada produced 3 million cubic feet of natural gas (EIA, 2015d).

Minerals

As of 2015, Nevada's total nonfuel mineral production was valued at almost $7 billion, ranking first in the nation and accounting for more than 8.8 percent of the country's total nonfuel mineral production (USGS, 2016a). Nevada produced nearly $8.7 billion of gold in 2011 (USGS, 2015b). "Excluding 2005, when it ranked third in nonfuel mineral production value, the State has continuously occupied first or second place [in total gold production] since 1992" according to the most recent 2010-2011 Minerals Yearbook for Nevada (USGS, 2015b). Also as of the 2010-2011 Minerals Yearbook for Nevada, copper and silver account for approximately 2 percent of the state's total nonfuel mineral production. Nevada is the only nationwide producer of magnesite, and one of six states to produce perlite and zeolites. Nevada also produces bentonite, boron, crushed stone, cement, diatomite, gemstones, and gypsum; magnesium compounds are also mined and produced in Nevada (USGS, 2015b) (USGS, 2004).

6.1.3.8. Geologic Hazards

The four major geologic hazards of concern in Nevada are volcanoes, earthquakes, landslides, and subsidence. The subsections below summarize current geologic hazards in Nevada

Volcanoes

Volcanoes are related to tectonic plate motion. Volcanoes present multiple hazards to humans, including clouds of hot gasses carrying rock and sand, blast effects, ash falls, and mudflows. Unlike earthquakes, active volcanoes are generally well identified, although the specific timing of eruption events is difficult to predict. The presence of high geothermal heat flow is often associated with current and past volcanic activity. (USGS, 2010a)

Within Nevada, 2 areas have exhibited volcanic/geothermal activity within the past 10,000 years, Soda Lake and Steamboat Springs. Soda Lake and Little Soda Lake are two maars[47] located near Fallon, NV; both lakes formed within the last 10,000 years following a volcanic eruption in which basalt[48] blasted "through the water table or shallow lakes." Soda Lake, the larger of the maars, measures 0.7 by 0.9 miles. (USGS, 2014c)

[47] Maar: "A broad, short volcanic crater formed by groundwater or permafrost coming into contact with hot lava or magma, which causes an explosion powerful enough to create a large hole in the ground." (NPS, 2015k)
[48] Basalt: "A dark, fine-grained, extrusive (volcanic) igneous rock with a low silica content (40% to 50%), but rich in iron, magnesium and calcium." (USGS, 2015h)

In western Nevada, just northeast of Lake Tahoe, Steamboat Springs contains a volcanic rock field that dates to 2.53 to 1.14 MYA. While no volcanic activity has occurred there during the last 10,000 years, it was included in the *Catalog of Active Volcanoes of the World* based on its 50 active hot springs and multiple steam vents. (Smithsonian Institution, 2013)

Earthquakes

Nevada is in one of the most seismically active regions in the U.S. Nevada ranks 3rd (behind California and Alaska) in the number of large earthquakes over the last 150 years (University of Nevada, Reno, 2015a). Between 1915 and 2012, at least seven earthquakes of magnitude 5.0 or greater (on the Richter scale[49]) have occurred in Nevada (USGS, 2016b). 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 strong enough, they can damage manmade structures on the surface. Earthquakes can produce secondary flooding impacts resulting from dam failure (USGS, 2012c).

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 and the type that occur in Nevada, 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" (USGS, 2014d). 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)

Nevada's Largest Earthquake

The largest earthquake recorded in Nevada was a magnitude 7.1 on the Richter scale that occurred in 1915 in the eastern part of Pleasant Valley, north-central Nevada. Damage occurred within an 80-kilometer radius of the earthquake in Humboldt, Lander, and Pershing Counties. Property damage included the destruction of houses, mine tunnel collapse, and toppling of water towers. The earthquake was felt throughout the western U.S. in areas including coastal Oregon and California, and Salt Lake City, Utah. (USGS, 2012d)

Figure 6.1.3-5 depicts the seismic risk throughout Nevada; the box surrounding the range of colors shows the seismic hazards in the state. Areas of greatest seismicity in Nevada are concentrated in the western portions of the State (USGS, 2014e). The map indicates levels of horizontal shaking (measured in Peak Ground Acceleration [PGA]) that have a 2 percent chance of being exceeded in a 50-year period. Units on the map are measured in terms of acceleration due to gravity (% g). Most pre-1965 buildings are likely to experience damage with exceedances of 10% g. Post-1985 buildings (in California) have experienced only minor damage with shaking of 60% g. (USGS, 2010b)

[49] 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, 2014h)

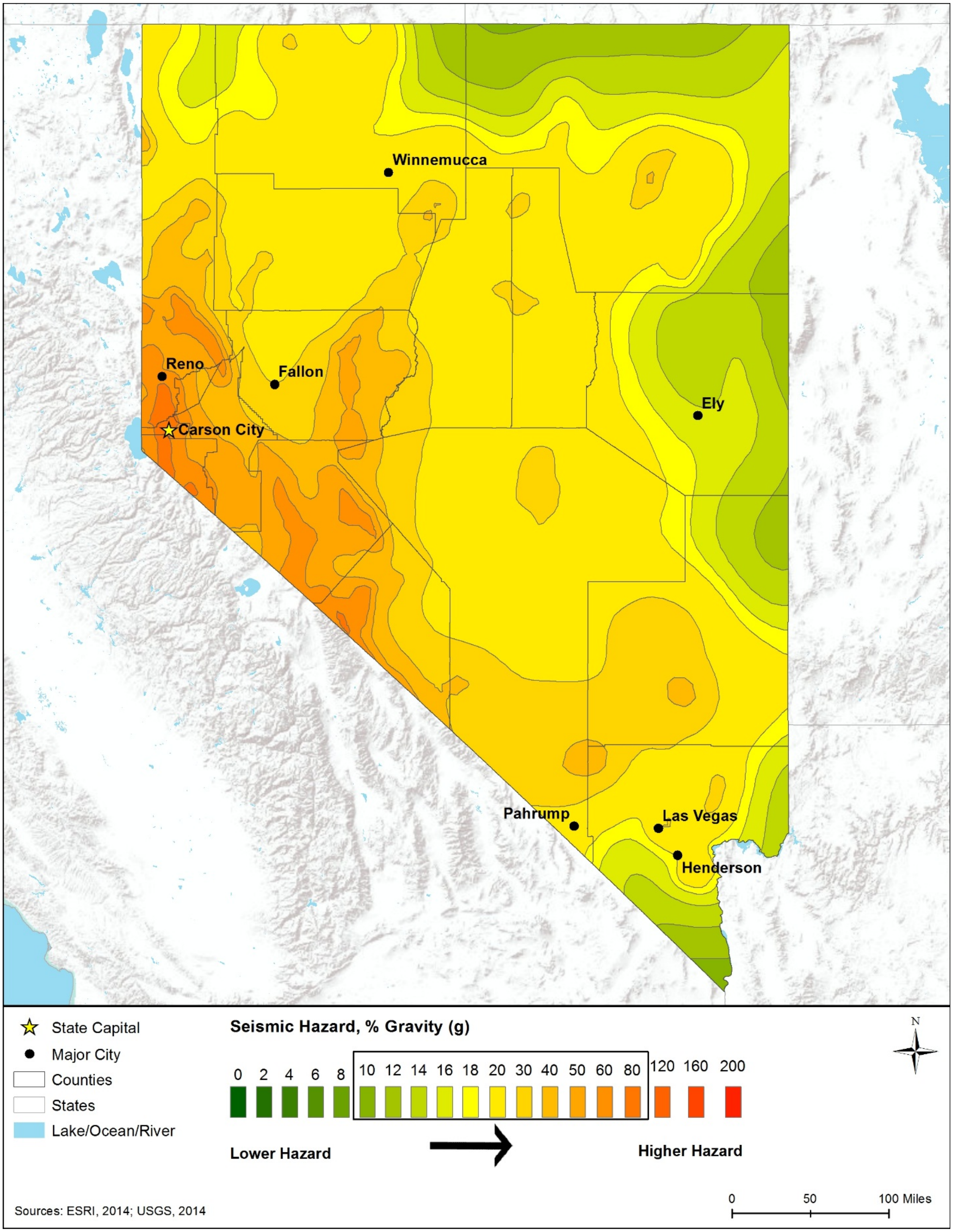

Figure 6.1.3-5: Nevada 2014 Seismic Hazard Map

Landslides

The potential for landslides is not widespread across Nevada, but exists in localized pockets throughout the State (Figure 6.1.3-6). "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, 2003). 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, 2003).

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, 2003)

The region of Nevada most susceptible to landslides is in the Cascade-Sierra Mountains physiographic province. The Sierra Nevada Mountains has undergone large rockslides due to earthquake activity or heavy precipitation events that "have been triggered either by strong seismic shaking or long periods of unusually wet weather" (Wieczorek, 2002). During the wet years of 1982 and 1983 in the Sierra Nevada Mountains, multiple landslides occurred. One notable debris flow occurred in May 1983 on Slide Mountain (about 5 miles northeast of Lake Tahoe) (Wieczorek, 2002).

Figure 6.1.3-6 displays the areas susceptible to landslides throughout Nevada.

Photo of Debris Flow Resulting from 1983 Scarp Mountain Landslide

Source: (Wieczorek, 2002)

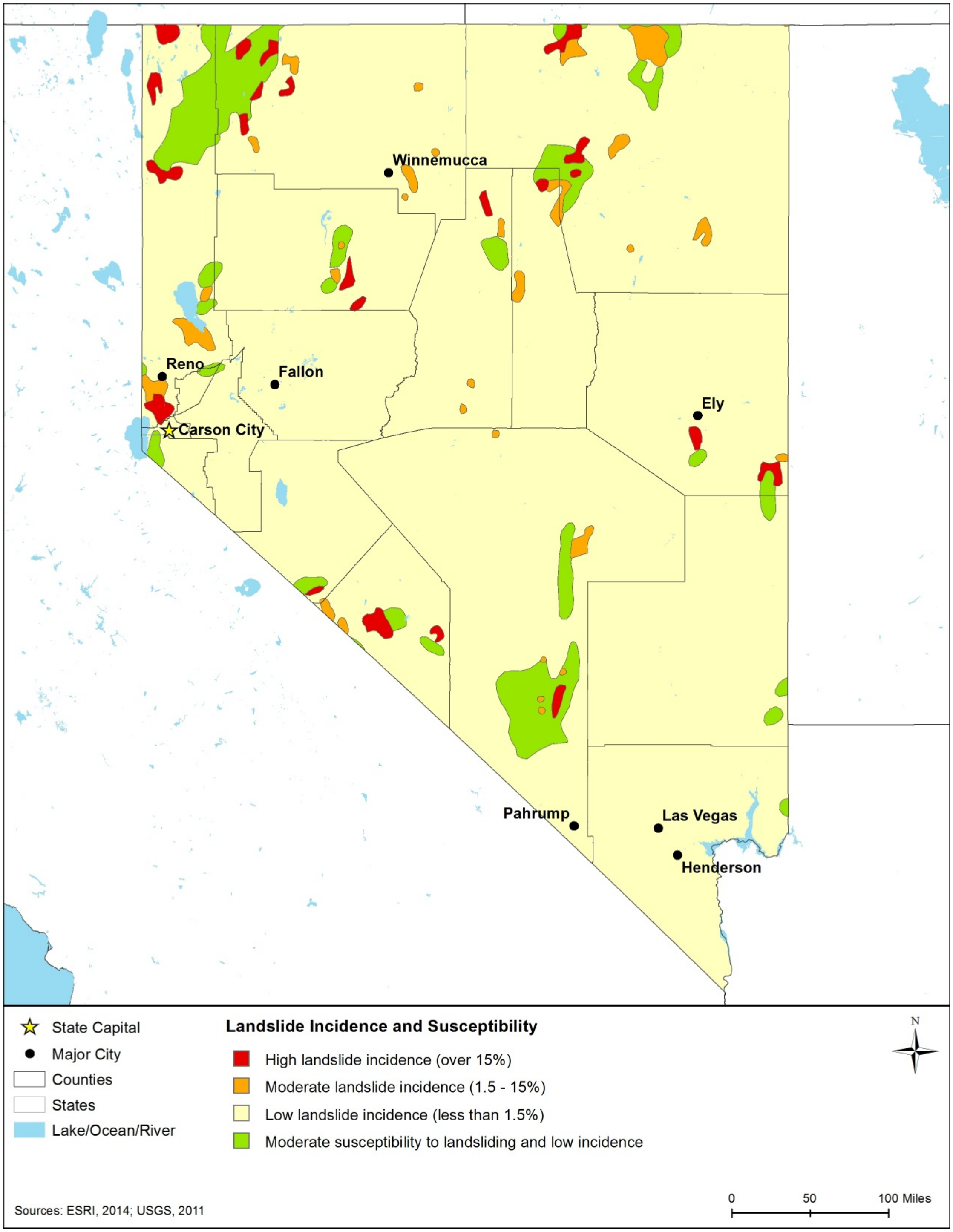

Figure 6.1.3-6: Nevada Landslide Incidence and Susceptibility Hazard Map[50]

[50] Susceptibility hazards not indicated in Figure 6.1.3-6 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, 2014i)

Land Subsidence

Land subsidence is a "gradual settling or sudden sinking of the Earth's surface owing to subsurface movement of earth materials" (USGS, 2000). The main triggers of land subsidence can be aquifer compaction, drainage of organic soils, mining, sinkholes, and thawing permafrost. More than 80 percent of subsidence in the 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 an aquifer is confined by layers of silt or clay, which do not transport groundwater, the lowered water pressure in the sand and gravel causes slow drainage of water from the clay and silt beds. The reduced water pressure compromises support for the clay and silt beds, causing them to collapse on one another. The effects of this compression are seen in the permanent lowering of the land surface elevation (USGS, 2000). As discussed further below, land subsidence has been observed in Nevada due to groundwater withdrawals and mine subsidence.

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, 2013b)

Subsidence due to underground water withdrawal is a significant problem in Nevada, particularly in the Las Vegas Valley, where 20 percent of the water supply comes from groundwater withdrawals. Beginning in 1946, extraction of groundwater began to exceed the volume of water that infiltrated into the ground. Withdrawals have exceeded groundwater recharge since this time, resulting in a decline in the water table by more than 290 feet and the compaction of aquifer sediments beneath the Las Vegas Valley (Bell, Price, & Mifflin, 1992). Throughout the region, the ground surface elevation has dropped by six feet since the 1930s (University of Nevada, Reno, 2015b). In localized areas, additional subsidence of more than 5.5 feet was documented between 1963 and 2000 (USGS, 2006). Figure 6.1.3-7 displays the observed subsidence throughout the Las Vegas Valley between 1963 and 2000.

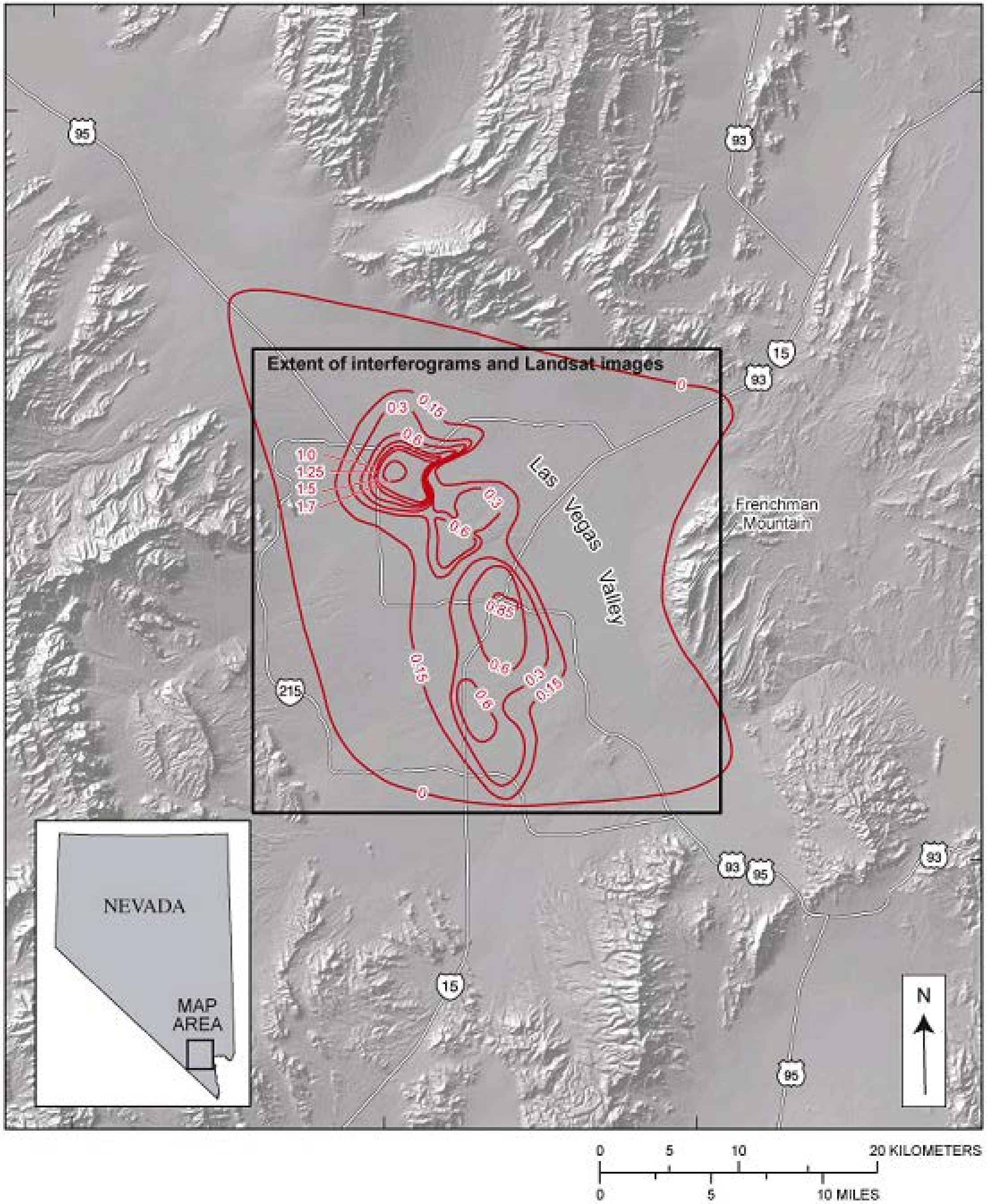

Figure 6.1.3-7: Subsidence in the Las Vegas Valley (1963-2000)

Source: (USGS, 2006)

6.1.4. Water Resources

6.1.4.1. Definition of the Resource

Water resources are defined as all surface water bodies and groundwater systems including streams, rivers, lakes, floodplains, aquifers, and other aquatic habitats (wetlands are discussed separately in Section 6.1.5). These resources can be grouped into watersheds, which are defined as areas of land whose flowing water resources (including runoff from rainfall) drain to a common outlet such as a river or ocean. The value and use of water resources are influenced by the quantity and quality of water available for use and the demand for 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 the maintenance of natural infrastructure and ecological health. (USGS, 2014f)

6.1.4.2. Specific Regulatory Considerations

Table 6.1.4-1 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. Federal laws relevant to protecting the quality and use of water resources are summarized in Appendix C, Environmental Laws and Regulations, and Section 1.8, Overview of Relevant Federal Laws and Executive Orders.

Table 6.1.4-1 Relevant Nevada Water Laws and Regulations

State Law/Regulation	Regulatory Agency	Applicability
Protection of Waters	Nevada Department of Environmental Protection (NDEP)	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 (WQC) from NDEP indicating that the proposed activity will not violate water quality standards.
Water Pollution Control (WPC) Discharge	NDEP	Discharges that may impact subsurface waters, and other waters of the state, are permitted pursuant to Water Pollution Control Law and referred to as the state's WPC Permits.
Nevada Revised Statutes (NRS) Chapters 533 and 534	Nevada Division of Water Resources	A water permit may only be granted for beneficial use (surface water or groundwater).

6.1.4.3. Environmental Setting: Surface Water

Surface water resources include lakes, ponds, rivers, and streams. There are 600 rivers and streams and over 200 lakes and reservoirs in Nevada, providing approximately 553,239 acres of surface water (NDOW, 2012a) (NDEP, 2014a). There are over 15,000 miles of perennial rivers and streams in Nevada, and another 126,000 miles of intermittent or ephemeral streams and nearly 2,000 miles of manmade ditches and canals in the state (NDEP, 2014a). Surface water is a very important resource in Nevada, providing approximately 70 percent of the water supply for the state (NDWP, 1999).

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). Nevada’s waters (lakes, rivers, and streams) are divided into 14 major watersheds, or drainage basins (Figure 6.1.4-1). Most of Nevada lies within the Great Basin (Figure 6.1.4-1), which is an area of internal drainage where streams and rivers are not connected, and do not flow to the ocean. Surface waters in this area will drain into interior lakes, such as Pyramid Lake at the terminus of the Truckee River, or Walker Lake at the terminus of the Walker River, wetlands, or playas (lakebeds that are normally dry). (NDEM, 2013)

Freshwater

As shown in Figure 6.1.4-1, major rivers in Nevada include the Colorado, Humboldt, Truckee, Carson, and Walker rivers. These are the only significant perennial rivers in the state (USGS, 1995a). The Colorado River serves as the border between Arizona and Nevada, flowing nearly 1,450 miles from the Rocky Mountains to the Gulf of California in Mexico. Its water supply is appropriated among seven western states, as well as Mexico, and is one of the most controlled and litigated rivers in the world. In Nevada, the Colorado River supplies nearly 90 percent of the water supply for the southern Nevada population, and supplies electricity for southern Nevada via the Hoover Dam (Southern Nevada Water Authority, 2015). The Humboldt River is the longest river entirely contained within Nevada, with the majority of its water utilized for agriculture. The Truckee River originates in California, and provides water for domestic, industrial, agricultural, wildlife uses, as well as hydroelectric power. Waters from the Carson and Walker Rivers are primarily used for agriculture. (NDWP, 1999)

Nevada contains more than 200 lakes and reservoirs including alpine lakes and manmade reservoirs (NDOW, 2012a). Some of the major lakes in the state include Lake Mead, Lake Mohave, Lake Tahoe, Rye Patch Reservoir, Pyramid Lake, Lahontan Reservoir, and Walker Lake (NDWP, 1999).

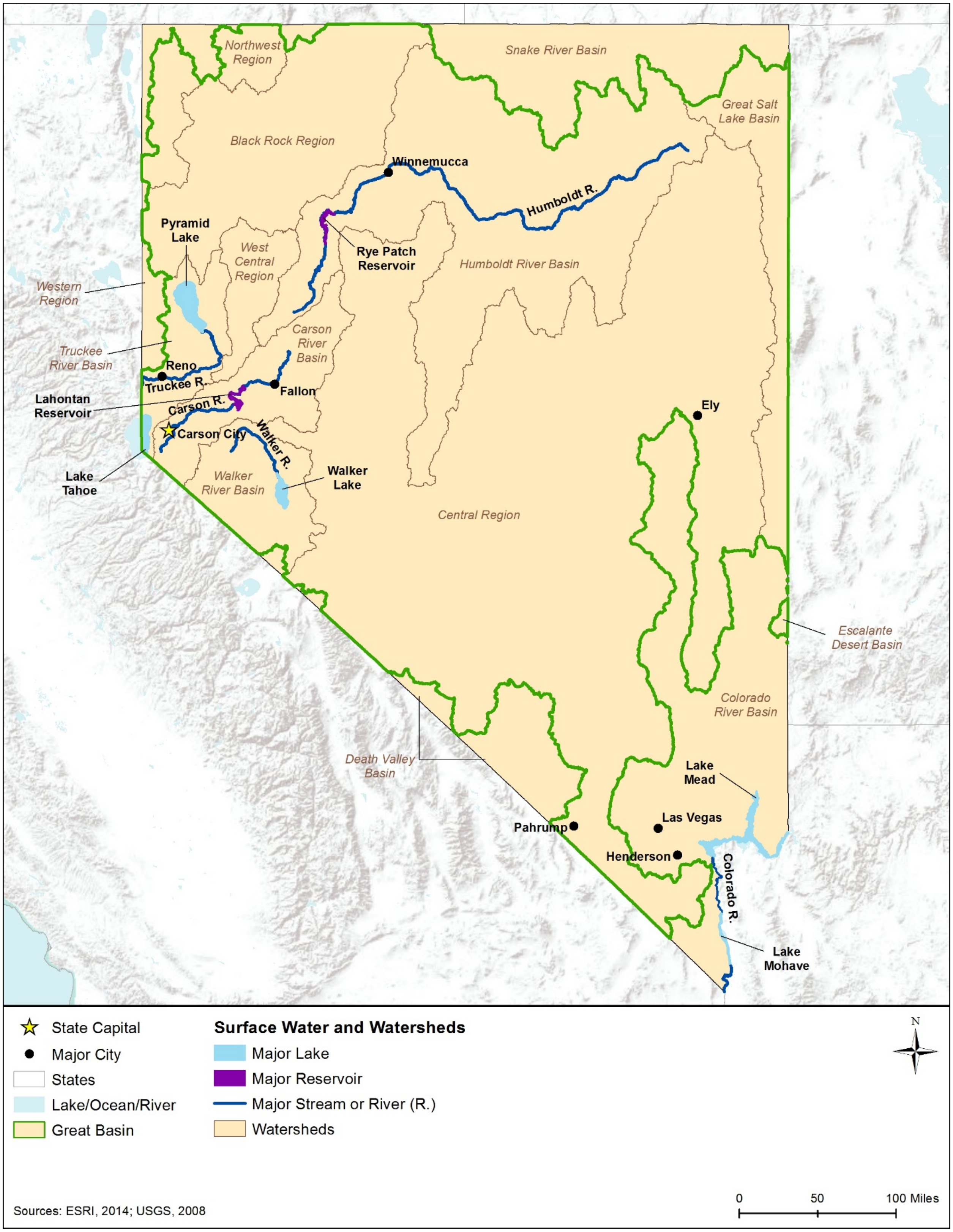

Figure 6.1.4-1 Major Nevada Watersheds and Surface Waterbodies

- Lake Mead was formed after the construction of the Hoover Dam on the Colorado River. It is, by volume, the largest reservoir in the U.S. At capacity, Lake Mead contains 28,945,000 acre-feet of water, and covers approximately 248 square miles. The reservoir is also one of the most important reservoirs in the country, based on the services it provides. Lake Mead provides storage for water supplied to more than 25 million people in Arizona, California, and Nevada. Water from Lake Mead provides drinking water and hydropower for electricity to major cities including Las Vegas, Phoenix, Tucson, Los Angeles, and San Diego. Water from the reservoir irrigates approximately 2.5 million acres of croplands in the southwestern U.S. (Rosen, Turner, Goodbred, & Miller, 2012). Lake Mead is one the most popular recreation areas in the country, with approximately 9 million visitors annually (USBR, 2015). Together, Lake Mohave, which was formed after the construction of the Davis Dam on the Colorado River, and Lake Mead comprise the Lake Mead National Recreation Area (NPS, 2015c).
- Lake Mohave is located south of Las Vegas along the Nevada-Arizona border. It has a holding capacity of nearly 2 million acre-feet of water, and a surface area of over 43.75 square miles. It was constructed to regulate the water delivery released from Hoover Dam to Mexico. (NPS, 2015c)
- Lake Tahoe is located in the Sierra Nevada Mountain Range in western Nevada, west of Carson City, along the border of Nevada and California. Lake Tahoe is the largest alpine lake and second deepest lake in North America. It covers approximately 191 square miles, and is drained by the Truckee River, which then flows into Pyramid Lake (USGS, 2012a). Lake Tahoe has been designed a "Water of Extraordinary Aesthetic or Ecologic Value" by the state of Nevada, and the federal government has designated it an "Outstanding National Resource Water." (NDEP, 2015i)

6.1.4.4. Sensitive or Protected Waterbodies

Nevada does not have any federally designated National Wild and Scenic Rivers (National Wild and Scenic Rivers System, 2015).

6.1.4.5. Impaired Waterbodies

Water quality is evaluated by several constituents and attributes, including temperature, dissolved oxygen, suspended sediment, nutrients, metals, oils, pesticides water color, condition of stream banks and lake shores; observations of aquatic wildlife communities; and sampling of fish tissue or sediment. Under Section 303(d) of the Clean Water Act (CWA), states are required to report a listing of impaired waters,[51] the causes of impairment, and probable sources. Table 6.1.4-2 summarizes the water quality of Nevada's assessed major waterbodies by category, percent impaired, designated use,[52] cause, and probable sources in 2012. Figure 6.1.4-2 shows the Section 303(d) waters in Nevada as of 2014.

[51] Impaired waters: waterways that do not meet state water quality standards. Under the CWA, Section 303(d), states, territories, and authorized tribes are required to develop prioritized lists of impaired waters. (USEPA, 2015m)
[52] Designated Use: an appropriate intended use by humans and/or aquatic life for a waterbody. Designated uses may include recreation, shellfishing, or drinking water supply. (USEPA, 2015m)

Table 6.1.4-2 Section 303(d) Impaired Waters of Nevada, 2012

Water Type[a]	Amount of Waters Assessed (Percent)	Amount Impaired (Percent)	Designated Uses of Impaired Waters	Top Causes of Impairment	Top Probable Sources for Impairment
Rivers and Streams	35%	50%	aquatic life, fish consumption, recreation, enhancement of water quality	nutrients, metals, temperature, mercury, turbidity	agriculture, natural sources, rangeland grazing, grazing in riparian or shoreline zones, non-point source
Lakes, Reservoirs, and Ponds	41%	52%	aquatic life, fish consumption, recreation, enhancement of water quality, Waters Of Extraordinary Ecological Or Aesthetic Value	nutrients, organic enrichment/oxygen depletion, mercury, pH, turbidity	natural sources, non-point source, agriculture, impacts from abandoned mine lands
Wetlands	35%	99%	aquatic life, fish consumption, irrigation	mercury, toxic impairments, metals, temperature	impacts from abandoned mine lands, natural sources, agricultural

[a] Some waters may be considered for more than one water type.

Source: (USEPA, 2015a)

As shown in Table 6.1.4-2, various sources affect Nevada's waterbodies, causing impairments. At least half of all waters assessed are impaired. Common impaired uses include impairment of aquatic uses and contact recreation in rivers and streams. In lakes and reservoirs, the most common impaired uses include aquatic life, fish consumption, and municipal and domestic supply. Non-point source pollution causes the majority of impairments to Nevada's waterbodies. They include pollutants from atmospheric deposition; bacteria and excess nutrients from pet and livestock waste and faulty septic systems; abandoned mine acid drainage; excess salts from irrigation; pollutants such as fertilizers, herbicides, insecticides, greases, oils, and other toxic chemicals from both urban and agricultural lands; and sediments from construction site, crop, and forest land runoff. Total Maximum Daily Loads (TMDL) have been developed for more than 90 waterbody segment/parameter combinations. Additional information on Nevada's water quality, including 305(b) and 303(d) reports, can be found on the NDEP Bureau of Water Quality Planning, Water Quality Standards and Monitoring Branch website (www.ndep.nv.gov/bwqp/standard.htm). (NDEP, 2014a)

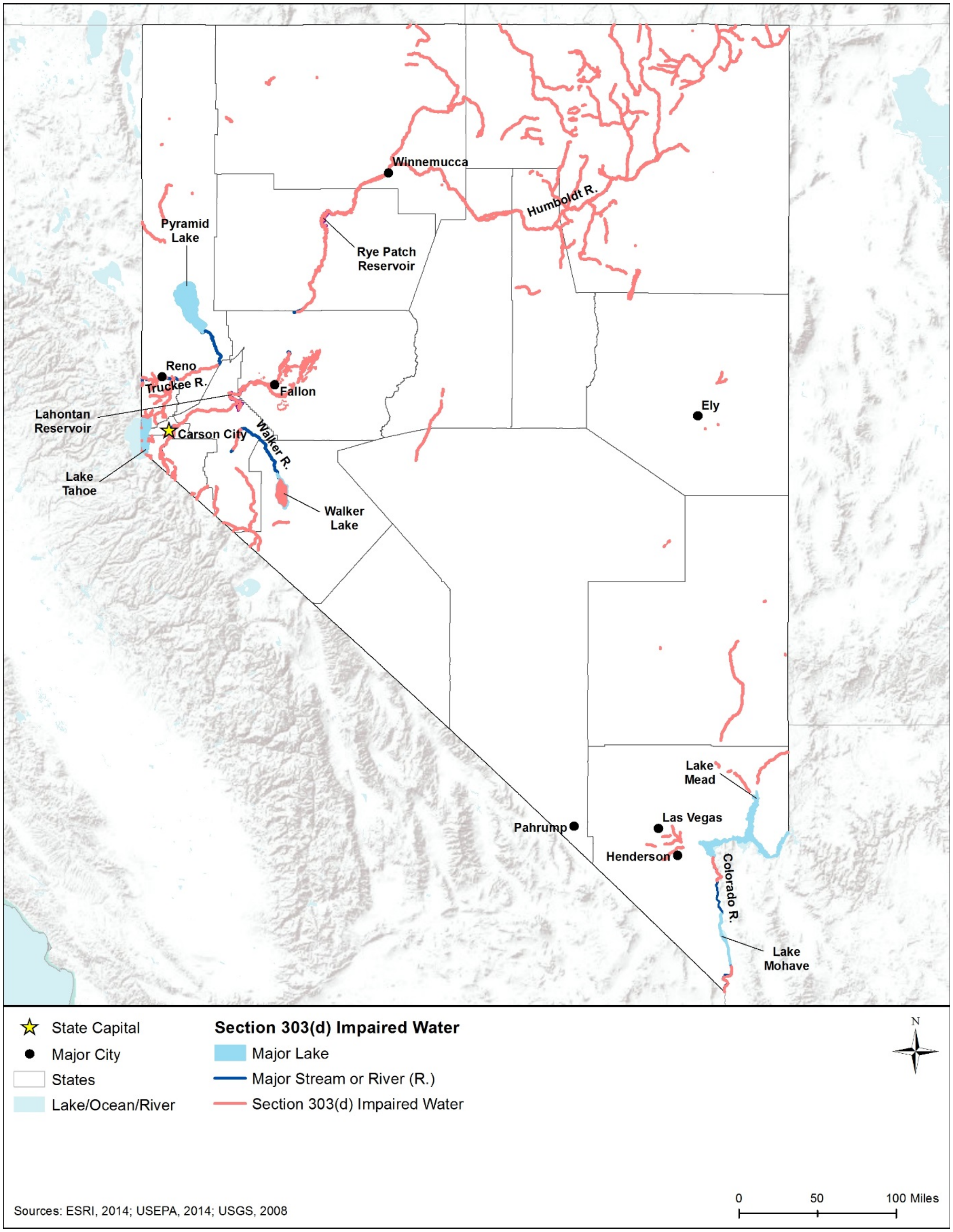

Figure 6.1.4-2 Section 303(d) Impaired Waters of Nevada, 2014

6.1.4.6. 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).[53] 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, 2014)

The primary type of floodplain in Nevada is Riverine floodplains (including along streams and arroyos that are normally dry) (NDEM, 2013). Riverine and lake floodplains occur along rivers, streams, or lakes where overbank flooding may occur, inundating adjacent land areas. 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, 2014).

There are several causes of flooding in Nevada, including flash flooding from rainfall and snowmelt, as well as earthquakes or dam failure. Riverine flooding has occurred in the past along the Carson, Truckee, Walker, Humboldt, and Amargosa rivers, and the lower Colorado River, Virgin River and Muddy Rivers. Flooding in these is likely to occur again. (NDEM, 2013)

Based on historical flooding and flood disaster declarations, the largest amount of flood insurance claims paid among counties in Nevada has been in Washoe County (which includes the cities of Reno and Sparks), followed by Clark County (including the cities of Boulder City, Henderson, Las Vegas, Mesquite, and North Las Vegas), and then Douglas County. (NDEM, 2013)

Local communities often have floodplain management or zoning ordinances that restrict development within the floodplain. FEMA provides floodplain management assistance, including mapping of 100-year floodplain limits, to approximately 34 communities in Nevada

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

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, 2015). 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 June 2016, Nevada has 34 communities participating in the CRS[54] (FEMA, 2016).

6.1.4.7. 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, such as 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, surface bodies of water, or wetlands. This exchange between surface water and groundwater is an important feature of the hydrologic (water) cycle.

Table 6.1.4-3 provides details on aquifer characteristics in the state; Figure 6.1.4-3 shows Nevada's principal aquifers. There are no sole source aquifers in Nevada (USEPA, 2014a).

Nevada's principal aquifers consist of carbonate-rock[55] volcanic-rock, basaltic-rock, and basin-fill aquifers. Groundwater supply is scarce throughout the state. Areas with higher concentrations of people, such as Carson City, Reno, Sparks, and Las Vegas, depend heavily on surface water for their public water supply. Agricultural irrigation draws the most groundwater from the aquifers. (USGS, 1995a)

[54] A list of the CRS communities can be found in the most recent FEMA CRS report dated May 1, 2014 (www.fema.gov/media-library-data/1398878892102-a5cbcaa727a635327277d834491210fec/CRS_Communites_May_1_2014.pdf) and additional program information is available from FEMA's NFIP CRS website (www.fema.gov/national-flood-insurance-program-community-rating-system).

[55] Carbonate-rock aquifers typically consist of limestone with highly variable water-yielding properties (some yield almost no water and others are highly productive aquifers) (Olcott, 1995).

Table 6.1.4-3 Description of Nevada's Principal Aquifers

Aquifer Type and Name	Location in State	Groundwater Quality
Basin and Range Basin-Fill Aquifers Typically unconfined and not hydraulically connected, consisting primarily of unconsolidated alluvial-fan deposits	Throughout the state	Generally useable, with localized dissolved solids concentrations that can exceed standards.
Pacific Northwest Basin-Fill Aquifers Unconsolidated and semiconsolidated sand and gravel	Small areas in the far western and northern areas of the state	Generally useable, with localized dissolved solids concentrations that can exceed standards.
Basin and Range Carbonate-Rock Aquifers Typically unconfined and not hydraulically connected, consisting primarily of unconsolidated alluvial-fan deposits	Eastern portions of the state	Suitable for most uses.
Pacific Northwest Basaltic-Rock Aquifers Igneous and metamorphic rock	Far northern and western areas of the state	Suitable for most uses.
Southern Nevada Volcanic-Rock Aquifers Consolidated volcanic rocks that underlie the unconsolidated alluvium	Southern areas of the state	Suitable for most uses, although arsenic concentrations can exceed standards.

Sources: (Thomas & Hoffman, 1987), (USGS, 1995b), (USGS, 1995a), (USGS, 2015c), (USGS, 2015d)

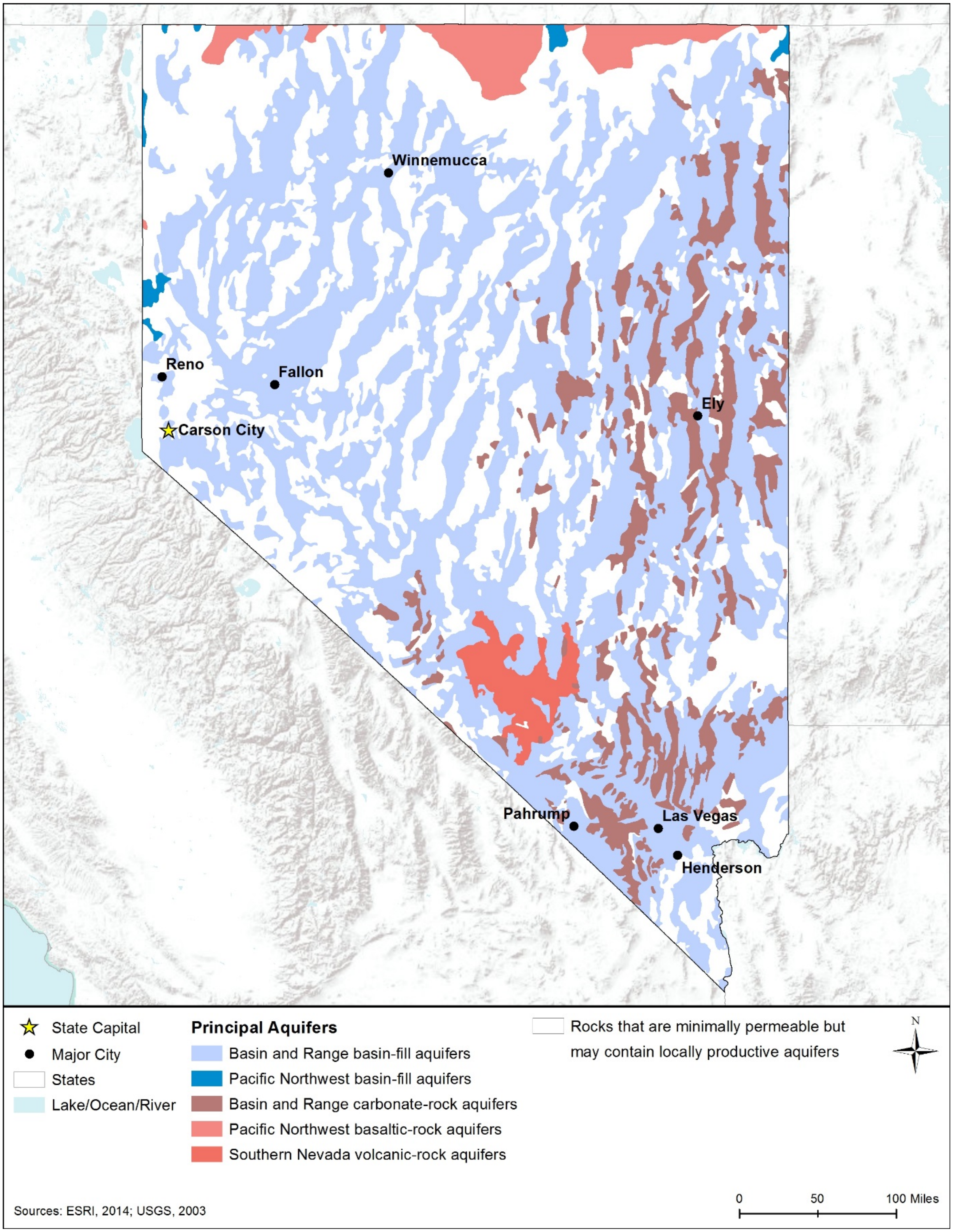

Figure 6.1.4-3: Principal Aquifers of Nevada

6.1.5. Wetlands

6.1.5.1. 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" (CFR, 1993).

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

6.1.5.2. Specific Regulatory Regulations

Appendix C, Environmental Laws and Regulations, explains the pertinent federal laws to protecting wetlands in detail. Table 6.1.5-1 summarizes the major Nevada state laws and permitting requirements relevant to the state's wetlands.

Table 6.1.5-1: Relevant Nevada Wetlands Laws and Regulations

State Law/Regulation	Regulatory Agency	Applicability
WQC (CWA Section 401)	NDEP	In accordance with Section 401 of the CWA, activities that may result in a discharge to waters of the U.S. require a WQC from NDEP indicating that the proposed activity will not violate water quality standards.

6.1.5.3. Environmental Setting: Wetland Types and Functions

The U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) mapping adopted a national Wetlands Classification Standard that classifies wetlands according to shared environmental factors, such as vegetation, soils, and hydrology, as defined in Cowardin et al. (Cowardin, Carter, Golet, & LaRoe, 1979). The Wetlands Classification System includes five major wetland systems: Marine, Estuarine, Riverine, Lacustrine, and Palustrine. Nevada includes two of these Systems, as detailed in Table 6.1.5-2. Four wetland systems include both wetlands and deepwater habitats, but the Palustrine includes only wetland habitats. (USFWS, 2015a)

- "The Marine System consists of the open ocean overlying the continental shelf and its associated high-energy coastline. Marine habitats are exposed to the waves and currents of the open ocean and the Water Regimes are determined primarily by the ebb and flow of oceanic tides. Salinities exceed 30 parts per thousand (ppt), with little or no dilution except outside the mouths of estuaries." Where wave energy is low, mangroves, or mudflats may be present.

- "The Estuarine System consists of deepwater tidal habitats and adjacent tidal habitats that are usually semi enclosed by land but have open, partly obstructed, or sporadic access to the open ocean and the ocean water is at least occasionally diluted by freshwater runoff from the land."
- "Riverine System includes all wetlands and deepwater habitats contained within a channel with two exceptions (1) wetlands dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens, and (2) habitats with water containing ocean-derived salts in excess of 0.5 ppt."
- Lacustrine System includes inland 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 salts is below 0.5 percent." The System is characterized based on the type and duration of flooding, water chemistry, vegetation, or substrate characteristics (soil types). (USFWS, 2013a) (FGDC, 2013).

In Nevada, the two main types of wetlands are palustrine (freshwater) wetlands found along channels, rivers, and lake floodplains; and lacustrine wetlands around lakes (both manmade and natural). Table 6.1.5-2 uses 2014 NWI data to characterize and map Nevada wetlands on a broad-scale. The data is not intended for site-specific analyses and is not a substitute for field-level wetland surveys, delineations, or jurisdictional determinations. As shown in Figure 6.1.5-1, both palustrine and lacustrine wetlands are located throughout the state. The map codes and colorings in Table 6.1.5-2 correspond to the wetland types in Figure 6.1.5-1.[56]

Table 6.1.5-2: Nevada 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.	Found throughout the state, including along the	190,541

[56] 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 scrub-shrub wetland	PSS	Woody vegetation less than 20 feet tall dominates PSS wetlands. Thickets and shrub swamps are examples of PSS wetlands.	Humboldt River in the north	
Palustrine emergent wetlands	PEM	PEM wetlands have erect, rooted, green-stemmed, annual, water-loving plants, excluding mosses and lichens present for most of the growing season in most years. PEM wetlands include freshwater marshes, wet meadows, fens[c], prairie potholes, and sloughs.	Mostly found in the north and western areas of the state.	497,272
Palustrine unconsolidated bottom	PUB	PUB and PAB are commonly known as freshwater ponds, and includes all wetlands with at least 25% cover of particles smaller than stones and a vegetative cover less than 30%.	Found throughout the state	2,672
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[d], and other miscellaneous wetlands are included in this group.	Found mostly in the western part of the state	3,980
Riverine wetland	R	Riverine systems include rivers, creeks, and streams. They are contained in natural or artificial channels periodically or continuously containing flowing water.	Found along rivers in the west and south, including the Colorado River	5,009
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.	Found throughout the state	999,163
			TOTAL	**1,698,637**

[a] The wetlands descriptions are based on information from the Federal Geographic Data Committee (FGDC)'s Classification of Wetland and Deepwater Habitats of the United States. Based on Cowardin et al. (1979), some data has been revised based on the latest scientific advances. The USFWS uses these standards as the minimum guidelines for wetlands mapping efforts. (FGDC, 2013)

[b] All acreages are rounded to the nearest whole number. The maps are prepared from the analysis of high altitude imagery. A margin of error is inherent in the use of imagery. The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. (USFWS, 2015b)

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

[d] 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)

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

Palustrine Wetlands

The most common type of palustrine wetlands in Nevada are forested, scrub-shrub, and emergent. Palustrine wetlands are found along the stream banks of most perennial streams in Nevada and along constructed channels. (USGS, 1996)

Large wetlands occur along the Truckee, Carson, and Colorado River basins (Nevada Natural Heritage Program, 2006). Palustrine wetlands in western Nevada, including Stillwater Marsh, serve as an essential habitat for migratory birds along the Pacific Flyway (USFWS, 1986). Artificial wetlands also comprise part of Nevada's wetlands. These are both intentionally and accidentally created, usually by water diversions and impoundment for irrigation, are found along irrigation ditches, drains and other impoundments, and sometimes include the meadows and marshes created by water diversions to feed livestock or to create habitat for wildlife. Artificial wetlands can also be created to control urban storm water, as stock ponds for fish, or to contain runoff from cultivated fields. Although these artificial wetlands typically fall short of providing the same benefits as native wetlands, they are a growing portion of Nevada's wetlands resources and are still preferable to net wetland loss (Nevada Natural Heritage Program, 2006).

Wetlands throughout the state are vulnerable due to water diversions and development, including both surface water diversions and groundwater withdrawal. And, the natural flushing functions of stream channels and wetlands caused by spring floods has been reduced because of the diversion of water for irrigation, construction of dams, and stream channelization (USGS, 1996). Urban and rural development, along with increased farming and mining activity are also threats to wetlands (Nevada Natural Heritage Program, 2006).

Lacustrine Wetlands

Lacustrine wetlands in Nevada are commonly formed in areas where groundwater is discharged from springs and seeps, such as the wetlands in the Ruby Lake area (USGS, 1996). Another common setting for wetlands is in playa lakes, which comprise nearly half of the mapped wetlands in Nevada. They are found in harsh environments, including terminal sinks and arid valleys below 5,000 feet, and usually appear as dry lakebeds that are inhospitable to animal and plant life. However, many desert plants, insects, amphibians, reptiles, and mammals dwell within these ecosystems. During above-normal precipitation periods, aquatic and wetland habitats form that benefit migratory birds and the local wildlife (Nevada Natural Heritage Program, 2006).

Playa and wet meadow wetlands are found in many areas of the state, but are most common in northwest Nevada. The large playas are Carson Sink (272,000 acres) and Black Rock Desert (108,000 acres). Both playas are located in west-central Nevada. Other large playas include Smoke Creek Desert and Winnemucca Lake in northwest Nevada, Spring Valley in eastern Nevada, Railroad Valley in south-central Nevada, and Clayton Valley in southwest Nevada. Non-playa lacustrine wetlands are found at Pyramid Lake, Walker Lake, Lake Tahoe, and Lake Mead, along with other small reservoirs. (USGS, 1996)

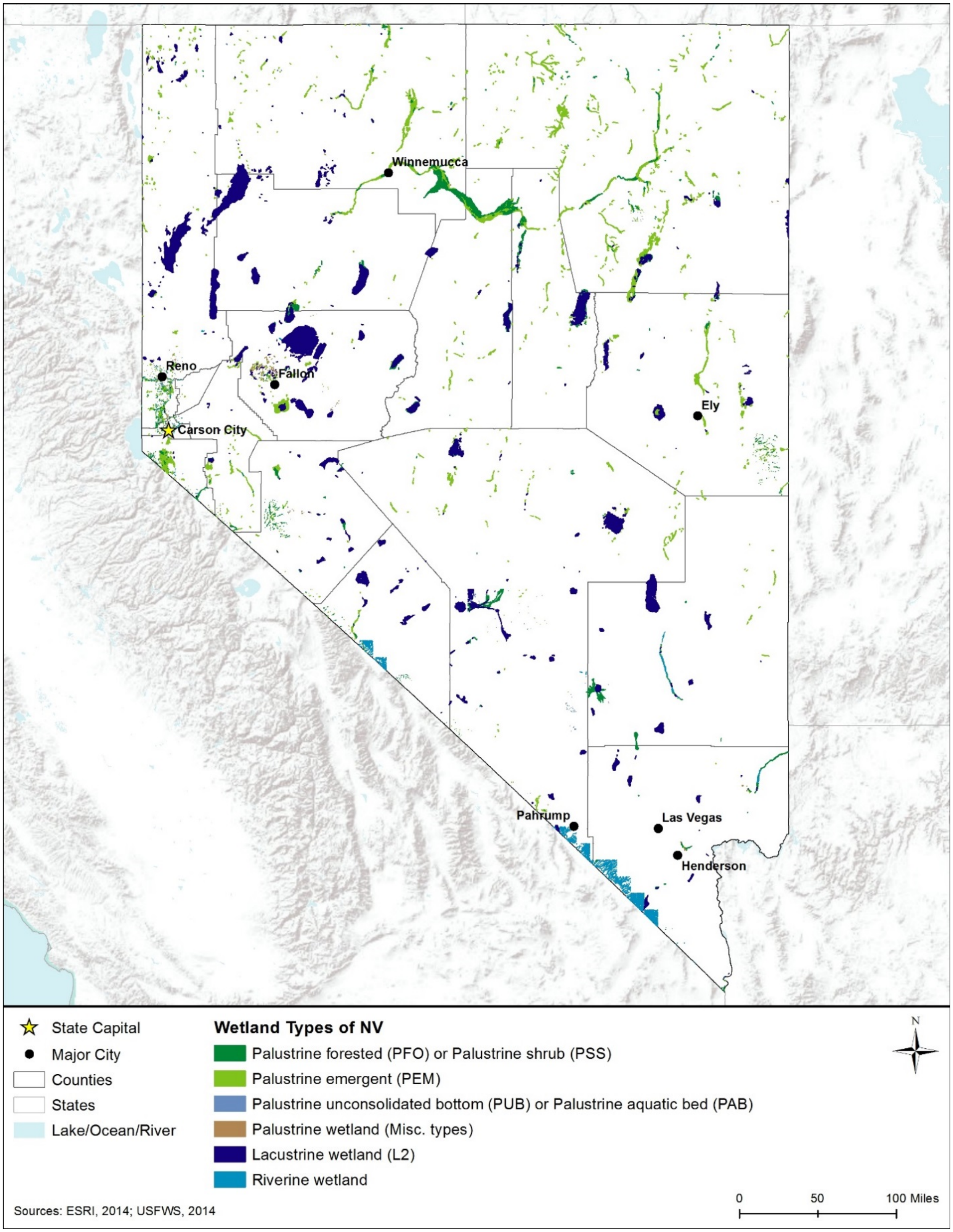

Figure 6.1.5-1: Wetlands by Type, Nevada, 2014

6.1.5.4. Wetlands of Special Concern or Value

There are no National Estuarine Research Reserves nor wetlands associated with Critical Resource Waters located in Nevada.

Stillwater Marsh, Nevada's largest wetland, is approximately 25,000 acres in size and considered a high quality wetland. It is located 60 miles east of Reno, near the town of Fallon, at the terminus of the Carson River. Stillwater Marsh provides important migratory bird habitat in the Pacific Flyway and, along with other wetlands in the Lahontan Valley, the area was designated a Hemispheric Reserve within the Western Hemispheric Shorebird Reserve Network. This area provides habitat for approximately 75 percent of the ducks in the state, along with 50 percent of the Canada geese (*Branta canadensis*), and 65 percent of tundra swans (*Cygnus columbianus*) (USGS, 1996). In 1990, Congress authorized the USFWS to purchase water rights and use that water to maintain the habitat of the Marsh. The USFWS, along with The Nature Conservancy, Nevada Department of Wildlife (NDOW), and the Nevada Waterfowl Association, have purchase nearly 30,000 acre-feet of water rights since then (Nature Conservancy, 2015).

Other important wetland sites in Nevada include:

- Wildlife Management Areas are managed for protection of wetlands and waterfowl, including the use of the areas as public hunting grounds outdoor recreation; these public lands include more than 120,000 acres (NDOW, 2012b). More information about state Wildlife Management Areas is available on the NDOW website: www.ndow.org/Nevada_Wildlife/Wildlife_Management_Areas/.
- National Natural Landmarks range in size from 15 acres to approximately 264,000 acres. They are owned by federal agencies including the U.S. Forest Service (USFS), USFWS, Department of Defense (DoD), and the Bureau of Land Management (BLM), along with Nevada State Parks, NDOW, and other private individuals (NPS, 2012b). More information about Nevada's Natural Landmarks is available on the National Park Service (NPS) website's Nevada page: www.nature.nps.gov/nnl/state.cfm?State=NV.
- Other wetlands protected under easements or agreements through voluntary government programs and resource conservation groups are found across the state. According to the National Conservation Easement Database, a national electronic repository of government and privately held conservation easements (http://conservationeasement.us/), Lyon County holds 12,559 acres, The Nature Conservancy holds 8,577 acres, the NRCS holds 3,917 acres, the USFS holds 717 acres, and the Nevada Land Trust holds 599 acres in conservation easements in Nevada (NCED, 2015).

For more information on Nevada's wildlife management areas, National Natural Landmarks, conservation programs, and easements, see Section 6.1.7, Land Use, Recreation, and Airspace, and Section 6.1.8, Visual Resources.

6.1.6. Biological Resources

6.1.6.1. Definition of the Resource

This section describes the biological resources of Nevada. Biological resources include terrestrial[57] vegetation, wildlife, fisheries and aquatic[58] habitats, and threatened[59] and endangered[60] 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 and climate variation within the state, Nevada supports a wide diversity[61] of biological resources ranging from lowland desert settings in the southern portion of the state, to mountain forests in the northern portion of Nevada. Each of these topics is discussed in more detail below.

6.1.6.2. Specific Regulatory Considerations

The proposed project must meet the requirements of NEPA and other applicable laws and regulations. Pertinent federal laws relevant to the protection and management of biological resources in Nevada are summarized in Appendix C, Environmental Laws and Regulations, and Section 1.8, Overview of Relevant Federal Laws and Executive Orders. Table 6.1.6-1 summarizes the major state laws relevant to the state's biological resources.

Table 6.1.6-1: Relevant Nevada Biological Resources Laws and Regulations

State Law/Regulation	Regulatory Agency	Applicability
Control of insects, pests, and noxious weeds through Nevada Revised Statute 555 (NRS Chapter 555)	Weed Control Districts	Requires each county in Nevada to prepare regulations for their district for species identification management, and control.
Administration and Enforcement of Wildlife Laws (NRS Chapter 501 and Nevada Administration Code [NAC] 501)	NDOW	Establishes procedures for administering the state's wildlife laws for hunting and taking wildlife (specifically game mammals and birds); unlawfully possessing live wildlife, big game, fur-bearing mammals outside open hunting season, or game birds and fish during closed season; transferring wildlife without proper permits, tags, or seals; and unlawfully importing or transporting prohibited species of wildlife without a permit or license.
Wildlife Licenses, Tags, and Permits (NRS Chapter 502 and NAC 502)	NDOW	Outlines the process for obtaining and using licenses and permits required for hunting and fishing.

[57] Terrestrial: "Pertaining to land." (USEPA, 2015n)
[58] Aquatic: "Pertaining to water." (USEPA, 2015n)
[59] Threatened species are "any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range" (16 U.S.C §1532(20)) (USEPA, 2015n).
[60] Endangered species are "any species which is in danger of extinction throughout all or a significant portion of its range" (16 U.S.C §1532(6)) (USEPA, 2015n).
[61] Diversity: "An ecological measure of the variety of organisms present in a habitat." (USEPA, 2015n)

State Law/Regulation	Regulatory Agency	Applicability
Hunting, Fishing, and Trapping; Miscellaneous Protective Measures (NRS Chapter 503 and NAC 503)	NDOW	Summarizes provisions for hunting, fishing, and trapping fur-bearing mammals and permits required to hunt, trap, and possess birds of prey. Summarizes wildlife protection and propagation of native fauna regulations, including regulations for bald and golden eagles, as well as birds protected under the Migratory Bird Treaty Act (MBTA).
Wildlife Management and Propagation (NRS Chapter 504 and NAC 504)	NDOW	Establishes wildlife management areas, outlines the process for administering funds related to wildlife damage, describes wildlife protection procedures to capture and seize escaped wildlife, establishes shooting preserves for upland game birds, outlines hunting and fishing guides, and summarizes the regulations for wild horses preservation.

6.1.6.3. Terrestrial Vegetation

The distribution of flora within the state is a function of the characteristic geology,[62] soils, climate,[63] and water of a given geographic area and correlates with distinct areas identified as ecoregions.[64] 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. The boundaries of an ecoregion are not fixed, but rather depict a general area with similar ecosystem types, functions, and qualities (NWF, 2015) (USFS, 2015c) (WWF, 2015). Ecoregion boundaries often coincide with geographic regions of a state. In Nevada, geographic regions include the Columbia Plateau, the Great Basin, the Sierra Nevada Mountains, and the Mojave Desert, with the Great Basin occupying the majority of the state. The ecoregions mapped by the USEPA are the most commonly referenced, although individual states and organizations have also developed ecoregions that may differ slightly from those designated by the USEPA. The USEPA 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 provides an overview of the terrestrial vegetation resources for Nevada at USEPA Level III (USEPA, 2016a).

As shown in Table 6.1.6-1, the USEPA divides Nevada into five Level III ecoregions. The five ecoregions support a variety of different plant communities, all predicated on their general location within the state. Communities range from coniferous[65] forest and alpine communities in the Sierra Nevada Mountain region to desert regions found in the majority of the state. Table 6.1.6-2 provides a summary of the general abiotic[66] characteristics, vegetative communities, and the typical vegetation found within each of the five Nevada ecoregions.

[62] "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, 2015n)
[63] Climate: "Climate in a narrow sense is usually defined as the "average weather," or more rigorously, as the statistical description in terms of the mean and variability of relevant quantities over a period of time ranging from months to thousands of years. The classical period is 3 decades, as defined by the World Meteorological Organization (WMO)." (USEPA, 2015n)
[64] Ecoregion: "A relatively homogeneous ecological area defined by similarity of climate, landform, soil, potential natural vegetation, hydrology, or other ecologically relevant variables." (USEPA, 2015n)
[65] Coniferous: "Cone-bearing trees, mostly evergreens, that have needle-shaped or scale-like leaves." (USEPA, 2015n)
[66] 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, 2016c)

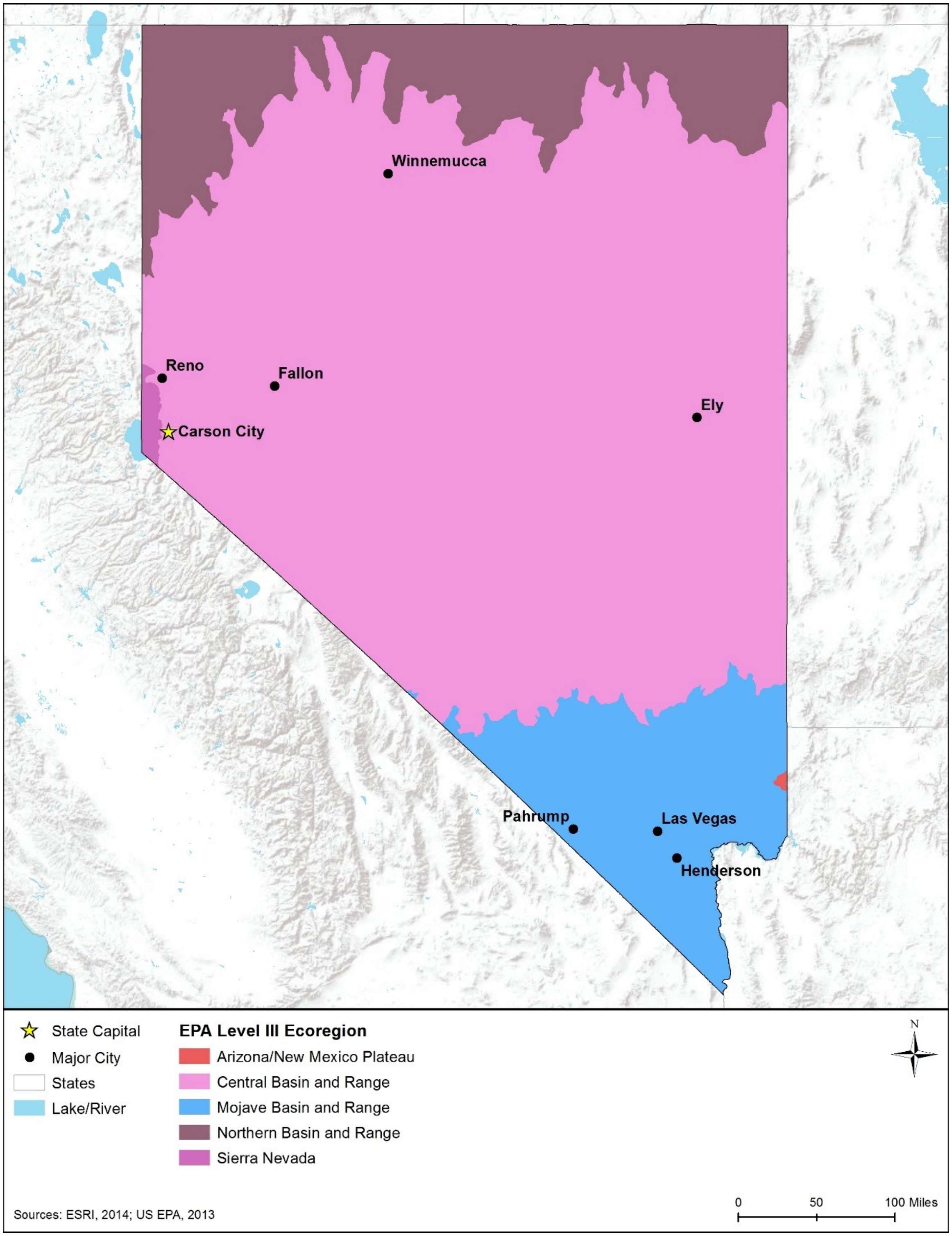

Figure 6.1.6-1: USEPA Level III Ecoregions in Nevada

Table 6.1.6-2: USEPA Level III Ecoregions of Nevada

Ecoregion Number	Ecoregion Description	Abiotic Characterization	General Vegetative Communities	Typical Dominant Vegetation
Geographic Region: Sierra Nevada Mountains				
5	Sierra Nevada	A deeply dissected fault block[a] that rises sharply from the arid basin and range ecoregions to the east. This region slopes gently towards Central California to the west. The central and southern portion is underlain by granite.	Ponderosa pine, Lodgepole Pine Forest, Fir-Spruce Forest	• **Conifer Trees –**Ponderosa pine (*Pinus ponderosa*), lodgepole pine (*Pinus contorta*), Jeffery pine (*Pinus jeffreyi)*, red fir *(Abies magnifica)*, white fir (*Abies concolor)*, incense cedar (*Calocedrus decurrens)*, Western white pine (*Pinus monticola)*, sugar pine (*Pinus lambertiana)* • **Hardwood Trees –** Mountain willow (*Salix eastwoodiae*), dusky willow (*Salix melanpsis)*, quaking aspen (*Populus tremuloides)*, California poplar (*Populus trichocarpa)*, white alder (*Alnus rhombifolia)* • **Shrubs –** Madrone (*Aesculus californica)*, chamise (*Adenostoma fasciculatum)*, manzanita (*Arctostaphylos* spp.*)*, Sierra currant (*Ribes nevadense*), common sagebrush (*Artemisia tridentata)*, Utah juniper (*Juniperus osteosperma)*
Geographic Region: The Great Basin				
13	Central Basin and Range	A mosaic of arid[b] basins with scattered low mountains, high mountains, and salt flats. This ecoregion tends to be hot with a greater density of mountains with perennial streams.[c]	Mixed desert scrub, Pinyon-Juniper woodland, Sage brush Scrub, Sagebush Steppe, Salt-Desert Shrub	• **Cacti–** Joshua tree (*Yucaa brevifolia)* • **Conifer Trees –** Pinyon pine (*Pinus monophylia)*, Juniper (*Juniperus osteosperma)* • **Shrubs –** Creosote bush (*Larrea tridentate*), bursage (*Ambrosia dumosa)*, Shadescale (*Atriplex* spp.), Searls' prairie clover (*Dalea searlsiae)*, blackbush (*Colegyne ramosissima)*, burrobush (*Ambrosia dumonsa*), saltbush species (*Artiplex species)*, Sagebrush (*Artemisia)*, winterfat (*Ceratoides lanata)*, rabbitbrush (*Chrysothamnus)*, blackbrush (*Coleogyne)*, horsebrush (*Tetradymia)*
22	Arizona/New Mexico Plateau	Transitional region between semiarid grasslands to the east, drier shrublands and woodlands of the Colorado Plateau to	Big sagebrush scrub, Black greasewood, Juniper-pinyon,	• **Conifer Trees –** Utah juniper (*Juniperus osteosperma)*, Rocky Mountain Juniper (*Juniperus scopulorum)*

Ecoregion Number	Ecoregion Description	Abiotic Characterization	General Vegetative Communities	Typical Dominant Vegetation
		the north, and the lower, hotter, less vegetated Mojave Basin in the west and Chihuahuan Desert in the south.	Mountain brush, Shadscale-saltbrush, Wyoming big sagebrush	• **Hardwood Trees -** Water birch (*Betula occidentalis)*, paper birch (*Betula papyrifera),* curl-leaf mountain mahogany (*Cercocarpus ledifolius)*, alderleaf mountain mahogany (*Cercocarpus montanus)*, singleleaf ash (*Fraxinus anomala)*, gambel oak (*Quercus gambelii)* • **Shrubs -** Greasewood (*Sarcobatus vermiculatus),*winterfat (*Krascheninnikovia lanata*), rubber rabbitbrush (*Ericameria nauseosa),* Bigelow sage (*Artemisia bigelovii*), yellow rabbitbrush (*Chrysothamnus viscidiflorus*), little sagebrush (*Artemisia arbuscula*), Bigelow sage *(Artemisia bigelovii*), basin big sagebrush (*Artemisia tridentata*), Wyoming big sagebrush (*Artemisia tridentate wyomingensis*) • **Grasses/Forbs -** Saltbush (*Atriplex spp.*), Indian ricegrass (*Achnatherum hymenoides)*
Geographic Region: The Mojave Desert				
14	Mojave Basin and Range	Scattered low mountains with very little rainfall.	Creosote Bush Scrub, Alkali Sink, Aspen-conifer Forest, Basin big Sagebrush, Black Greasewood, Mixed Desert Scrub, Inland Saltgrass, Joshua Tree Woodland, Pinyon-Juniper Woodland, Shadscale scrub	• **Conifer Trees –** Utah juniper (*Juniperus osteosperma)*, California juniper (*Juniperus californica)* • **Hardwood Trees –** Rocky Mountain maple (*Acer glabrum)*, boxelder (*Acer negundo)*, thinleaf alder (*Alnus incana tenuifolia*), water birch (*Betula occidentalis)* • **Shrubs –** Creosote bush (*Larrea tridentat*e), burrobrush (*Hymenoclea salsola),* Rusty Molly (*Kochia californica)*, slender bedstraw (*Galium angustifolium)* • **Grasses/Forbs –** Mojave woolly sunflower (*Eriophyllum mohavense),* Thomas buckwheat (*Eriogonum thomasii)*, common fiddleneck (*Amsinckia menziesii)*
Geographic Region: Columbia Plateau				

Ecoregion Number	Ecoregion Description	Abiotic Characterization	General Vegetative Communities	Typical Dominant Vegetation
80	Northern Basin and Range	Consists of arid tablelands,[d] intermountain basins, dissected lava plains, and scattered low mountains.	Sagebrush Steppe, Shadescale Scrub, Greasewood	• **Conifer Trees –** Douglas fir *(Pseudotsuga mensiesii)* • **Hardwood Trees –** Quaking aspen (*Populus tremuloides)* • **Shrubs –** Mountain sagebrush (*Artemisia tridentate vaseyana)*, little sagebrush (*Artemisia arbuscula)*, Wyoming big sagebrush (*Artemisia tridentate wyomingensis)* • **Grasses/Forbs –** Idaho fescue (*Festuca idahoensis)*, spiny hopsage (*Grayia spinosa)*

[a] Fault Block: "A fracture or zone of fractures between two blocks of rock." (USGS, 2016d)
[b] Arid: "Terrestrial systems characterized by a climate regime where the potential evapotranspiration exceeds precipitation, annual precipitation is not less than 5 cm and not more than 60 cm, and daily and seasonal temperatures range from 40 C to 50 C." (USEPA, 2015n)
[c] Perennial stream: "A stream that runs continuously throughout the year." (USEPA, 2015n)
[d] Tablelands: broad high-level area; a plateau.
Sources: (USEPA, 2015b) (CEC, 2011)

Communities of Concern

Nevada contains vegetative communities of concern that include rare natural plant communities, plant communities with greater vulnerability or sensitivity to disturbance, and communities that provide habitat for rare plant and wildlife species. Although there is a global ranking system for these communities, which give an indication of the relative rarity, sensitivity, uniqueness, or vulnerability of these areas to potential disturbances, Nevada has not ranked vegetation communities using a similar system. Instead, NDOW has identified 22 key habitat groups that occur in the state.

NV Appendix A, Table A-1 Biological Resources provides a description of the communities of conservation concern in Nevada along with their distribution, abundance, and 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. Noxious weeds are typically non-native species that have been introduced into an ecosystem either inadvertently or purposely (such as kudzu); however, on occasion native species can be considered a noxious weed. Noxious weeds greatly affect agricultural areas, forest management, natural, and other open areas (GPO, 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.) and the state further designated noxious weeds to be controlled within Nevada (Nevada Administrative Code 555.010). According to NRS Chapter 555.005, noxious weeds are "…any species of plant which is, or is likely to be, detrimental or destructive and difficult to control or eradicate." As of September 2014, 112 federally recognized noxious weed species have been catalogued in the U.S. (88 terrestrial, 19 aquatic, and 5 parasitic[67]) (USDA, 2015), of which 47 are on the Nevada Noxious Weed List (NDA, 2015a).

Noxious weeds are a threat to Nevada's key habitat communities, as described above. Noxious weeds can have adverse ecological and economic impacts to these resources by displacing native species, degrading wildlife habitat, and increasing soil erosion[68] (NDA, 2015b). Below is a summary of the noxious weeds regulated in Nevada by plant type.

- **Aquatic –** Purple loosestrife (*Lythrum salicaria*, *Lythrum virgatum*, and their cultivars), Eurasian water-milfoil (*Myriophyllum spicatum*); and
- **Terrestrial Forbs and Grasses –** Camelthorn (*Alhagi maurorum*), Stinking chamomile (*Anthemis cotula*), Giant reed (*Arundo donax*), African mustard (*Brassica tournefortii*), Musk thistle (*Carduus nutans*), Crimson fountaingrass (*Cenchrus setaceus*), Purple starthistle (*Centaurea calcitrapa*), Diffuse knapweed (*Centaurea diffusa*), Iberian starthistle (*Centaurea iberica*), Malta starthistle (*Centaurea melitensis*), Yellow

[67] Parasitic: An organism living on a host species

[68] 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, 2015n)

starthistle (*Centaurea solstitialis*), Spotted knapweed (*Centaurea stoebe ssp*.), Squarerose knapweed (*Centaurea virgate*), Rush skeletonweed (*Chondrilla juncea*), Spotted waterhemlock (*Cicuta maculate*), Canada thistle (*Cirsium arvense*), poison-hemlock (*Conium maculatum*), common crupina (*Crupina vulgaris*), houndstongue (*Cynoglossum officinale*), leafy spurge (*Euphorbia esula*), goatsrue (*Galega officinalis*), Hydrilla (*Hydrilla verticillata*), Black henbane (*Hyoscyamus niger*), Common St. Johnswort (*Hypericum perforatum*), Dyer's woad (*Isatis tinctoria*), hoary cress (*Lepidium draba*), Perennial pepperweed (*Lepidium latifolium*), Dalmatian toadflax (*Linaria dalmatica*), yellow toadflax (*Linaria vulgaris*), Scotch thistle (*Onopordum acanthium*), African rue (*Peganum harmala*), sulfur cinquefoil (*Potentilla recta*), Russian knapweed (*Rhaponticum repens*), Austrian fieldcress (*Rorippa austriaca*), Mediterranean sage (*Salvia aethiopis*), Giant salvinia (*Salvinia molesta*), Horsenettle (*Solanum carolinense*), Silverleaf nightshade (*Solanum elaeagnifolium*), Perennial sowthistle (*Sonchus arvensis*), Johnsongrass (*Sorghum halepense*), Swainsonpea (*Sphaerophysa salsula*), Medusahead (*Taeniatherum caput-medusae*), Tamarisk (*Tamarix spp.*) Puncturevine (*Tribulus terrestris*), Syrian beancaper (*Zygophyllum fabago*).

6.1.6.4. Terrestrial Wildlife

This section discusses the terrestrial wildlife species in Nevada, divided among mammals,[69] birds,[70] reptiles and amphibians,[71] and invertebrates.[72] 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, nongame animals, game birds, waterfowl, and migratory birds as well as their habitats within Nevada. 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.

Nevada has a rich and varied biodiversity and among the 50 states, it ranks 11th in overall biological diversity and 6th in the nation for endemics,[73] with 173 species found in Nevada and nowhere else in the world (NDOW, 2013a). The Nevada Natural Heritage Program (NNHP) is currently tracking over 600 species on either the program's tracking list or watch list. Species placed on the tracking list include species that NNHP actively maintain inventories for, including compiling and mapping data; regularly assessing conservation status; and providing information for proactive planning efforts. Generally, these species are ranked S-1 to S-3,[74] have federal or

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[69] 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, 2015n)

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

[71] 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, 2015n)

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

[73] Endemics: "A species or higher taxonomic unit found only within a specific area." (USEPA, 2015n)

[74] NatureServe Conservation Status Rank referring to state species populations (S) as: S1 "Critically Imperiled – At very high risk of extirpation in the jurisdiction due to very restricted range, very few populations or occurrences, very steep declines, severe threats, or other factors"; S2 – "Imperiled – At high risk of extirpation in the jurisdiction due to restricted range, few populations or occurrences, steep declines, severe threats, or other factors"; or S3 "Vulnerable – At moderate risk of extirpation in the

other state agency status, and are considered at the highest risk for extirpation[75] or extinction. According to the Nevada Wildlife Action Plan (WAP) prepared by NDOW in 2013, the state is home to a total of 136 mammal species, 487 total bird species including 275 bird species that breed in the state, 56 reptile species, 15 amphibian species, and approximately 151 freshwater fish species (NDOW, 2013a). Of the approximate 340 species assessed in the state, Nevada recognizes 256 Species of Conservation Priority[76] (NDOW, 2013a).

Mammals

Common and widespread mammalian species in Nevada include its largest carnivore, the black bear (*Ursus americanus*), as well as mountain lions (*Puma concolor*), coyote (*Canis latrans*), kit fox (*Vulpes macrotis*), gray fox (*Urocyon cinereoargenteus*), and bobcat (*Lynx rufus*). The red fox (*Vulpes vulpes*) also occurs in the state, and occurrences of the Sierra Nevada red fox, a California subspecies, have been confirmed on the Nevada side of Lake Tahoe indicating the species may exist in Nevada. Other common carnivore species include the northern river otter (*Lontra Canadensis*), mink (*Neovison vison*), long-tailed weasel (*Mustela frenata*), ermine (*Mustela erminea*), American badger (*Taxidea taxus*), striped skunk (*Mephitis mephitis*), spotted skunk (*Spilogale*), and American marten (*Martes americana*). Raccoons (*Procyon lotor*) and ringtails (*Bassariscus astutus*) also occur in Nevada. Most mammals are widely distributed in the state. A number of threatened and endangered mammals are located in Nevada. Section 6.2.6.6, Threatened and Endangered Species, identifies these protected species. (NDOW, 2013b)

In Nevada, mule deer (*Odocoileus hemionus*) also occur and were much less numerous until the 1920s and 1950s when there was a population boom. After a second population boom in the mid-1980s, mule deer have been declining as wildfire impacts their winter ranges and reduces native vegetation. Similarly, bighorn sheep (*Ovis canadensis*) have returned too much of their original range through assistance from NDOW programs and partners with sportsmen organizations (NDOW, 2013b). Pronghorn (a mammal similar to an antelope) (*Antilocapra americana*) are increasing in response to changes in range conditions that are shifting from shrub-dominated vegetative communities to more grass/forb-dominated vegetative communities (NDOW, 2013a). Rocky Mountain elk (*Cevus elaphus nelsoni*) are also increasing their population and range across the state in response to improved range conditions with more significant grass components (NDOW, 2013b).

Nevada has identified 40 mammals as Species of Conservation Priority in the Nevada WAP Revision. The Species of Conservation Priority 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 Species of Conservation Priority list is updated periodically and is used by the state to focus their conservation efforts and as a basis for implementing the Nevada WAP (NDOW, 2013a). Since 2005, the following mammal species

jurisdiction due to a fairly restricted range, relatively few populations or occurrences, recent and widespread declines, threats, or other factors." (Nevada Natural Heritage Program, 2016)
[75] Extirpation: "A species no longer surviving in regions that were once part of their range." (USFWS, 2015c)
[76] Species populations in decline, rare, or vulnerability.

were added to the list: Mexican free-tailed bat (*Tadarida brasiliensis),* Sierra Nevada snowshoe hare (*Lepus americanus tahoensis),* and Silver-haired bat (*Lasionycteris noctivagans*) (NDOW, 2013a).

Birds

According to the Nevada Birds Records Committee (NBRC),[77] approximately 487 bird species have been documented in Nevada including 275 that are known to regularly breed in the state, and a small percentage that are year-round residents. Among the 275 extant[78] species in Nevada, 60 Species of Conservation Priority have been identified (NDOW, 2013a). Of the bird species recorded, approximately 129 species only occur irregularly as accidentals or vagrants. The remaining balance migrates through Nevada in the spring or fall, or use the state as their wintering area. In general, the diverse ecological communities found in Nevada support a large variety of bird species. With 314 mountain ranges of varying elevations (500 feet to 13,000 feet), 2 deserts, portions of 5 ecoregions, 7 major habitat types, and 22 “key habitats,” Nevada provides a wide range of habitat diversity for birds (NDOW, 2013a). Other factors affecting the state’s bird diversity include its geography, precipitation patterns, continental bird migration patterns, and the dominant Basin and Range topography (NDOW, 2013b).

Nevada is located within the Pacific Flyway. The Pacific Flyway covers the entire state of Nevada and spans from the west coast of Mexico to the arctic. Large numbers of migratory birds utilize this flyway 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 majority of waterbird migration in this flyway takes place west of the Sierra Nevada Mountains; the other concentration of migration occurs following the Rocky Mountains. However, the occurrence of several large wetland areas in the Lahontan Valley and near the Ruby Lakes attracts a significant number of ducks, geese, shorebirds, and wading birds to Nevada during the migration season (NDOW, 2013a).

“The [MBTA] makes it illegal for anyone to take, possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, or barter, any migratory bird, or the parts, nests, or eggs of such a bird except under the terms of a valid permit issued pursuant to Federal regulations” (USFWS, 2013a). The USFWS is responsible for enforcing the MBTA and maintaining the list of protected species. The migratory bird species protected under the MBTA are listed in 50 CFR 10.13 (USFWS, 2013a).

Bald eagles (*Haliaeetus leucocephalus*) are protected under the Bald and Golden Eagle Protection Act. Bald eagles may be found wintering in Nevada and occasionally nesting in northern parts of the state along rivers and coastlines (NDOW, 2012c). Golden eagles (*Aquila chrysaetos*) are found in several counties of Nevada (NatureServe, 2015).

[77] NVBC, among other purposes, “evaluate[s] and endorse[s] records of occurrence of selected birds within the state of Nevada,” “release[s] for publication at least minimal data on all records”, and “keep[s] or cause[s] to be kept the office Nevada State List.” (NBRC, 2016)
[78] Extant: “A species that is currently in existence (the opposite of extinct).” (USEPA, 2015n)

A number of Important Bird Areas (IBAs) have also been identified in Nevada (Figure 6.1.6-2). The IBA program is an international bird conservation initiative with a goal of identifying the most 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 (NGOs), 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 critical habitat for native bird populations (Audubon Society, 2016).

According to the Audubon Society, 40 IBAs have been identified in Nevada encompassing approximately 6,431,941 acres and, including breeding,[79] migratory stopover, feeding, and over-wintering areas, and a variety of habitats such as native grasslands, sagebrush, and wetland/riparian[80] areas (Audubon Society, 2016). These IBAs are widely distributed throughout the state, although the largest concentration of IBAs are located in the southern portion of the state in the Mojave Desert and across the Great Basin range in the central portion of the state. These IBAs occur at spring-fed wetlands, desert uplands, a variety of mountain ranges across the states, in cottonwood-willow riparian forests, pasture-grasslands, washes, and at within desert playas in broad valleys (Audubon Society, 2016).

A number of threatened and endangered birds are located in Nevada, including the Southwestern willow flycatcher (*Empidonax traillii extimus*) and Yellow-billed cuckoo (*Coccyzus americanus*) (USFWS, 2015d). Section 6.2.6.6, Threatened and Endangered Species, identifies these protected species.

[79] Breeding range: "The area utilized by an organism during the reproductive phase of its lifecycle and during the time that young are reared" (USEPA, 2015n)
[80] 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, 2015n)

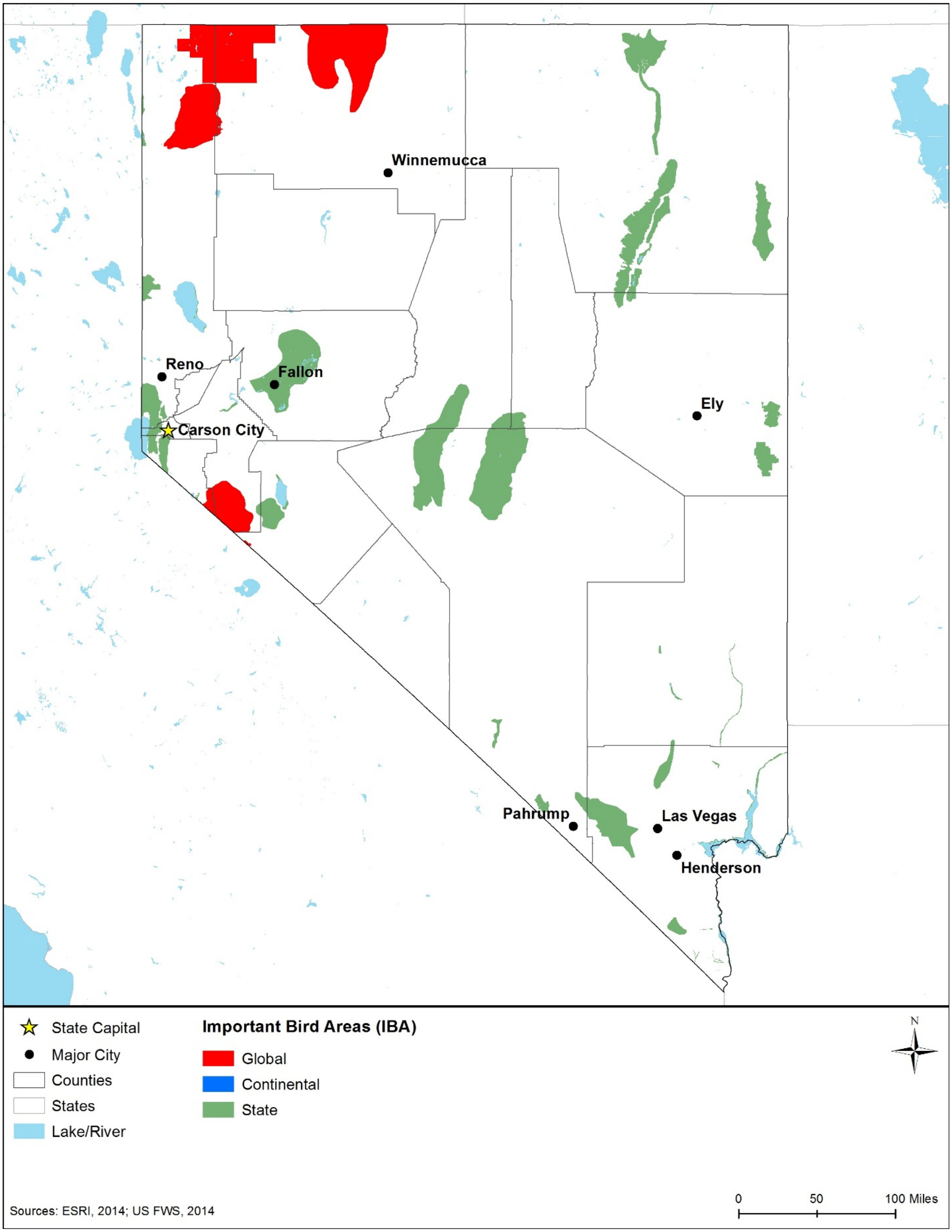

Figure 6.1.6-2: Important Bird Areas in Nevada

Reptiles and Amphibians

A total of 71 native reptile and amphibian species occur in Nevada, including 56 reptile species and 15 amphibian species. The 51 native reptile species in the state consist of 26 snakes, 24 lizards, and 1 turtle; the 15 amphibian species consist of 6 frogs and 9 toads (NDOW, 2013a).

Several of the reptile species, including the desert horned lizard (*Phrynosoma platyrhinos),* western whiptail lizard (*Aspidoscelis tigris),* long-nosed leopard lizard *(Gambelia wislizenii),* gopher snake (*Pituophis catenifer),* and striped whipsnake (*Masticophis taeniastus ornatus)* are common and can be found throughout the state. Other species, such as the northern alligator lizard (*Elgaria coerulea),* western red-tailed skink *(Plestiodon gilberti rubricaudatus),* Sonoran mountain kingsnake (*Lampropeltis pyromelana)*, and western diamondback rattlesnake (*Crotalus atrox)* have specific habitat requirements or are found in small and isolated populations in Nevada. Population distribution information for amphibian species is limited to a few species, including the Columbia spotted frog (*Rana luteiventris*), Amargosa toad (*Bufo nelson*), and relict leopard frog (*Lithobates onca*). For other species, documentation is limited, and some evidence has detected declines in most Nevada amphibian species, which have been attributed to alterations in habitat quality and availability (NDOW, 2013b).

Of the 51 native reptile and amphibian species, 35 Species of Conservation Priority have been identified (9 amphibian and 26 reptile species) (NDOW, 2013a). There are no federally listed reptiles in Nevada (USFWS, 2015d).

Invertebrates

Nevada is home to many species of invertebrates, including a wide variety of bees, hornets, wasps, butterflies, moths, beetles, flies, dragonflies, damselflies, spiders, mites, and nematodes. These invertebrates provide an abundant food source for mammals, birds, reptiles, amphibians, and other invertebrates. In the United States, one third of all agricultural output depends on pollinators.[81] 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. “By helping to keep plant communities healthy and able to reproduce naturally, native pollinators assist plants in providing food and cover for wildlife, preventing erosion, and keeping waterways clean” (NRCS, 2005).

The Nevada Department of Agriculture (NDA) has jurisdiction over the management of insects. Their mission is to encourage and advance the protection of agriculture in the state. As a result, their focus is on managing insects that are considered agricultural pests. The NNHP tracks approximately 168 sensitive insect species and 28 species on its watch list. The 168 tracked sensitive insect species consist of 2 arthropods,[82] 80 mollusks, and 86 insects (NDOW, 2013a). A number of threatened and endangered invertebrates are located in Nevada. Section 6.1.6.6,

[81] Pollinators: “Animals or insects that transfer pollen from plant to plant.” (USEPA, 2015n)
[82] Arthropods: “Any member of the phylum Arthropoda, which are characterized by jointed appendages, an exoskeleton, and segmented body parts. Arthropods are the most diverse group of animals on Earth and include insects, crustaceans, arachnids, myriapods, and onychophorans as well as extinct forms like trilobites.” (Smithsonian Institution, 2016)

Threatened and Endangered Species and Species of Conservation Concern, identifies these protected species.

Invasive Wildlife Species

Unlike other states, Nevada has not adopted regulations that prohibit or regulate the possession, transport, importation, sale, or purchase of terrestrial wildlife species. The NDOW manages aquatic invasive species and noxious weeds (NDOW, 2013a). Section 6.1.6.5, Fisheries and Aquatic Habitat, summaries the aquatic invasive species program. Section 6.1.6.3, Terrestrial Vegetation, summarizes the noxious weed program.

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 (USFWS, 2012a).

6.1.6.5. Fisheries and Aquatic Habitats

This section discusses the aquatic wildlife species in Nevada, including freshwater fish and invertebrates. A summary of non-native or invasive aquatic species is also presented. Although known as an arid state, a distinctive feature of the Nevada landscape with regard to aquatic wildlife is the over 200 lakes and reservoirs and 600 streams and rivers, which provide nearly 400,000 surface acres of fishing opportunities (NDOW, 2012a). No essential fish habitat (EFH) identified by the Magnuson-Stevens Fishery Conservation and Management Act exists in Nevada. Critical habitat for threatened and endangered fish species, as defined by the ESA, does exist within Nevada and is discussed in Section 6.2.6.6, Threatened and Endangered Species.

Freshwater Fish

The fish species that make up the osteoglossids, freshwater eel, and herring and shad family were mostly introduced into various fish habitats throughout the state. Although the threadfin shad (*Dorosoma petenense*) of the herring and shad family was introduced to the Colorado River, it is known to abundantly occur in the river's reservoirs (USGS, 2015e) (USGS, 2009).

There are 16 fish species in the trout, salmon, and whitefish family, including 6 subspecies of the cutthroat trout. These subspecies include the Yellowstone cutthroat (*Oncorhynchus clarkia bouvieri*), Lahontan cutthroat (*Oncorhynchus clarki henshawi)*, Alvord cutthroat (*Oncorhynchus clarki alvordensis*), Humboldt cutthroat (*Oncorhynchus clarkii humboldtensis*), Greenback cutthroat (*Oncorhynchus clarkii stomias*), and Bonneville cutthroat (*Oncorhynchus clarki utah*). This family is often known as the economically most important family of cold water fishes is North America, significantly supporting sport fisheries, commercial fishing, and hatchery and fish farm operations (NDOW, 2004).

The Lahontan cutthroat was once the predominant native trout in lakes and streams across the Great Basin of Nevada. However, competition with non-native trout and habitat degradation have attributed to the decline of the species. Another popular species, the rainbow trout, is comprised of over 90 percent of the hatchery production from Nevada's four major hatcheries. These species are native to the Pacific coast waters and all rainbow trout in Nevada are introduced, with the exception of the Great Basin redband trout (*Oncorhynchus mykiss newberrii*), which can be found in12-mile Creek in the northwest corner of the state. Four species, including the bull trout (*Salvelinus confluentus),* Lahontan cutthroat trout (*Oncorhynchus clarkia henshawi),* Warner Valley redband trout (*Oncorhynchus mykiss pop. 4),* and Yellowstone cutthroat trout (*Oncorhynchus clarkia bouvieri)* are identified as Species of Conservation Priority. Warner Valley redband trout (*Oncorhynchus mykiss pop. 4*) and Yellowstone cutthroat trout (*Oncorhynchus clarkia bouvieri*), both resident fish in mid- to high-elevation montane stream systems, were recently added to the priority list in 2012 (NDOW, 2013a).

The pike family in Nevada consists of one species, the Northern pike (*Esox lucius),* found in Comins Lake. The pike population crashed in 1989, and the lake was treated to remove all remaining pike; however, they were illegally reintroduced in the late 1990's and have eliminated all trout and almost all bass from the lake (NDOW, 2015a). As a result, Northern pike are now considered a prohibited species and must be killed if kept by anglers (NDOW, 2015a).

Approximately 31 species of carp and minnows occur in Nevada, including 21 native species (Deacon & Williams, 1984). This is the most abundant and widely distributed families of freshwater fishes in the world, and up to 40 species historically occurred in Nevada, with many species only occurring in isolated habitats in central and eastern Nevada (Nevada Natural Heritage Program, 2008). Common minnow species in Nevada include the northern pikeminnow (*Ptychocheilus oregonensis*), Alvord chub (*Gila alvordensis*), Newark valley tui chub (*Siphateles bicolor newarkensis*) (which has 17 subspecies), leatherside chub (*Lepidomeda copei*), Pahranagat roundtail chub (*Gila robusta jordani*), and speckled dace species (*Rhinichthys osculus*). Minnows are not typically a popular sportfish, but are important economically because they provide the link in the aquatic food chain from algae or aquatic invertebrate to large fish species that are highly sought after for food and recreation (Nevada Natural Heritage Program, 2006).

Historically, in Nevada, the sucker family consisted of 15 native species in Nevada, although several of the species are no longer present in the state, resulting in 10 known species today. Common species include the Utah sucker (*Catostomus ardens*), Desert sucker (*Catostomus clarki),* Bridgelip sucker (*Catostomus columbianus),* and the Mountain sucker (*Catostomus platyrhynchus*). Four sucker fishes, including the flannelmouth sucker (*Catostomus latipinnis),* razorback sucker *(Xyrauchen texanus),* Wall Canyon sucker (*Catostomus* spp.*)*, and White River desert sucker (*Catostomus clarkia intermedius)* have been identified as Species of Conservation Priority (NDOW, 2013a).

The bullheads/catfishes family includes seven species in Nevada, which include the white catfish (*Ameiurus catus*), black bullhead (*Ameiurus melas*), yellow bullhead (*Ameiurus natalis*), brown bullhead (*Ameiurus nebulosus*), channel catfish (*Ictalurus punctatus*), walking catfish (*Clarias batrachus*), and suckermouth catfish (*Hypostomus plecostomus*). The channel catfish prefers large rivers and lowland lakes and is widely found in Nevada waters. Most of the bullhead and catfish fish species have been introduced and established in various rivers, creeks, and reservoirs in the state (Deacon & Williams, 1984).

The topminnow family consists of only two species in Nevada, the plains killifish (*Fundulus zebrinus*), and rainwater killifish (*Lucania parva)* - both introduced species. The Plains killifish was introduced to the Colorado River; the species also established in streams tributary to Lake Mead (Deacon & Williams, 1984).

The goodeidae family consists of goodeids, springfish, and poolfish. The state recognizes seven of these species as Species of Conservation Priority, including the Pahrump poolfish (*Empetrichthys latos*), Hiko White River springfish (*Crenichthys baileyi grandis*), Moapa White River springfish (*Crenichthys baileyi moapae*), Moorman White River springfish (*Crenichthys baileyi thermophilus*), Preston White River springfish (*Crenichthys baileyi albivallis*), Railroad Valley springfish (*Crenichthys nevadae*), and White River springfish (*Crenichthys baileyi baileyi*) (NDOW, 2013a). Of these, the Pahrump poolfish (*Empetrichthys latos*), Hiko White River springfish (*Crenichthys baileyi grandis*), Railroad Valley springfish (*Crenichthys nevadae*), and White River springfish (*Crenichthys baileyi baileyi*) are also federally listed (USFWS, 2015d).

The pupfish family consists of two species in Nevada, the Devils Hole pupfish (*Cyprinodon diabolis*) and Amargosa pupfish (*Cyprinodon nevadensis*). The Devils Hole pupfish is endemic to Devil's Hole in Ash Meadows National Wildlife Refuge in Nye County in southern Nevada. The Amargosa pupfish includes two endemic subspecies in Ash Meadows. These two pupfish are recognized by the state as Species of Conservation Priority, including both subspecies of the Ash Meadows Amargosa pupfish (NDOW, 2013a).

The livebearers family consists of six species in Nevada, all of which are introduced species to the state. Common fish in the family include the mosquitofish (*Gambusia affinis),* Sailfin molly (*Poecilia latipinna),* and Steindachner or Shortfin molly (*Poecilia Mexicana).* The Mosquitofish is widely introduced and established in Nevada waters. Sailfish molly is also introduced and established in several springs in Ash Meadows in Nye County and Ash Springs in Lincoln County (Deacon & Williams, 1984).

Historically, in Nevada, the bass family contains two species: white bass (*Morone chrysops)* and striped bass (*Morone saxatilis*). White bass were introduced and are now established in Lahontan Reservoir and throughout the Truckee-Carson Irrigation District system in Lahontan Valley; the species is also introduced to Rye Patch Reservoir in Pershing County and Washoe Lake in Washoe County. Striped bass were introduced and are established in Lake Mead in Clark County (Deacon & Williams, 1984).

The sunfish family contains 10 fish species in Nevada including the black crappie (*Pomoxis nigromaculatus),* green sunfish (*Lepomis cyanellus),* and largemouth bass (*Micropterus salmoides*). All these species were introduced into Nevada water systems (Deacon & Williams, 1984).

The perch family consists of two species in Nevada, including the yellow *perch (Perca flavescens*) and walleye (*Stizostedion vitreum*). Both species were introduced as gamefish to the state. Yellow perch is established in Walker Lake in Mineral County, at Rye Patch Reservoir in Pershing County, and at Lahontan Reservoir in Lyon and Churchill Counties. Walleye are established in the Colorado River, Rye Patch Reservoir in Pershing County, Chimney Dam Reservoir in Humboldt County, and Lahontan Reservoir in Lyon and Churchill Counties. (Deacon & Williams, 1984)

There are eight fish in the cichlid family in Nevada: the Rio Grande cichlid (*Cichlasoma cyanoguttatum),* convict cichlid (*Cichlasoma nigrofasciatum),* banded cichlid (*Cichlasoma severum),* golden mbuna (*Melanochromis auratus),* unnamed mbuna (*Melanochromis johanni),* zebra mbuna (*Pseudotropheus zebra),* spotted tilapia (*Tilapia mariae),* and redbelly tilapia (*Tilapia zilli*). All of these are introduced species to Nevada; several introductions were unsuccessful and the species were not established, or are no longer present (Deacon & Williams, 1984).

The sculpin family consists of two species in Nevada: mottled sculpin (*Cottus bairdi)* and Paiute sculpin (*Cottus beldingi*). Mottled sculpin is native to the Bonneville Basin of eastern Nevada. It is a bottom-dwelling carnivore, typically hiding in gravel, rubble, and other cover during the daytime, and feeding mainly at night on insect larvae, crustaceans, and small fishes. Paiute sculpin is native to the Lahontan and Bonneville basins in Nevada (Deacon & Williams, 1984). Paiute sculpin is also found in Lake Tahoe; they prefer habitat in streams where there is rubble or gravel bottom on medium-gradient rocky sections of cold, clear water (Nevada Natural Heritage Program, 2008). In Lake Tahoe, Paiute sculpin usually occur at depths less than 200 feet, but the species have been found in waters as deep as 650 feet (Nevada Natural Heritage Program, 2008).

Shellfish and Other Invertebrates

Five species of freshwater mollusks have been recorded in Nevada, most of which are assumed to be native. The majority of these mollusk species include the California floater (*Anodonta californiensis*), Oregon floater (*Anodonta oregonensis*), winged floater (*Anodonta californiensis),* and western ridged mussel (*Gonidea angulata*). Most of the freshwater mussels recorded consist of the California floater found in the Humboldt River system. None of the Nevada mollusk species are federally or state listed endangered or threatened species. However, the California floater is ranked in Nevada as a critically imperiled species by the NNHP, as it has been included on the list of aquatic species of Conservation Priority (NDOW, 2013a).

Fingernail clams and pea clams are small bivalves[83] in the family Sphaeriidae that are typically only a few millimeters in size. They are not dependent on a host. These species are widely distributed in Nevada, as there are hundreds of records for them with NDOW. None are listed as state species of conservation priority (NDOW, 2013a).

Invasive Aquatic Species

In 2011, NDOW was provided authority by the Nevada State Legislature under Assembly Bill 167 to implement an Aquatic Invasive Species (AIS) Prevention Program (NDOW, 2015b). The

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

goal of the AIS program is to prevent the spread of AIS threatening Nevada's waterways and to prevent any new introductions of AIS into Nevada. The most widespread and economically damaging AIS in the U.S. are quagga mussel (*Dreissena bugensis*) and zebra mussel (*Dreissena polymorpha*) (NDOW, 2015b). In Nevada, zebra mussels are not currently present; however, quagga mussels were found at Lake Mead National Recreation Area in 2007, and the mussels have since spread throughout the lower Colorado River system. Adult quagga mussels have not been found elsewhere in Nevada, but in 2011, quagga mussel larvae were identified in the Lahontan and Rye Patch reservoirs (NDOW, 2015b). The Asian clam (*Corbicula fluminea*) is a non-native freshwater bivalve that has established in Lake Tahoe in Nevada with two increasing populations near Nevada Beach and Emerald Bay (USFWS, 2014a). As a result, addressing the threat of AIS is a top priority for federal, state, and bi-state agencies in the Lake Tahoe Basin. Lake Tahoe's AIS program has implemented a prevention program that involves mandatory boat inspections and decontamination stations; control and eradication of existing AIS species, such as Asian clams; and development of an early detection and rapid response program (USFWS, 2014a).

6.1.6.6. 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 Nevada. The USFWS has identified 22 federally endangered and 17 federally threatened known to occur in Nevada[84] (USFWS, 2015d). Of these, 27 have designated critical habitats. Two candidate species are identified by USFWS as occurring within the state (USFWS, 2015e). Candidate species are not afforded statutory protection under the ESA; however, the USFWS recommends taking these species into consideration during environmental planning because they could be listed in the future (USFWS, 2014b). The 39 federally listed species include 2 birds, 23 fish, 1 reptile, 3 invertebrates, and 10 plants (USFWS, 2015d), and are discussed in detail under the following sections. There are no listed mammal species in Nevada. 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.

[84] The USFWS ECOS list identifies species believed to or known to occur in Nevada. This PEIS describes the ESA-listed species identified on the USFWS ECOS list (USFWS, 2015d); however, this PEIS also includes the desert tortoise (*Gopherus agassizii*) based on a review of the Nevada Fish & Wildlife Office listing (USFWS, Nevada Fish & Wildlife Office, 2016). Therefore, this PEIS has ESA-listed species totals that differ slightly than the reported ECOS total.

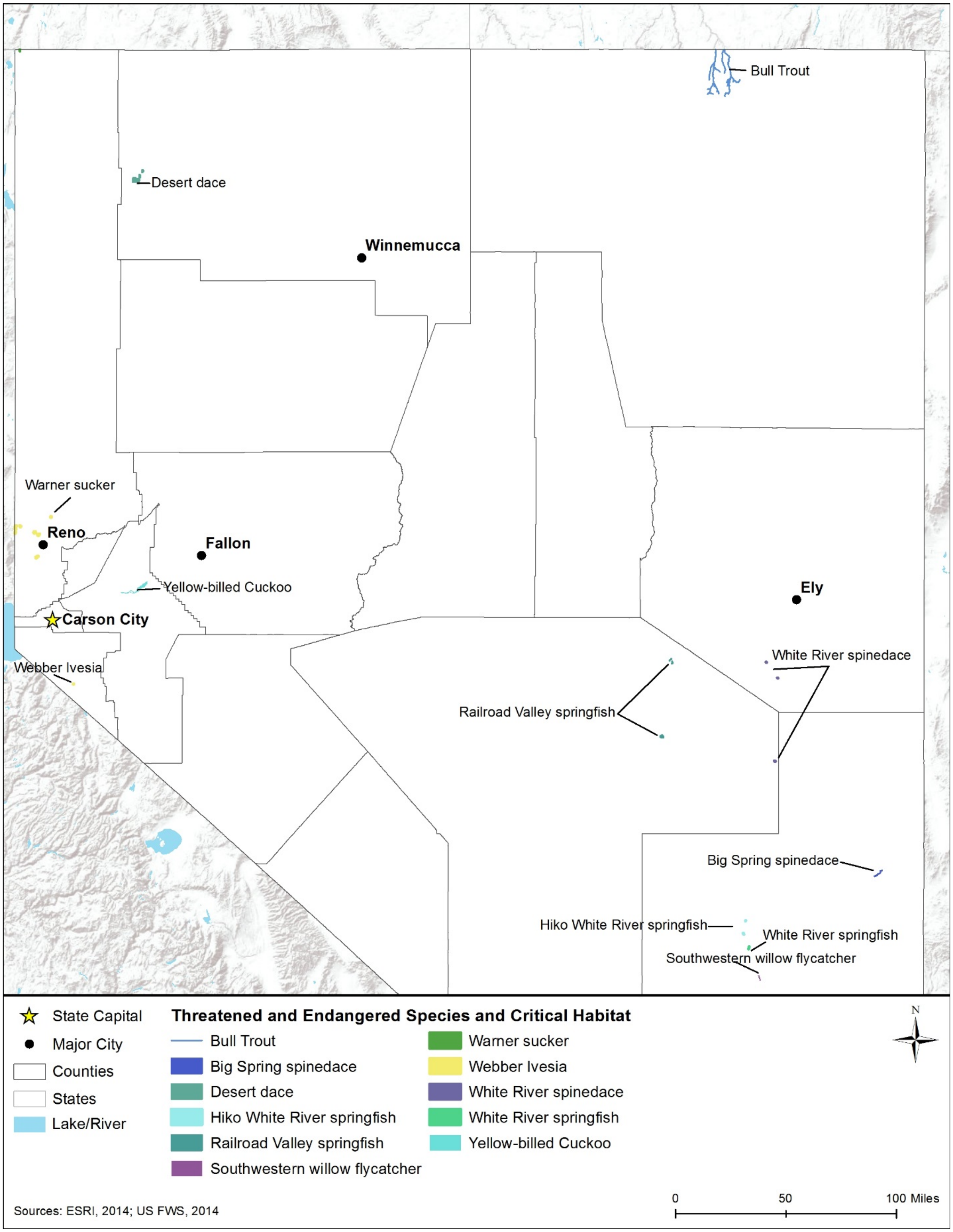

Figure 6.1.6-3: ESA Designated Critical Habitat for Northern Nevada

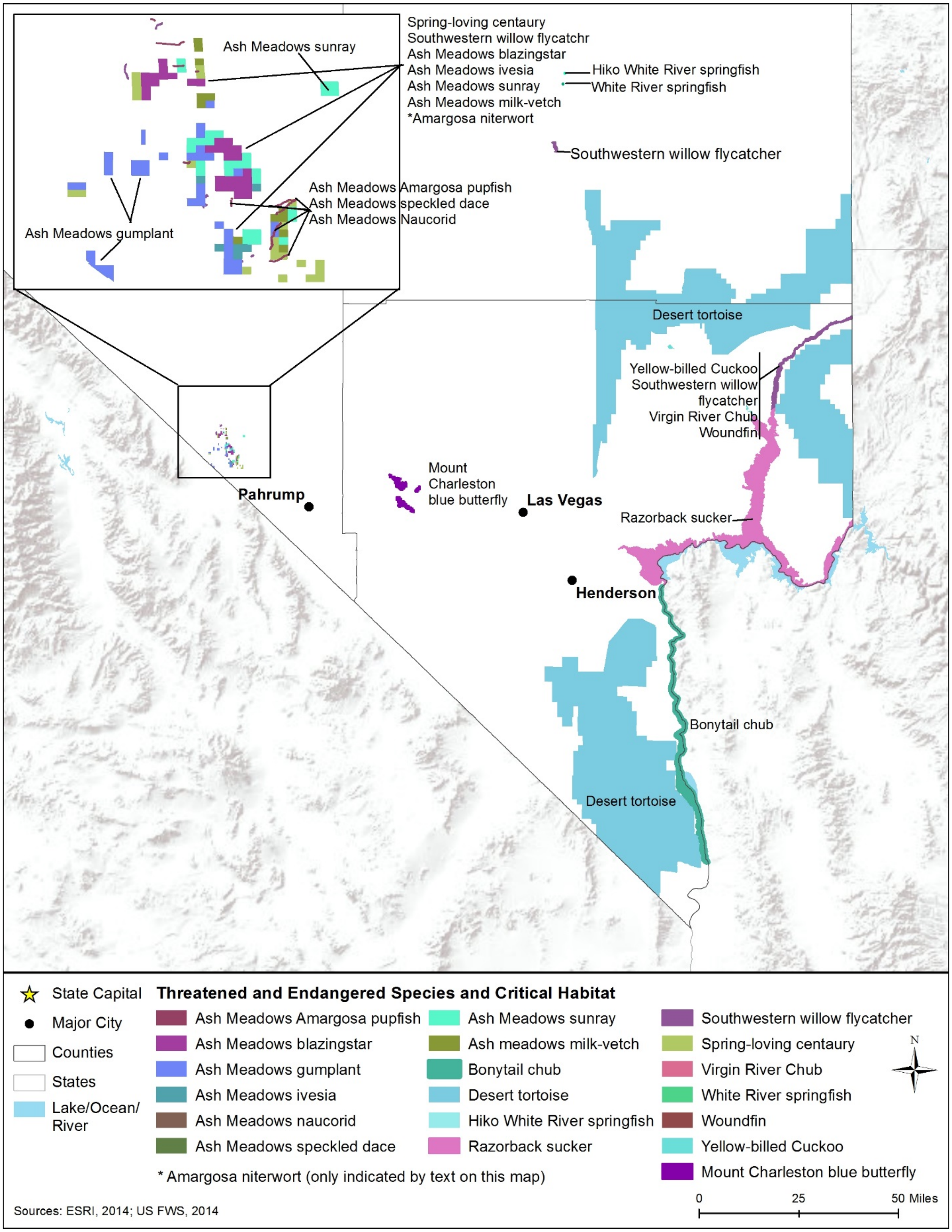

Figure 6.1.6-4: ESA Designated Critical Habitat for Southern Nevada

Birds

There is two federally listed endangered bird species known to occur in Nevada, as summarized in Table 6.1.6-3. The southwestern willow flycatcher (*Empidonax traillii extimus*) and yellow-billed cuckoo (*Coccyzus americanus*) are found along the lower-desert waterbodies in the southern portion of the state, such as the Colorado River and Virgin River. Information on the habitat, distribution, and threats to the survival and recovery of each of these species in Nevada is provided below.

Table 6.1.6-3: Federally Listed Bird Species of Nevada

Common Name	Scientific Name	Federal Status [a]	Critical Habitat in Nevada	Habitat Description
Southwestern Willow Flycatcher	*Empidonax traillii extimus*	E	Yes	Dense riparian and shrub communities, typically near perennial water.
Western Yellow-billed Cuckoo	*Coccyzus americanus*	T	Yes; Proposed	Riparian, forested habitat along drainages.

[a] E = Endangered, T = Threatened

Source: (USFWS, 2015d)

Southwestern Willow Flycatcher. The southwestern willow flycatcher (*Empidonax traillii extimus*) is a small grey-brown bird with a relatively large bill, white throat, and a yellowish belly. It is typically 6 inches in length (including tail) and is characterized by its sharp whistles. The Southwestern Willow flycatcher was federally listed as endangered in 1995 (60 FR 10695 10715, February 27, 1995); in 2013, it was designated with critical habitat in the southern and central portions of the state (78 FR 343 534 January 3, 2013).

The Southwestern Willow flycatcher breeds in riparian communities associated with rivers, lakes, swamps and other wetlands. In Nevada, it is known or believed to occur in 11 counties throughout the state (USFWS, 2015f) including the Virgin River, Muddy River, Amargosa River, Meadow Valley Wash, and Pahranagat River drainages. Threats to flycatcher include changes in riparian vegetation, due to reduction or elimination of surface water, livestock grazing, the establishment of invasive non-native plants, and parasites from brown-headed cowbirds (*Molothrus ater*) (USFWS, 2002a).

Western Yellow-billed Cuckoo. The Western yellow-billed cuckoo (*Coccyzus americanus*) is approximately 12 inches in length and weighs approximately 2 ounces. The western distinct population segment (DPS) is a shy, migrant bird that winters in South America and breeds in the western US. The western DPS was federally listed as threatened in 2014 (79 FR 59991 60038, October 3, 2014) and has proposed critical habitat (79 FR 71373 71375, December 2, 2014) (USFWS, 2015g). Currently, the western yellow-billed cuckoo is known to breed in Arizona, California, Colorado, Idaho, New Mexico, Nevada, and Utah (Johnson M. J., 2009).

Yellow-billed cuckoo Photo Credit: USFWS

Preferred habitat consists of continuous riparian habitat of cottonwood and willow trees. The yellow-billed cuckoo breeds in forested areas with significant canopy cover. Loss of suitable forested habitat along streams and rivers due to habitat fragmentation, invasion of invasive species, and conversion of land to other uses are considered the primary threats to this species (Johnson M. J., 2009).

Fish

There are 17 endangered and 6 threatened species of fish that are federally listed and are known to occur in Nevada as summarized in Table 6.1.6-4. Nevada has a high number of at-risk fish species because the state's harsh environment and isolated waterbodies has produced a large amount of endemic species. For example, four of the endangered species in the state have ranges that are entirely restricted to small springs in the Ash Meadows oasis in Nye County: Ash Meadows Amargosa pupfish (*Cyprinodon nevadensis mionectes*), Ash Meadows speckled dace (*Rhinichthys osculus nevadensis*), Warm Springs pupfish *Cyprinodon nevadensis pectoralis*), and Devils Hole pupfish (*Cyprinodon diabolis*). Similarly, Soldier Valley in Washoe County, Railroad and Pahrump Valleys in Nye County, Clover and Independence Valleys in Elko Valley, Meadow and Pahranagat Valleys in Lincoln County, and the White River Valley in White Pine County all contain small endemic fish species. Nevada also has several protected large fish (sucker, trout, chub, etc.) that occupy the state's rivers and lakes, such the Muddy/Moapa, Virgin, Colorado, and Truckee Rivers, and Pyramid Lake. Information on the habitat, distribution, and threats to the survival and recovery of each of these species in Nevada is provided below.

Table 6.1.6-4: Federally Listed Fish Species of Nevada

Common Name	Scientific Name	Federal Status [a]	Critical Habitat in Nevada	Habitat Description
Ash Meadows Amargosa Pupfish	*Cyprinodon nevadensis mionectes*	E	Yes	Warm, flowing, desert, freshwater springs, and their outflows within the Ash Meadows National Wildlife Refuge.
Ash Meadows Speckled Dace	*Rhinichthys osculus nevadensis*	E	Yes	Flowing, desert, freshwater springs and their outflows within the Ash Meadows National Wildlife Refuge.
Big Spring Spinedace	*Lepidomeda mollispinis pratensis*	T	Yes	Flowing, desert, freshwater springs and their outflows. Range is limited to Big Springs and Meadow Valley Wash.
Bonytail Chub	*Gila elegans*	E	Yes	River channels, and flooded, ponded, or inundated river eddies and pools in the Colorado River Basin.
Bull Trout	*Salvelinus confluentus*	T	Yes	Cold streams, rivers, reservoirs and lakes within the pacific northwest.
Clover Valley Speckled Dace	*Rhinichthys osculus oligoporus*	E	No	Reservoirs and spring outflows of three spring systems in the Clover Valley.
Cui-ui	*Chasmistes cujus*	E	No	Lakes and tributary rivers or streams within the Pyramid Lake watershed.
Desert Dace	*Eremichthys acros*	T	Yes	Warm, thermal springs and their outflows in the Soldier Valley.
Devils Hole Pupfish	*Cyprinodon diabolis*	E	No	Isolated, desert freshwater springs. Range limited to the Devils Hole in western Nevada.
Hiko White River Springfish	*Crenichthys baileyi grandis*	E	Yes	Warm, thermal springs and their outflows in the Pahranagat Valley.
Independence Valley Speckled Dace	*Rhinichthys osculus lethoporus*	E	No	Shallow marsh areas with emergent vegetation in the Independence Valley Warm Spring.
Lahontan Cutthroat Trout	*Oncorhynchus clarkii henshawi*	T	No	Interior lakes and rivers within the Lahontan Basin.
Moapa Dace	*Moapa coriacea*	E	No	Riverine habitats and thermal spring outflows in the upper Muddy River watershed.
Pahranagat Roundtail Chub	*Gila robusta jordani*	E	No	Deeper pools of water with areas of overhead cover of the Colorado River and its upper tributaries.
Pahrump Poolfish	*Empetrichthys latos*	E	No	Thermal, desert, alkaline spring and their outflows.
Railroad Valley Springfish	*Crenichthys nevadae*	T	Yes	Warm, desert, thermal springs and their outflows in the Railroad Valley.
Razorback Sucker	*Xyrauchen texanus*	E	Yes	Warm-water reaches of larger rivers of the Colorado River Basin.
Virgin River Chub	*Gila seminuda (=robusta)*	E	Yes	Deep protected water and relatively fast currents of the Virgin River.
Warm Springs Pupfish	*Cyprinodon nevadensis pectoralis*	E	No	Flowing, desert, freshwater springs and their outflows within the Ash Meadows National Wildlife Refuge.
Warner Sucker	*Catostomus warnerensis*	T	Yes	Streams, rivers, lakes, and sloughs within the Warner Basin.

Common Name	Scientific Name	Federal Status [a]	Critical Habitat in Nevada	Habitat Description
White River Spinedace	*Lepidomeda albivallis*	E	Yes	Cool, freshwater springs and their outflows in the White River drainage.
White River Springfish	*Crenichthys baileyi*	E	Yes	Warm, thermal springs and their outflows in the Pahranagat Valley.
Woundfin	*Plagopterus argentissimus*	E	Yes	Warm, quiet waters with sandy substrate in the Virgin River.

[a] E = Endangered, T = Threatened

Source: (USFWS, 2015d)

Ash Meadows Amargosa Pupfish. The Ash Meadows Amargosa pupfish (*Cyprinodon nevadensis mionectes*) is one of six subspecies of the Armargosa pupfish (*Cyprinodon nevadensis*), and is endemic to freshwater springs in Ash Meadows, Nye County, Nevada. While similar in appearance and life history to other Amargosa pupfish, the Ash Meadows subspecies is genetically distinct due its isolated habitat (USFWS, 2010a). The USFWS first listed the Ash Meadows Amargosa pupfish as endangered under an emergency determination in 1982 (47 FR 19995 19999, May 5, 1982); it was later given permanent endangered status and designated critical habitat in 1983 (48 FR 40178 40186, September 2, 1983). Critical habitat for the subspecies is limited to the springs for which it is known to inhabit in Ash Meadows National Wildlife Refuge (USFWS, 2015i).

Within its range, the Ash Meadows Amargosa pupfish is relatively common and uses a wide variety of habitats. Generally, the subspecies prefers areas of flowing water and warmer temperatures. Because of the small size of its desert spring habitats, the Ash Meadows Amargosa pupfish is heavily reliant on nutrient deposition from outside sources, such as runoff, leaching, and decomposition of organic material. Primary threats to the subspecies include a limited range, landscape-wide habitat alteration, predation from non-native aquatic species, and disease (USFWS, 2010a).

Ash Meadows Speckled Dace. The Ash Meadows speckled dace (*Rhinichthys osculus nevadensis*) is an endemic subspecies of the speckled dace (*Rhinichthys osculus*) that is found only in freshwater springs in Ash Meadows, Nye County, Nevada. It is a small slender minnow, reaching a maximum length of 3.9 inches. Coloration varies widely, but individuals are frequently covered with black spots and have a distinct black lateral stripe across their body (USFWS, 2015j). The USFWS first listed the Ash Meadows speckled dace as endangered under an emergency determination in 1982 (47 FR 19995 19999, May 5, 1982); it was later given permanent endangered status and designated critical habitat in 1983 (48 FR 40178 40186, September 2, 1983). Critical habitat for Ash Meadows speckled dace is composed of approximately 36 acres in the Ash Meadows National Wildlife Refuge (USFWS, 2015j).

Historically, the Ash Meadows speckled dace likely occupied the majority of springs and outflows in the Ash Meadows region, but habitat alteration has reduced its distribution to three springs. In 1990, the subspecies' population was estimated at 500. Preferred habitat is flowing water as the subspecies feeds on drifting insects and spawns in stream riffles. Threats include a limited distribution and predation or competition from non-native species (USFWS, 2015j).

Big Spring Spinedace. The Big Springs spinedace (*Lepidomeda mollispinis pratensis*) is a subspecies of the Lower Colorado spinedace (*Lepidomeda moiispinis*) that is an endemic to Meadow Valley Wash and the Big Spring outflow in Lincoln County, Nevada. It is a small silver minnow, reaching a maximum length of 2.2 inches (USFWS, 1994a). The Big Springs spinedace was listed as threatened and afforded critical habitat in 1985 (50 FR 12298 12302, March 28, 1985) (USFWS, 2015k).

While the Big Springs spinedace historically occupied both the Meadow Valley Wash and the Big Spring outflow, it has been extirpated from the Big Spring outflow. Little is known about the life history of this subspecies. General habitat requirements include moderately flowing clear water with emergent vegetation. The subspecies is assumed to drift feed on aquatic invertebrates, algae, and plant material. Threats to the subspecies include a limited range, habitat alteration, and pressure from non-native species, particularly bullfrog (*Rana pipens*) and mosquitofish (*Gambusia affinis*) (USFWS, 1994a).

Bonytail Chub. The bonytail chub (*Gila elegans*) is an extremely rare, long-lived fish, once prevalent in the Colorado River basin. The species has a streamlined body, concave skull, and pencil-like in appearance, growing over two feet in length. The species was federally listed as endangered in 1980 (45 FR 27710 27713, April 23, 1980), and in Nevada has critical habitat designated in Clark County, including the Colorado River and associated 100-year floodplain (59 FR 13374 13400, March 21, 1994) (USFWS, 2015l). The bonytail chub is the rarest native fish in the Colorado River Basin and has been observed infrequently in the last decades. Historically, the fish's range was widespread and abundant throughout the Colorado River Basin in the warmer waters from Mexico to Wyoming. Today, few populations are known to exist in the upper Colorado and Green Rivers (USFWS, 2002b).

Though little is known about this fish, drawing upon other similar chub, it is speculated that spawning occurs in eddies during the months of June and July and that habitats required for conservation include, river channels, and flooded, ponded, or inundated river eddies and pools. Threats to the species include impacts to river hydrology, which modify water temperatures, flow rates, and sedimentation of the species habitat. Since 1905, in the lower Colorado River Basin there have been more than 14 dams, which impede migration, and make the variability of the genepool less diverse, and have introduced non-native competition from other species. Additional threats include pesticides and pollutants, disease and predation (USFWS, 2002b).

Bull Trout. The bull trout (*Salvelinus confluentus*) is a member of the Salmonidae family with an olive green to bronze colored back covered in pale yellow, orange, or salmon-colored spots. There are two forms of bull trout: resident, which spend their whole lives in the same stream; and migratory, which swim to larger bodies of water over the winter and then migrate back to smaller waters to spawn. Resident bull trout can grow up to 10 inches in length, while migratory bull trout can reach up to 35 inches and weigh up to 32 pounds. The bull trout was federally listed as threatened in 1998 (63 FR 31647 31674, June 10, 1998). (USFWS, 2015m)

Bull trout Photo credit: USFWS

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, 2014c). In Nevada, it is known or believed to occur in Elko County, in the northeastern corner of the state (USFWS, 2015m). In Nevada, critical habitat for the bull trout is located within the Jarbidge River Basin, in Elko County (USFWS, 2014c).

Similar to other salmonid species, bull trout have specific habitat requirements. They require cold water typically less than 54 degrees Fahrenheit, good water quality, strong migratory corridor connectivity, 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. In Nevada, critical habitat for the bull trout is located within the Jarbidge River Basin, in Elko County. (USFWS, 2014c)

Clover Valley Speckled Dace. The Clover Valley speckled dace (*Rhinichthys osculus oligoporus*) is a subspecies of the speckled dace, endemic to the Clover Valley in Elko County, Nevada. It is a small slender minnow, generally not growing larger than 3.5 inches in length. Coloration varies widely in speckled daces, but individuals are frequently covered with black splotches that can combine into a distinct black lateral stripe (USFWS, 1998a). The Clover Valley speckled dace is distinguished from other subspecies by its less prominent lateral stripe, and the anterior pectoral fins (USFWS, 1989). The Clover Valley speckled dace was federally listed as endangered in 1989 (54 FR 41448 41453, October 10, 1989). No critical habitat has been designated as the subspecies' range is located entirely on private property (USFWS, 2015n).

The historic range of the Clover Valley speckled dace is unknown, but it is assumed that it occurred within the majority of springs and wetlands in the Clover Valley. Currently, the subspecies is limited to three spring systems. Within these spring systems, the subspecies is primarily found in reservoirs and outflows (USFWS, 1998a). Threats include habitat destruction, over-collection, and predation from non-native species, particularly rainbow trout (*Oncorhynchus mykiss*) (USFWS, 1989) (USFWS, 1998a).

Cui-ui. The cui-ui (*Chasmistes cujus*) is a large fish species in the lakesucker genus (*Chasmistes*) that is endemic to the Pyramid Lake watershed in northwestern Nevada. The cui-ui is typically dark brown or gray with a light underbelly and can reach 27 inches in length. The cui-ui is genetically distinct from other lakesucker species in the Great Basin region because of its location in the isolated Pyramid Lake watershed (USFWS, 1992). The cui-ui was first listed as endangered by the USFWS on the Endangered Species List of 1967 (32 FR 4001, March 11, 1967) and was later incorporated into the Endangered Species Act of 1973. No critical habitat has been designated for cui-ui (USFWS, 2015o).

For the majority of the year, the cui-ui inhabits warm shallow waters near the lakeshore. It is an obligate river spawner, its primary spawning ground being the Truckee River. The species will travel as far as 12 miles from the lake to spawn. Primary threats to the species are degradation of spawning habitat along the Truckee River and the buildup of harmful pollutants into the terminal Pyramid Lake (USFWS, 1992).

Desert Dace. The desert dace (*Eremichthys acros*) is a small olive-green minnow endemic to thermal springs in the Soldier Valley of Washoe County, Nevada. The species is distinguished from other dace by its small size (maximum length of 2.4 inches) and prominent horny sheath on each jaw (USFWS, 2015p). The desert dace was federally listed as threatened and afforded critical habitat in 1985 (50 FR 50304 50309, December 10, 1985). Critical habitat includes the springs for which the species is known to inhabit, their outflows, and a 50-foot buffer (USFWS, 2015p).

The desert dace is limited to eight thermal spring systems in the Soldier Valley. Within these systems, the desert dace occupies a wide variety of habitats including shallow outflow streams, alkali marshes, and artificial water features. Water temperature is the primary determining factor for the species’ habitat selection, with the fish preferring cooler waters. The desert dace is omnivorous, eating algae, plant material, and aquatic invertebrates. Primary threats to the species are habitat alteration and non-native species (USFWS, 2015p).

Devils Hole Pupfish. The Devils Hole pupfish (*Cyprinodon diabolis*) is a species of pupfish endemic to a small isolated limestone cave in Nye County, Nevada. The Devils Hole pupfish was first listed as endangered by the USFWS on the Endangered Species List of 1967 (32 FR 4001, March 11, 1967) and was later incorporated into the Endangered Species Act of 1973. The small blue fish is distinguished from other pupfish species by its lack of pelvic fins and very small size, rarely exceeding 1 inch in length. Because of Devils Hole’s extreme isolation in a desert environment, the species has been genetically isolated from other pupfish species for several thousand years (USFWS, 1990). No critical habitat has been designated as the species’ entire range is protected by both the Ash Meadows National Wildlife Refuge and the Devils Hole National Monument (USFWS, 1990) (USFWS, 2015q).

The Devils Hole pupfish inhabits a very restricted environment with no connecting tributaries. Within the approximately 400-foot deep Devils Hole, the species typically uses the top portion of the waterbody. The species' population naturally fluctuates considerably; however, groundwater pumping in the local vicinity for agriculture has caused a significant population decline. Primary threats to this species are its limited range and habitat alteration, primarily from groundwater pumping (USFWS, 1990).

Hiko White River Springfish. The Hiko White River springfish (*Crenichthys baileyi grandis*) is one of five subspecies of White River springfish (*Crenichthys baileyi*) and is endemic to the Pahranagat Valley, Lincoln County, Nevada. The Hiko subspecies is the largest of the five, averaging 1.5 inches in length. It is a small tan to white fish with two dark lateral stripes and yellow patches on the head and body (USFWS, 1998b). It was federally listed as endangered and afforded critical habitat in 1985 (50 FR 39123 39128, September 27, 1985). Critical habitat includes the springs for which the species is known to inhabit, their outflows, and a 50-foot buffer (USFWS, 2012b) (USFWS, 2015r).

All White River springfish subspecies inhabit isolated thermal pools in central and southern Nevada. Historically, the Hiko subspecies range was limited to two thermal pools and outflows in the Pahranagat Valley: Crystal and Hiko Springs. A refuge population was established in Blue Link Spring in Mineral County in 1984. Ideal habitats are calm waterbodies with deep pools, and submergent vegetation. Its diet is omnivorous, feeding feeds opportunistically on aquatic invertebrates, algae, plant material, and insects. Primarily threats include habitat alteration or destruction, over collection, disease, and predation from non-native species (USFWS, 2012b).

Independence Valley Speckled Dace. The Independence Valley speckled dace (*Rhinichthys osculus lethoporus*) is a subspecies of the speckled dace, endemic to the Independence Valley in Elko County, Nevada. The Independence Valley speckled dace was federally listed as endangered in 1989 (54 FR 41448 41453, October 10, 1989). It is a small slender minnow, generally not growing larger than 3.5 inches in length. Coloration varies widely in speckled daces, but individuals are frequently covered with black splotches that can combine into a distinct black lateral stripe (USFWS, 1998a). The Independence Valley speckled dace is distinguished from other subspecies by its compressed body shape, less prominent lateral stripe, and straight, oblique mouth (USFWS, 1989). No critical habitat has been designated, as the subspecies' range is located entirely on private property (USFWS, 2015s).

Currently, the Independence Valley speckled dace is limited to a marshy area below the Independence Valley Warm Spring. While the historic range of the subspecies is unknown, it likely occupied the entirety of the spring system and was forced into marsh habitat from introduced sportfish predation. The subspecies primarily lives in shallow marsh habitats among grasses and sedges where they feed on small aquatic invertebrates and plant material. Primary threats include habitat alteration, over-collection, and predation from introduced sportfish such as rainbow trout, bluegill (*Lepomis macrochirus*), and largemouth bass (*Micropterus salmoides*) (USFWS, 1998a).

Lahontan Cutthroat Trout. The Lahontan cutthroat trout (*Oncorhynchus clarkii henshawi*) is a subspecies of cutthroat trout (*Oncorhynchus clarkii*), endemic to the Lahontan Basin of northern

Nevada, eastern California, and southern Oregon. The Lahontan cutthroat trout was federally listed as threatened in 1970 (35 FR 13519 13520, August 25, 1970) and was later incorporated in to the Endangered Species Act of 1973 (USFWS, 2015t). The Lahontan Basin is an isolated watershed, which has lent to the subspecies diverging genetically from other cutthroat trout in the western US. It is a medium- to large-sized fish, with potential to grow four feet long in lake habitats. It is brown to olive green in color with a lighter underside, a reddish lateral stripe, and red coloration around its gills. The Lahontan subspecies is distinguished from other cutthroat trout by dark spots on the top of its head (USFWS, 1995a).

The listing was amended in 1975 to allow for legal sport fishing of the subspecies (40 FR 29863 29864, July 16, 1975). No critical habitat has been designated (USFWS, 2015t).

The Lohantan cutthroat trout inhabits lakes and streams throughout the Lohantan Basin. The subspecies is an obligate river spawner, with lake populations spawning in tributary streams. Preferred spawning habitats are slow-moving pools with stable banks, vegetative cover, and rocky substrate. Currently, the Lohantan cutthroat trout occurs in between 155 and 160 streams and six lakes. The subspecies has been reintroduced beyond its historic range for sport fishing. While historically widespread throughout their range, the subspecies began to decline in the mid-1800s with the introduction of non-native salmanoids, commercial fishing of lakes within the Lohantan Basin, and alteration of waterways for agriculture. Current threats include livestock grazing, overdevelopment, habitat alteration, pollution, hybridization, and competition with non-native species (USFWS, 1995a).

Moapa Dace. The Moapa dace (*Moapa coriacea*) is a small olive-green minnow endemic to the Muddy River watershed in Clark County, Nevada. The species is distinguished from other dace species by a black spot near the tail and smaller scales. Maximum size is approximately 4.7 inches in length (USFWS, 1996). It was first listed as endangered by the USFWS on the Endangered Species List of 1967 (32 FR 4001, March 11, 1967) and was later incorporated into the Endangered Species Act of 1973. No critical habitat has been designated for the Moapa dace (USFWS, 2015u).

The Moapa dace is endemic to the upper portions of the Muddy River, as well as thermal spring tributaries from the Warm Springs area. While adults inhabit the Muddy River, successful breeding can only take place in the more protected thermal spring outflows. Historically, the species had a larger range throughout the watershed; however, alterations of thermal pools and the damming of the downstream Colorado River have created significant range restriction. The Moapa dace prefers low to moderate flowing water and feeds on a wide variety of drifting food. Primary threats to the species are habitat alterations, introduction of non-native fish, and parasites (USFWS, 1996).

Pahranagat Roundtail Chub. The Pahranagat roundtail chub (*Gila robusta jordani*) is a common to rare fish found in the Colorado River mainstem and the Colorado River basin upper tributaries. The species has a streamlined body with greenish/gray coloring and is similar in appearance to a trout. The species can grow up to 20 inches in length but it typically around 10 inches long. The species was federally listed as endangered in 1970, (35 FR 16047 16048, October 13, 1970) and has no designated critical habitat. The Pahranagat roundtail chub is currently found in Lincoln County in the southeast corner of Nevada. Historically, the species was found from Wyoming to Arizona and possibly into Mexico (USFWS, 2014d).

The Pahranagat roundtail chub prefers deeper pools of water with areas of overhead cover. Spawning occurs in late-January through mid-February in fast moving water over a gravel substrate. Factors affecting the species today include loss of habitat from farming and ranching activities, particularly water diversion for irrigation and loss of overhead coverage. Competition, predation, and disease from non-native species are also current threats to the species (USFWS, 1998c).

Pahrump Poolfish. The Pahrump poolfish (*Empetrichthys latos*) is a small green and silver fish, which reaches 3 inches in length. It is endemic to, as well as the only fish native to, the isolated alkaline springs in Pahrump Valley, Nye County, Nevada (USFWS, 1980). It was first listed as endangered by the USFWS on the Endangered Species List of 1967 (32 FR 4001, March 11, 1967) and was later incorporated into the Endangered Species Act of 1973. No critical habitat has been designated for the Pahrump poolfish (USFWS, 2015v).

The Pahrump poolfish's historical range was limited to Manse Spring, a thermal alkaline spring system. The species historically was divided into three subspecies that each inhabited separate springs within the valley; however, all but one subspecies (*Empetrichthys latos latos*) is now extinct. The Pahrump poolfish has also been extirpated from Manse Spring, which went dry in the 1970s. Transplanted populations now survive in three refuge ponds across the state. Optimal habitat for this species are alkaline springs in desert environments with stable temperatures around 75 degrees Fahrenheit. Threats to this species include a limited distribution susceptible to catastrophic events, habitat alteration from local groundwater pumping, and predation from introduced crayfish (*Procambarus clarkii*) (USFWS, 1980) (USFWS, 2004).

Railroad Valley Springfish. The Railroad Valley springfish is a small springfish (*Crenichthys* spp.) endemic to, as well as the only fish native to, the Railroad Valley in Nye County, Nevada. It is a small tan or olive-grey fish with a dark lateral stripe, averaging 1.5 inches in length. The single lateral stripe distinguishes this species from the closely related White River springfish, which has two lateral stripes (USFWS, 1997). It was federally listed as threatened and afforded critical habitat in 1986 (51 FR 10857 10865, March 31, 1986). Critical habitat includes the springs for which the species is known to inhabit, their outflows, and a 50-foot buffer (USFWS, 1997) (USFWS, 2015w).

The Railroad Valley springfish naturally occurs in six thermal springs in the Railroad Valley, and has been introduced to three other springs in nearby counties. Habitat loss at each of the species' historically occupied springs warranted its federal protection. Optimal habitats for this species are warm thermal pools with temperatures ranging from 85 to 100 degrees Fahrenheit and low levels of dissolved oxygen. Having evolved as the sole inhabitants of the thermal pools, the Railroad Valley springfish is a generalist feeder. Its primary diet consists of algae, plant material, and aquatic invertebrates. Primary threats to this species include habitat alteration and the introduction of non-native guppies (*Poecilia reticulata*), mollies (*Poecilia* spp.), and mosquitofish (USFWS, 1997).

Razorback Sucker. The razorback sucker (*Xyrauchen texanus*) is a long, slender fish growing 39 inches in length and weighing up to 12 pounds. The species is marked with dark head and dorsal fins with a yellowish white underbelly and fins (USFWS, 2014e). The razorback sucker was federally listed as endangered in 1991 (56 FR 54957 54967, October 23, 1991) and was given designated critical habitat in 1994 (59 FR 13374 13400, March 21, 1994) in the Gila, Salt, Verde, and Colorado Rivers of Arizona; in Nevada, is believed or known to occur in Clark County (USFWS, 2015x).

Historically, the razorback sucker was widely distributed in warm-water reaches of larger rivers of the Colorado River Basin from Mexico to Wyoming. Habitats include features such as "deep runs, eddies, backwaters, and flooded environments in spring; runs and pools often in shallow water associated with submerged sandbars in summer; and low-velocity runs, pools, and eddies in winter… Spawning in rivers occurs over bars of cobble, gravel, and sand substrates during spring runoff at widely ranging flows and water temperatures" (USFWS, 2002c). Threats to the species include changes in streamflow, habitat, and introduction of competitive or predatory non-native fish species, and pesticides and pollutants (USFWS, 2014e).

Virgin River Chub. The Virgin River chub *(Gila seminuda (=robusta))* is an extremely rare fish found exclusively in the Virgin River. The species is a minnow with a silvery coloring. The species grows between 8 and 18 inches and has 8 to 10 year lifespan. The Virgin River chub was federally listed as endangered in 1989, (54 FR 35305 35311, August 24, 1989). The Virgin River chub was first identified as an intermediate species between the roundtail chub (*Gila robusta*) and the bonytail chub (*G. elegans*). The species was later determined to be a subspecies of (*G. robusta*); however, further study led to the recognition of the fish as a separate species named *G. seminuda* (USFWS, 2008).

Nevada critical habitat is designated in the Virgin River mainstem extending north from Lake Mead approximately 30 miles to the state border and the associated 100-year floodplain (65 FR 4140 4156, January 26, 2000). Historically, the species was abundant in the Virgin River into Southern Nevada, Southwest Utah, and Northwest Arizona. Currently, the extent of the species range is similar; however, it has become extremely rare (USFWS, 2014f).

The Virgin River chub prefers deep protected water and relatively fast currents. The species is tolerant of turbidity, salinity, and temperatures below 86 degrees Fahrenheit. Spawning occurs from late spring through early summer and eggs are deposited on rocky substrate with no further care. The species is an opportunistic feeder consuming algae, debris, and invertebrates. Threats to the Virgin River chub come from floods, toxic spills, the diversion of water, disease (including Asian fish tapeworm), and competition from non-native fish (particularly red shiner) (USFWS, 2014f).

Warm Springs Pupfish. The Warm Springs pupfish (*Cyprinodon nevadensis pectoralis*) is one of six subspecies of the Armargosa pupfish, and is endemic to freshwater springs in Ash Meadows, Nye County, Nevada. The small, silver fish is similar in appearance and life history to other Amargosa pupfish; however, the Warm Springs subspecies is genetically distinct due its isolated habitat. It is physically distinguished from other Armargosa pupfish subspecies by differences in its pectoral fin rays and its small size. The USFWS first listed the Warm Springs pupfish as endangered in 1970 (35 FR 13519 13520, August 25, 1970) and it was later incorporated in to the Endangered Species Act of 1973. No critical habitat has been established for this subspecies (USFWS, 2015y).

The Warm Springs pupfish is limited to six small, isolated, low-velocity freshwater springs and it is assumed that this environment is the optimal habitat for the subspecies. Similar to other pupfish subspecies, its diet is opportunistic, feeding on algae, plant material, and aquatic invertebrates. Primary threats to the subspecies are limited distribution, habitat alteration, and the introduction of non-native mosquitofish, crayfish, and bullfrogs (USFWS, 1990).

Warner Sucker. The Warner sucker (*Catostomus warnerensis*) is a long, slender fish endemic to the Warner basin in southern Oregon, northeastern Colorado, and northwestern Nevada. The species is dark brown or tan with a creamy white underbelly. Males have a prominent red stripe across their bodies during spawning season. The species reaches a maximum of 18 inches in length (USFWS, 1998b). It was federally listed as threatened and afforded critical habitat in 1985 (50 FR 39117 39123, September 27, 1984). Critical habitat for the species within Nevada is located along an approximate 0.5 mile stretch of Twelvemile Creek in the northwestern portion of the state (USFWS, 1998b) (USFWS, 2015z).

With adequate conditions, the Warner sucker is able to inhabit all natural waterbodies within the Warner Basin. Habitats include streams with aquatic vegetation, deep pools, and protective cover from vegetation or overhanging banks, and lakes with uniform depths and mud bottoms for foraging. The species feeds on a variety of invertebrates, algae, and organic plant material found on the bottoms of lakes and streams. Primary threats to the species include habitat alteration, introduction of predatory or competitive non-native fish species, and water pollution. (USFWS, 1998b)

White River Spinedace. The White River spinedace (*Lepidomeda albivallis*) is a species of spinedace (*Lepidomeda* spp.) that is an endemic to the White River Valley in Nye and White Pine Counties, Nevada. It is a small silver minnow and reaches a maximum length of 5 inches, making it the largest of the spinedace (USFWS, 1994b). It was listed as endangered and afforded critical habitat in 1985 (50 FR 37194 37198, September 12, 1985). Critical habitat for the species includes 3 springs, their outflows, and a 50-foot buffer (USFWS, 1994b).

Historically, the White River Spinedace was found throughout the White River drainage. By the early 1990’s the species had been limited to an approximate 230-foot stretch of North Flag Spring and its total population was believed to be less than 50 individuals. Since that time, the species has expanded its range into another historically occupied spring system. Additionally, a refuge population has been established in nearby Indian Spring. Habitat requirements include clear, cool, freshwater springs with temperatures ranging from 60 to 70 degrees Fahrenheit. The species is the most generalized feeder of the spinedace, eating drifting invertebrates and plant material (USFWS, 2010b). Primary threats to the species include a limited distribution, habitat alteration, and introduction of predatory or competitive non-native fish species (USFWS, 1994b).

White River Springfish. The common name White River springfish (*Crenichthys baileyi baileyi*) refers to both a species (*C. baileyi*) and subspecies (*C. baileyi baileyi*), the subspecies being protected by the USFWS. The subspecies *C. baileyi* is endemic to Ash Springs in the Pahranagat Valley, Lincoln County, Nevada. It is a small, tan to white fish with two dark lateral stripes and yellow patches on the head and body (USFWS, 1998c). It was federally listed as endangered and afforded critical habitat in 1985 (50 FR 39123 39128, September 27, 1985). Critical habitat includes Ash Springs, its outflow, and a 50-foot buffer (USFWS, 1998c) (USFWS, 2015aa).

Historically, the Ash Springs subspecies of White River Springfish was common in the Ash Springs system. Population declines began in the mid-20th century with the introduction of non-native fish and modification of the waterway for recreational swimming. Ideal habitats are calm waterbodies with warm temperatures (88 to 97º F), low levels of dissolved oxygen, deep pools, and submergent vegetation. Its diet is omnivorous, feeding opportunistically on aquatic invertebrates, algae, plant material, and insects. Primarily threats include habitat alteration or destruction, over collection, disease, and predation from non-native specie (USFWS, 1998c).

Woundfin. The woundfin (*Plagopterus argentissimus*) is a small, silvery minnow that grows to approximately three inches in length. This species primarily feeds on algae, seeds, detritus and various aquatic insects and larvae (USFWS, 2014g). This species was federally listed as endangered in 1970 (35 FR 16047 16048, October 13, 1970) and was designated with critical habitat in 2000 (65 FR 4140 4156, January 26, 2000). Similar to the Virgin River Chub fish species, critical habitat for this species occurs in in Utah, Arizona, and Nevada. Within Nevada, critical habitat for this species has been established in and along the Virgin River in Clark County (USFWS, 2000).

Suitable habitat for the Woundfin include warm, quiet water habitats with sand substrates within the mainstem of the Virgin River. Historically, this fish species occurred in the Gila, Salt, Moapa and Colorado rivers, however, this species is now restricted to the Virgin River. The primary threats for this species are low flows and high temperatures (USFWS, 2014g).

Reptiles

There is one federally threatened species of reptile known to occur in Nevada as summarized in Table 6.1.6-5, the desert tortoise (*Gopherus agassizii*). The desert tortoise is a characteristic species of the Mojave Desert environment that occupies the southern portion of the state. Information on the habitat, distribution, and threats to the survival and recovery of this species in Nevada is provided below.

Table 6.1.6-5: Federally Listed Reptile Species of Nevada

Common Name	Scientific Name	Federal Status [a]	Critical Habitat in Nevada	Habitat Description
Mojave desert tortoise	*Gopherus agassizii*	T	Yes	Sandy flats, rocky foothills, or alluvial fans in Mojave Desertscrub plant communities.

[a] T = Threatened,

Source: (USFWS, Nevada Fish & Wildlife Office, 2016)


Desert tortoise Photo Credit: USFWS

Desert Tortoise. The desert tortoise (*Gopherus agassizii*) has a domed shell with yellowish scute centers that have grooved, concentric rings. This species has round, stumpy hind legs and flattened front limbs for digging. The desert tortoise has a small, rounded head, small greenish-yellow eyes and a small tail. Mature adults typically weigh between 8 to 15 pounds and are approximately 4 to 6 inches in height (USFWS, 2014h). This species was federally listed as threatened in 1980 (45 FR 55654 55666, August 20, 1980) and afforded critical habitat in 1994 (59 FR 5820 5866, February 8, 1994). Critical habitat in Nevada is located in Clark County, in the southern portion of the state (USFWS, 2014h).

The desert tortoise spends the majority of its life underground and prefers to live in a variety of desert habitats that range from sandy flats to rocky foothills and alluvial fans where suitable soils for digging can be found. In Nevada, the species occurs in areas of Mojave desertscrub. This species depends on bushes and shrubs for shade and protection from predators such as coyotes. Primary threats to this species include habitat loss, degradation and fragmentation (USFWS, 2014h).

Amphibians

There are no federally listed endangered or threatened amphibian species in Nevada. The relict leopard frog (*Lithobates onca*) has been identified as a candidate species in Nevada (USFWS, 2015e).

Invertebrates

Two endangered and one threatened invertebrates are federally listed for Nevada as summarized in Table 6.1.6-6. Information on the habitat, distribution, and threats to the survival and recovery of each of these species in Nevada is provided below.

Table 6.1.6-6: Federally Listed Invertebrate Species of Nevada

Common Name	Scientific Name	Federal Status [a]	Critical Habitat in Nevada	Habitat Description
Ash Meadows Naucorid	*Ambrysus amargosus*	T	Yes	Areas of flowing water with rocky/pebbly substrate in the Point of Rocks Spring, Ash Meadows, Nevada.
Carson Wandering Skipper	*Pseudocopaeodes eunus obscurus*	E	No	Lowland grassland habitats, less than 5,000 feet in elevation, in the northeastern Sierra Nevada Mountains.
Mount Charleston Blue Butterfly	*Icaricia shasta ssp. charlestonensis*	E	Yes	Open alpine habitats and ridgelines, over 8,200 feet in elevation, in the Spring Mountains.

[a] E = Endangered, T = Threatened

Source: (USFWS, 2015d)

Ash Meadows Naucorid. The Ash Meadows naucorid (*Ambrysus amargosus*) is an aquatic insect in the creeping water bug family (*Naucoridae*) endemic to freshwater springs in Ash Meadows, Nye County, Nevada (USFWS, 1990). It grows to approximately 0.2 inches in length and is flightless. The USFWS listed the Ash Meadows naucorid as threatened and afforded it critical habitat in 1985 (50 FR 20777 20794, May 20, 1985). Critical habitat for the species includes approximately 10 acres of land at the springs for which it is known to inhabit in Ash Meadows National Wildlife Refuge (USFWS, 2015ab).

The Ash Meadows naucorid is known only to occur in one very limited location: an area of flowing water with rocky/pebbly substrate in the Point of Rocks Spring. It reproduces during the spring and summer by laying eggs that adhere to the rocky substrate. Feeding habits are unknown, but the species likely feeds opportunistically on other insect’s larvae. Primary threats to the species include an extremely limited range and habitat alteration (USFWS, 1990).

Carson Wandering Skipper. The Carson wandering skipper (*Pseudocopaeodes eunus obscurus*) subspecies of the wandering skipper (*Pseudocopaeodes eunus*), which is native to a portion of the Sierra Nevada Mountains in northwestern Nevada and northeastern California. It is a small butterfly, averaging 0.5 inches in length, with dull orange/brown wings bordered with a thin dark line. The Carson subspecies is distinguishable from other subspecies by its duller, browner color (USFWS, 2007a). It was federally listed as endangered in 2002 (67 FR 51116 51129, August 7, 2002) (USFWS, 2015ac).

The Carson wandering skipper use lowland grassland habitats with less than 5,000 feet of elevation in a small portion of the northeastern Sierra Nevada Mountains. The subspecies appears to be dependent on the succulent leaves of saltgrass (*Distichlis spicata*) for larval feeding. Adults require a flowering nectar source from March through June. Which meadows are occupied by the species often varies from year to year depending on the availability of food. As saltgrass requires a high water table, the Carson wandering skipper has declined severely from historic populations due to natural drying and groundwater pumping. Current threats include habitat alteration, over-collection, disease and predation, and a limited range (USFWS, 2007a).

Mount Charleston Blue Butterfly. The Mount Charleston blue butterfly (*Icaricia shasta charlestonensis*) is one of seven subspecies of the Shasta blue butterfly (*Plebejus shasta*), and is endemic to the Spring Mountains of Clark County, Nevada. It is a small butterfly with an approximately 1-inch wingspan. Males are an iridescent blue and females are a dull brown with blue spotting (USFWS, 2013b). The subspecies was federally listed as endangered in 2013 (78 FR 57749 57775, November 19, 2013) and was afforded approximately 5,200 acres of critical habitat in the Spring Mountains in 2015 (80 FR 37403 37430, June 30, 2015) (USFWS, 2013b) (USFWS, 2015ad).

While historically populous in the Spring Mountains, the Mount Charleston blue butterfly is presumed to be extirpated from at least seven of its seventeen known locations. Typical habitat for this subspecies are ridgelines above 8,200 feet in elevation with available Torrey's milkvetch (*Astragalus calycosus* var. *calycosus*) for larval feeding. Adults will use a small variety of flowering plants as nectar sources. Because Torrey's milkvetch is an early successional species dependent on open habitats created by fire, human fire suppression has limited its available habitat and indirectly caused a decline in the Mount Charleston blue butterfly. Current threats to the subspecies includes a limited range, habitat alteration, over-collection, disease and predation, and climate change (USFWS, 2013b).

Plants

There are two endangered and eight threatened species of plants that are federally listed and known to occur in Nevada, as summarized in Table 6.1.6-7. Additionally, USFWS has identified one candidate plant species in Nevada, the whitebark pine (*Pinus albicaulis*). Similar to its fish and invertebrates, many of Nevada's protected plants are endemic species with very limited home ranges. Ash Springs in Nye County is the primary range for seven of these listed species. Two of the species, Steamboat buckwheat (*Eriogonum ovalifolium* var. *williamsiae*) and Webber ivesia (*Ivesia webberi*), inhabit the Sierra Nevada region in the northwestern portion of the state. The Ute Ladies'-tresses (*Spiranthes diluvialis*) is instead limited to the eastern portion of the state, near Utah. Information on the habitat, distribution, and threats to the survival and recovery of the listed species in Nevada is provided below.

Table 6.1.6-7: Federally Listed Plant Species of Nevada

Common Name	Scientific Name	Federal Status [a]	Critical Habitat in Nevada	Habitat Description
Amargosa Niterwort	*Nitrophila mohavensis*	E	Yes	Alkaline, salt encrusted, clay soils in wetland areas of Ash Meadows, Nevada, and Death Valley, California.
Ash Meadows Blazingstar	*Mentzelia leucophylla*	T	Yes	Dry washes or on barren bluffs with alkaline soils in Ash Meadows, Nevada.
Ash Meadows Gumplant	*Grindelia fraxinipratensis*	T	Yes	Moist, clay soils in riparian areas of Ash Meadows, Nevada, and Death Valley, California.
Ash Meadows Ivesia	*Ivesia kingii var. eremica*	T	Yes	Moist, alkaline, clay soils in Ash Meadows, Nevada, and Death Valley, California.
Ash Meadows Milk-vetch	*Astragalus phoenix*	T	Yes	Dry, stable, alkaline or clay soils in barren flats, knolls, or slopes in Ash Meadows, Nevada.
Ash Meadows Sunray	*Enceliopsis nudicaulis var. corrugata*	T	Yes	Dry, stable, saline soils in uplands; seasonally moist, saline soils; moist soils near seeps and springs; desert pavement; or dry arroyos in Ash Meadows, Nevada.
Spring-loving Centaury	*Centaurium namophilum*	T	Yes	Moist, clay soils in riparian areas of Ash Meadows, Nevada.
Steamboat Buckwheat	*Eriogonum ovalifolium var. williamsiae*	E	No	Shallow, silica-rich, hot spring deposits in the Steamboat Hills, Nevada.
Ute Ladies'-tresses	*Spiranthes diluvialis*	T	No	Open wetlands, meadows, and swales.
Webber Ivesia	*Ivesia webberi*	T	Yes	Seasonally moist, rocky, clay soils in a transition zone between the Sierra Nevada Mountains and the Great Basin Desert.

[a] E = Endangered, T = Threatened

Source: (USFWS, 2015d)

Amargosa Niterwort. The Amargosa niterwort (*Nitrophila mohavensis*) is a member of the goosefoot family (*Chenopodiaceae*) endemic to eastern California and Ash Meadows in Nye County, Nevada. It is a small, perennial, rhizomatous species, which rarely exceeds four inches in height (USFWS, 1990). It was federally listed as endangered and afforded critical habitat in 1985 (50 FR 20777 20794, May 20, 1985). Critical habitat for this species includes approximately 1,300 acres of land in Nevada and California (USFWS, 2015ae).

The Amargosa niterwort is currently known to form 2 populations in eastern California and three populations in Ash Meadows Arizona with a total of 56 acres of estimated occupied habitat. While population trends for the species are unknown, the largest population (in Lower Carson Slough, California) is believed to be decreasing in size (USFWS, 2007b). Habitat for the species is limited to alkaline, salt encrusted, clay soils in wetland areas of harsh desert environments. Being tolerant of high levels of salt and alkali in soils, it is often the only species occupying this habitat. It grows in in large root colonies with many seemingly individual plants sprouting from one colony. Plants produce small flowers in the late spring. The species is particularly sensitive to ground disturbance due to its delicate habitat requirements (USFWS, 1990). The primary threat to the species is human caused habitat alteration in several varieties: direct disturbance or draining of wetlands for mining activities, altered sedimentation from nearby roads, off-highway vehicle usage, and soil compaction from feral horses (USFWS, 1990) (USFWS, 2007b).

Ash Meadows Blazingstar. Ash Meadows blazingstar (*Mentzelia leucophylla*) is a member of the *Loasacea* family and is endemic to Ash Meadows in Nye County, Nevada. It is a biennial, herbaceous plant growing to a height of approximately 20 inches. It produces yellow flowers with five petals that grow in broad inflorescences and bloom in summer months (USFWS, 1990). It was federally listed as threatened and afforded critical habitat in 1985 (50 FR 20777 20794, May 20, 1985). Critical habitat for this species includes approximately 1,200 acres of land in Ash Meadows (USFWS, 1990) (USFWS, 2015af).

Ash Meadows blazingstar is considered the rarest plant species endemic to Ash Meadows. It has strict habitat requirements, only growing in dry washes or on barren bluffs with alkaline soils. The species' entire range is limited to the eastern portion of Ash Meadows. It is typically found in association with shadscale saltbush (*Atriplex confertifolia*) and Ash Meadows sunray (*Enceliopsis nudicaulis* var. *corrugata*), another Ash Meadows endemic. The species is assumed to be sensitive to ground disturbance. It has experienced a decline in population due to agricultural development, off-highway vehicle disturbance, and trampling by livestock or feral horses. Approximately 37 percent of the species' known populations are now protected in the Ash Meadow's National Wildlife Refuge. Its current threats include a limited distribution, habitat alteration, over-collection, and trampling from feral horses or livestock (USFWS, 1985) (USFWS, 1990).

Ash Meadows Gumplant. The Ash Meadows gumplant (*Grindelia fraxinipratensis*) is a member of the daisy family (*Asteraceae*) that is endemic to eastern California and Ash Meadows in Nye County, Nevada. The species is biennial or perennial, herbaceous plant with a maximum height of 40 inches. It has yellow, daisy-like flowers, which bloom in the summer and early autumn (USFWS, 1990). It was federally listed as threatened and afforded critical habitat in 1985 (50 FR 20777 20794, May 20, 1985). Critical habitat for this species includes approximately 2,000 acres land in Ash Meadows and eastern California (USFWS, 1990) (USFWS, 2015ag).

The Ash Meadows gumplant lives in ecotonal habitats between riparian wetlands and desert uplands. It requires moist soils, which are typically maintained by perched groundwater or spring discharges. Its reliance on moist soils in a desert environment make it highly sensitive to changes in water supply (USFWS, 1985). While once widespread in the Ash Meadows region, the species' population was dramatically reduced by the draining of wetlands for agriculture or mining in the mid-20th century, as well as drying of soils from groundwater pumping (USFWS, 1990). Approximately 26 percent of the known population of the species is now protected within the Ash Meadows National Wildlife Refuge. Current threats to the species include habitat alteration (particularly from water usage or road building), off-highway vehicle disturbance, and trampling from feral horses and livestock (USFWS, 1985).

Ash Meadows Ivesia. The Ash Meadows ivesia (*Ivesia kingii var. eremica*) is a variety of King's ivesia (*Ivesia kingii*) in the rose family (*Rosaceae*). It is endemic to eastern California and Ash Meadows in Nye County, Nevada. The variety is a perennial herb, occurring in solitary clumps that reach 2 inches in height. It produces small white flowers in the late summer and early autumn (USFWS, 1990). It was federally listed as threatened and afforded critical habitat in 1985 (50 FR 20777 20794, May 20, 1985). There are 880 acres of critical habitat established for this species in the Ash Springs region (USFWS, 1985) (USFWS, 2015ah).

The Ash Meadows ivesia grows in lowlands and depressions with alkaline, clay soils, moistened by high water tables or nearby springs and seeps. It is often associated with shadscale saltbush and rushes (*Juncus* spp.). As it is dependent on soil moisture, it is very sensitive to changes in the local water system. Much of its historic habitat has been destroyed by agricultural development, spring alteration, channelization or diversion of waterbodies, groundwater pumping, and road construction. Approximately 45 percent of the known population of the variety is now protected within the Ash Meadows National Wildlife Refuge. The primary threat to this variety is drying of its habitat by groundwater pumping. Other threats include road construction, off-highway vehicle disturbance, and trampling from feral horses or livestock (USFWS, 1985).

Ash Meadows Milk-vetch. The Ash Meadows milk-vetch (*Astragalus phoenix*) is a species within the legume family (*Fabaceae*) that is endemic to the Ash Meadows region of Nye County, Nevada. It is a small, matted, perennial herb that grows in mounds, the oldest of which reach 20 inches in diameter. It bears small purple flowers that extend off short, erect stems (USFWS, 1985). It was federally listed as threatened and afforded critical habitat in 1985 (50 FR 20777 20794, May 20, 1985). There are 1,200 acres of critical habitat established for this species in the Ash Springs region (USFWS, 1985) (USFWS, 2015ai).

The Ash Meadows milk-vetch is one of the rarer endemic species in Ash Meadows as it is only associated with dry, stable, alkaline or clay soils in barren flats, knolls, or slopes. These specific habitat requirements have resulted in a spotty distribution, with small populations spread across the Ash Meadows region. Unlike other protected plants in Ash Meadows, the Ash Meadows milk-vetch is not dependent on moist soils dampened by springs; nevertheless, the species has experienced a recent reduction in its population from agricultural development and road construction. Approximately 45 percent of its known occupied habitat is protected within the Ash Meadows National Wildlife Refuge. The most pressing threats to the species are alterations of storm water drainage, road construction, mining, and trampling from feral horses or livestock (USFWS, 1985).

Ash Meadows Sunray. The Ash Meadows sunray (*Enceliopsis nudicaulis var. corrugata*) is a variety of naked-stem sunray (*Enceliopsis nudicaulis*) in the sunflower family (*Asteraceae*). The perennial plant is endemic to the Ash Meadows region of Nye County, Nevada. It grows in small woody clumps of up to 16 inches high and produces yellow, ray flowers on individual heads, which number up to 23 per plant (USFWS, 2011). It was federally listed as threatened and afforded critical habitat in 1985 (50 FR 20777 20794, May 20, 1985). There are 1,700 acres of critical habitat established for this species in the Ash Springs region (USFWS, 1985) (USFWS, 2015aj).

The Ash Meadows sunray grows in a variety of habitats including dry, stable, saline soils in uplands; seasonally moist, saline soils; moist soils near seeps and springs; desert pavement; and along dry arroyos. It is typically found between 2,200 and 2,400 feet in elevation and in association with Alkali Shrub-Scrub or Salt Desert Scrub plant communities. Similarly, to other protected species in Ash Meadows, the Ash Meadows sunray's population was reduced by groundwater pumping in the region and the associated drying of springs and seeps. Current threats to the species are groundwater pumping, off-highway vehicle disturbance, road construction, trampling by feral horses or livestock, competition from non-native plant species, wildfire, mining, and solar energy development (USFWS, 2011).

Spring-loving Centaury. The spring-loving centaury (*Zeltnera namophila*) is a species within the gentian family (*Gentianaceae*) of flowering plants that is native to Ash Meadows in Nye County, Nevada and the Death Valley region of eastern California. It is a low-branching, erect, annual, herbaceous plant with pinkish flowers. It grows to a maximum height of approximately 18 inches (USFWS, 1985) (USFWS, 1990). It was federally listed as threatened and afforded critical habitat in 1985 (50 FR 20777 20794, May 20, 1985). There are 1,800 acres of critical habitat established for this species in the Ash Springs region (USFWS, 1985) (USFWS, 2015ak).

This spring-loving centaury was historically distributed throughout the Ash Meadows and Death Valley regions, having populations in Tecopa and Furnace Creek, California and in Beatty and Ash Meadows, Nevada. However, all of these populations, except for the Ash Springs population, are now considered extirpated. In Ash Meadows, it is associated with riparian habitats that border springs or seeps and requires moist, clay soils. Similarly, to other protected plants in Ash Meadow's, this species is highly susceptible to changes in the groundwater regime. Its population was historically diminished by the drying of local soils from groundwater pumping. Approximately 37 percent of the known population is protected within the Ash Springs National Wildlife Refuge. Current threats to the species include habitat alteration (primarily groundwater pumping and road construction) and trampling from feral horses or livestock. (USFWS, 1990)

Steamboat Buckwheat. The steamboat buckwheat (*Eriogonum ovalifolium var. williamsiae*) is a variety of cushion buckwheat (*Eriogonum ovalifolium*) that is endemic to hot spring deposits in the Steamboat Hills of Washoe County, Nevada. It is a low, herbaceous plant that grows in mats of up to 18 inches in diameter. These mats produce erect stems that stand approximately 10 inches tall and are topped with small, dense, white flower clusters. It was federally listed as endangered in 1986 (51 FR 24669 24672, July 8, 1985) (USFWS, 2015al).

While locally abundant, the steamboat buckwheat is restricted to approximately 50 acres of habitat. Its endemism is a result of extremely restrictive habitat requirements; this variety only grows on shallow, silica-rich, hot spring deposits in the Steamboat Hills. The Steamboat buckwheat is colonial, producing multiple individuals from one underground root system. Population estimates suggest that there are tens of thousands of individuals in existence within its range. Construction activities in the local vicinity, such as construction of U.S. Highway 395, have reduced the suitable habitat for this variety (USFWS, 1995b). However, much of the land now occupied by the Steamboat buckwheat is now protected under a conservation agreement. Current threats include a very limited distribution, geothermal energy development, off-highway vehicle activity, maintenance activities on U.S. Highway 395, illegal dumping, changes in geothermal activity, over-collection, and disease (USFWS, 2009).

Ute Ladies'-tresses. The Ute ladies'-tresses (*Spiranthes diluvialis*) is a perennial orchid that grows up to 24 inches in height and that typically flowers from early August to early September. Ute ladies' tresses was federally listed as threatened in 1992 (57 FR 2048 205, January 17, 1992) and was proposed for delisting in 2004. Though the species is recovering, its threatened status is current (USFWS, 2015am).

The species occurs throughout Colorado, Idaho, Montana, Nebraska, Nevada, Utah, Washington, and Wyoming. Within Nevada, the species is believed to grow in wetlands, meadows, and swales[85] in the extreme eastern portion of the state. Threats to this species include urbanization, agriculture, recreation, grazing, and invasive non-native species (USFWS, 1995c).

Webber Ivesia. The Webber ivesia (*Ivesia webberi*) is a species within the rose family (*Rosaceae*) that is endemic to northeastern California and northwestern Nevada. It is a low-growing, perennial, herbaceous plant with clusters of small yellow flowers and green/grey leaves (USFWS, 2014i). It was listed as threatened and afforded approximately 2,000 acres of critical habitat in 2014 (79 FR 8668 8677, February 13, 2014 and 79 FR 31878 31883, June 3, 2014) (USFWS, 2014i) (USFWS, 2015an).

The Webber ivesia has a limited range, occurring in only 165 acres of land in a transition zone between the Sierra Nevada and the Great Basin Desert in California and Nevada. The species was historically known to exist in 17 populations, one of which has been confirmed as extirpated and three of which may be extirpated. The species is associated with seasonally moist, rocky, clay soils, which shrink when dry. It is typically found in sparsely vegetated sagebrush-bunchgrass communities. The species' endemism is a result of specific soil requirements and of limited seed dispersal. The primary threat to this species is the encroachment of non-native vegetation, causing increased competition and a change in the natural fire regime. The species is also threatened by off-highway vehicle disturbance, urban development, climate change, and trampling by livestock or feral horses (USFWS, 2014i).

6.1.7. Land Use, Recreation, and Airspace

6.1.7.1. Definition of the Resources

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

[85] Swale: "A swale, sometimes called a biofilter, is a grass-lined channel that is designed to convey storm water in shallow flow. Pollutant removal is accomplished through filtration through the vegetation and swales are frequently designed to allow for infiltration of storm water." (USEPA, 2015n)

Land Use, Recreation, and Airspace

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

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. Recreational resources are typically managed by federal, state, county, or local governments.

Descriptions of land uses are presented in three primary categories: forest and woodlands, agricultural, and developed. Descriptions of land ownership are presented in four main categories: private, federal, state, and tribal. Descriptions of recreational opportunities are presented in a regional fashion.

Airspace

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

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

The FAA Air Traffic Services Unit (the Unit) manages the National Airspace System (NAS) and international airspace assigned to U.S. control and is responsible for ensuring efficient use, security, and safety of the nation's airspace. FAA field and regional offices (e.g., Aircraft Certification Offices, Airports Regional Offices, Flight Standards District Offices [FSDOs], Regional Offices & 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.

6.1.7.2. 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 Nevada. However, most site-specific land use controls and requirements are governed by local county, and city laws and regulations. Furthermore, many land use controls and requirements are implemented and enforced under the umbrella of land use planning, often with the help and support of state authorities. The Nevada State Land Use Planning Agency prepared *The Planner's Guide* as the state-level guidance for land use planning in Nevada (State Land Use Planning Agency, 2015).

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

6.1.7.3. Land Use and Ownership

For the purposes of this analysis, land use in Nevada is classified into primary land use groups based on coverage type as semi-desert, forest and woodland, shrubland and grassland, agricultural, and developed land. Land ownership within Nevada is classified into four main categories: private, federal, state, and tribal.

Land Use

Nevada is mostly composed of semi-desert or shrubland and grassland. Of the land use categories defined in this PEIS, 73 percent of Nevada's total land is comprised of semi-desert land (Table 6.1.7-1). Forest and woodland is the second largest area of land use with 15 percent of the total land area. Shrubland and grassland accounts for 7 percent and agricultural land for approximately 1 percent of the total land area. The remaining percentage of land includes developed land (<1 percent) and public land and other land covers, shown in Figure 6.1.7-1, that are not associated with specific land uses (USGS, 2011).

Table 6.1.7-1: Major Land Use in Nevada by Coverage Type

Land Use	Square Miles	Percent of Land
Semi-Desert Land	80,250	73%
Forest and Woodland	16,519	15%
Shrubland and Grassland	7,280	7%
Agricultural Land	860	1%
Developed Land	488	<1%
Other	4,384	4%

Source: (USGS, 2011)

Semi-Desert Land

Land use within the semi-desert category in Nevada includes wildlife management areas, wilderness and wilderness study areas, recreation, minerals development, wild horse management areas, and livestock grazing (BLM, 2016). Semi-desert areas cover 73 percent of Nevada's land (Figure 6.1.7-1) and are managed by private land owners, the state, DoD, Department of Energy (DOE), NPS, USFWS, tribes, and the BLM (Figure 6.1.7-1).

Forest and Woodland

Forest and woodland areas are located in the Sierra Nevada Mountains in western Nevada, the Spring Mountains in southern Nevada, and in higher elevations and mountain ranges in central Nevada. Approximately 15 percent of Nevada's total land area is classified as forest and woodland (approximately 16,519 square miles). Most forest and woodland areas in Nevada are on public lands, approximately 92 percent of which are managed by the USFS and BLM (Nevada Division of Forestry, 2010). Nevada is home to the Humboldt-Toiyabe National Forest and also houses a small portion of the Inyo National Forest (USFS, 2016a). Additionally, the USFS manages the Lake Tahoe Basin Management Unit (LTBMU) similarly to a national forest, a portion of which lies along the east side of the lake in Nevada (USFS, 2016b). Section 6.1.6.3, Terrestrial Vegetation, presents additional information about vegetation in the state.

State Forests

There are no State Forests in Nevada. The purpose of the Nevada Division of Forestry is to "provide professional natural resource and fire services to Nevada citizens to enhance and protect forest, rangeland, and watershed values; conserve endangered plants and other native flora; and provide effective statewide fire protection and emergency management" (Nevada Division of Forestry, 2015).

Private Forest and Woodland

Private forest owners collectively own approximately seven percent (approximately 1,172 square miles) of Nevada's total forest and woodland. Most of the private ownership is in the Carson Range in western Nevada, the Ruby Mountains and Schell Creek Mountains in eastern Nevada, and the Spring Mountains in southern Nevada (Nevada Division of Forestry, 2010). For additional information regarding forest and woodland areas, see Section 6.1.6.3, Terrestrial Vegetation and Section 6.1.8, Visual Resources.

Shrubland and Grassland

The largest concentrations of shrubland and grassland are located in mountain valleys, edges of forest and woodlands, and the transition between high and low elevations (Figure 6.1.7-1). Land use in these areas varies by location and includes both private and public land ownership (Figure 6.1.7-1). Some of the uses within this category include ranching, recreation, and wildlife preservation.

Agricultural Land

Agricultural land is occurs in isolated and scattered locations (Figure 6.1.7-1). Approximately one percent of Nevada's total land area is classified as agricultural land (approximately 860 square miles). In 2012, there were 4,137 farms in Nevada and 78 percent were owned and operated by families or individuals, with the average farm size of 1,429 acres (USDA, 2012). Some of the state's largest agricultural uses include hay, dairy, cattle, and hogs (USDA, 2014).

Developed Land

Developed land in Nevada tends to be concentrated within major metropolitan areas and surrounding cities, towns, and suburbs (Figure 6.1.7-1). Less than one percent of Nevada land is developed (approximately 488 square miles). These areas are highly utilized for residential, commercial, industrial, recreational, and government purposes. Table 6.1.7-2 lists the top five developed metropolitan areas within the state and their associated population estimates, and shows where these areas are located within the Developed land use category.

Table 6.1.7-2: Top Developed Metropolitan Areas

Metropolitan Area	Population Estimate (2014)
Las Vegas-Henderson-Paradise, NV Metro Area	2,069,681
Reno, NV Metro Area	443,990
Carson City, NV Metro Area	54,522
Total Estimated Population of Metropolitan Areas	**2,568,193**
Total State Estimated Population	**2,839,099**

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

Figure 6.1.7-1: Major Land Use Distribution by Coverage Type

Land Ownership

Land ownership within Nevada has been classified into four main categories: private, federal, state, and tribal. Federal, state, and tribal lands are shown in Figure 6.1.7-2.[86]

Private Land

Privately owned land in Nevada falls within the agricultural land, developed land, and forest and woodland land uses (Figure 6.1.7-1). Highly developed, urban, metropolitan areas transition into suburban, agriculture, shrub, and woodland areas. Private land exists in all regions of the state.[87]

Federal Land

The federal government owns the majority of land in Nevada. The federal government manages 93,854 square miles (85 percent) of Nevada land with a variety of land types and uses, including military bases and ranges, national wildlife refuges, national forest and wilderness areas, and NPS units (Figure 6.1.7-2) (USGS, 2016c) (USGS, 2014g). Seven federal agencies manage the majority of federal lands throughout the state (Table 6.1.7-3 and Figure 6.1.7-2). There may be other federal lands, but they are not shown on the map due to their small size relative to the entire state.

Table 6.1.7-3: Federal Land in Nevada

Agency	Square Miles	Representative Type
DoD	4,036	Military Bases, Ranges
USFWS	3,643	National Wildlife Refuges
USFS	9,024	National Forest and Wilderness Areas
NPS[a]	1,193	National Parks, a National Recreation Area, and a National Monument
Bureau of Reclamation	299	Projects and Facilities
Department of Energy	1,358	Projects and Facilities
Bureau of Land Management	74,301	Mining, Energy Development, Recreation, Livestock Grazing, and Special Areas
Total	**93,854**	

[a] Additional trails and corridors pass through Nevada that are part of the National Park System.

Sources: (USGS, 2016c) (USGS, 2014g)

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

[87] Total acreage of private land could not be obtained for the state.

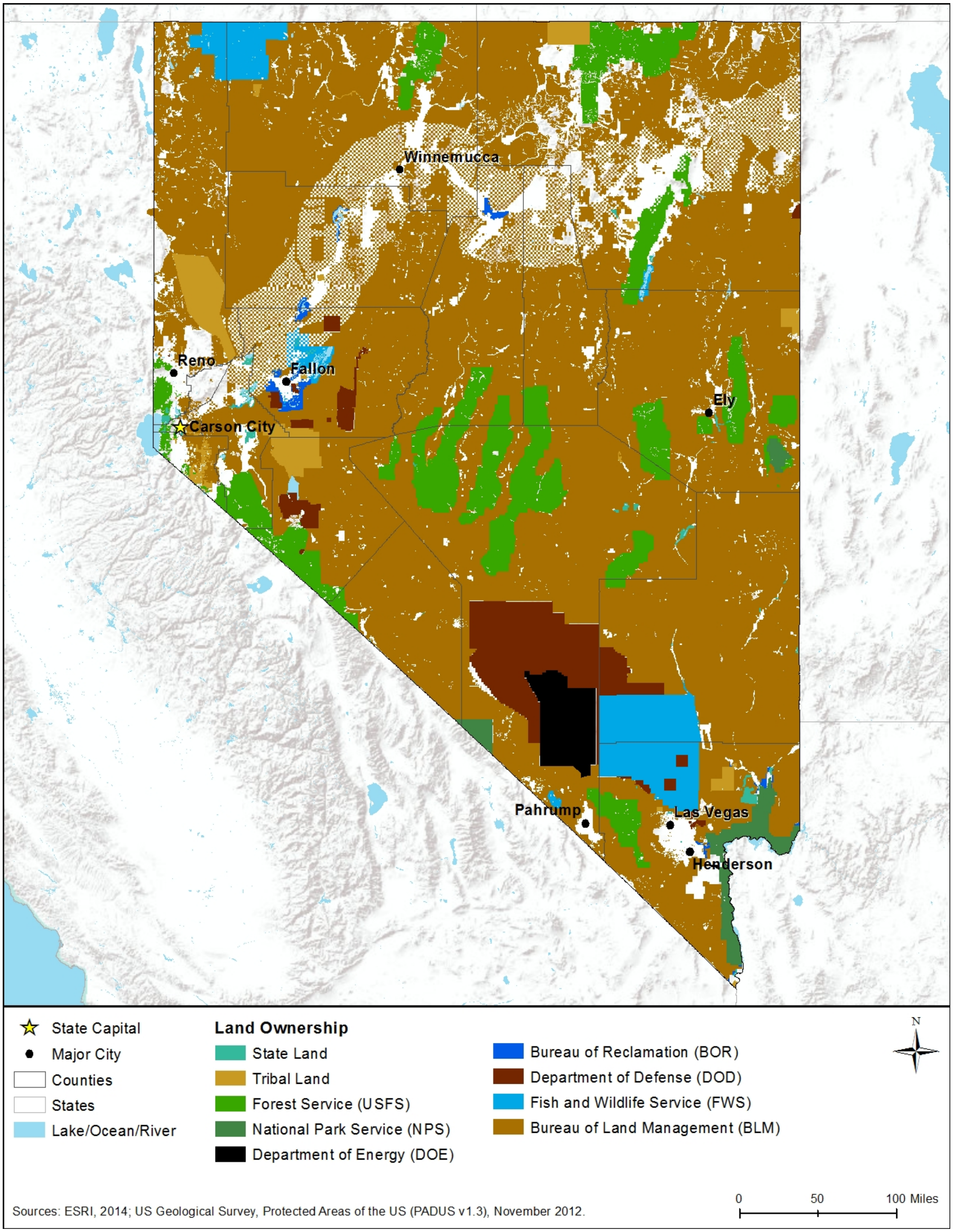

Figure 6.1.7-2: Land Ownership Distribution

- The DoD owns and manages 4,036 square miles used for military bases and ranges (DoD, 2014);
- The USFWS owns and manages 3,643 square miles consisting of nine National Wildlife Refuges in Nevada, with four located within the Desert National Wildlife Refuge Complex, one in the Sheldon-Hart Mountain National Wildlife Refuge Complex, and three in the Stillwater National Wildlife Refuge Complex (USFWS, 2014j);
- The USFS owns and manages 9,024 square miles set aside as the Humboldt-Toiyabe National Forest including 2,000 square miles consisting of 23 Wilderness Areas. Additionally, the USFS owns and manages small portions of the Inyo National Forest and LTBMU in Nevada (USFS, 2015d) (USFS, 2015e) (USFS, 2016a);
- The NPS manages 1,193 square miles consisting of four National Parks and other affiliated sites (NPS, 2014b);
- The Bureau of Reclamation manages 299 square miles consisting of projects and facilities such as power plants and dams;
- The DOE manages 1,358 consisting of energy-related projects and facilities such as the Nevada National Security Site; and
- The BLM manages 74,301 square miles of public lands managed for a variety of uses such as mining, energy development, recreation, and livestock grazing and includes special areas such as National Conservation Areas, National Monuments, and Wilderness Areas (USGS, 2012b) (USGS, 2014g).

State Land[88]

The Nevada state government owns approximately 268 square miles of land (USGS, 2012b) (USGS, 2014g). This land is comprised of State Parks and Wildlife Management Areas (Table 6.1.7-4).

Table 6.1.7-4: State Land in Nevada

Agency	Square Miles[a]	Representative Type
Department of Conservation and Natural Resources, Division of State Parks	180	State Parks
NDOW	188	Wildlife Management Areas

[a] The acres are not additive due to overlapping boundaries of the State Parks and Wildlife Management Areas.

Source: (USGS, 2012b) (USGS, 2014g)

- The Department of Conservation and Natural Resources, Division of State Parks manages 180 square miles consisting of 23 State Parks; and
- The NDOW owns and manages 188 square miles consisting of 12 Wildlife Management Areas. (USGS, 2012b) (USGS, 2014g)

[88] 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.

Tribal Land

The Bureau of Indian Affairs, along with individual tribes, manages 1,861 square miles, or 1.7 percent of the total land within Nevada (USGS, 2012b) (USGS, 2014g).[89] These lands are composed of 25 Indian Reservations, Colonies, and Allotments located throughout the state, managed by the 19 federally recognized tribes currently located in the state (Figure 6.1.7-2 and Table 6.1.7-5). For additional information regarding tribal land, see Section 6.1.11, Cultural Resources.

Table 6.1.7-5: Indian Reservations and Other Land Holdings in Nevada

Reservation Name	Square Miles
Battle Mountain Reservation	1
Carson Colony	0.2
Dresslerville Colony	0.1
Duck Valley Reservation	225.2
Duckwater Reservation	6
Elko Band Colony	5.7
Ely Colony	0.2
Fallon Colony (northeast of Fallon)	0.1
Fallon Reservation (east of Fallon)	13
Fort McDermitt Reservation	26.1
Las Vegas Colony	6.2
Lovelock Indian Colony	9.4
Moapa River Reservation	112.2
Pyramid Lake Reservation	724.7
Reno-Sparks Indian Colony	3.3
South Fork Reservation	18.6
Stewart Community	1.2
Summit Lake Reservation	19.7
Walker River Reservation	531.2
Washoe Ranches	4.5
Washoe Tribe of Nevada and California Allotments[90]	139.7
Wells Colony	0.1
Yeringtion Reservation	2.5
Yerington Colony	2.5
Yomba Reservation	7.2
Total	**1,860.6**

Sources: (USGS, 2012b) (USGS, 2014g)

6.1.7.4. Recreation

Nevada terrain is dominated by the presence of the Great Basin that extends between the Colorado Plateau to the east and the Sierra Nevada Mountains to the west. The topography is characterized by dramatic contrasts that support an unexpected variety of recreational opportunities. Expansive flat desert basins are broken up by hundreds of narrow, short, isolated

[89] Although the Bureau of Indian Affairs "manages" American Indian lands, the Bureau of Indian Affairs is different than other land management agencies as the lands are held in trust and are sovereign nations.
[90] "An Indian allotment refers to land owned by individuals and either held in trust by the United States or subject to a statutory restriction on alienation. Most allotments were originally carved out of tribal lands held in common." (IRS, 2015)

mountain ranges, some large National Forests, and intermittent streams, lakes, and large salt marsh "sinks." All of Nevada is very sparsely populated except for the border towns of Las Vegas and Reno. Tourism is a prime industry mainly capitalizing on gambling and entertainment venues established in those two metropolitan areas, as well as neighboring Lake Mead and Lake Tahoe. American Indian cultures, Mormon settlers, emigrants, miners, Basque sheepherders, and ranchers have also left a rich variety of historical and cultural sites. On the community level, cities and towns provide an assortment of indoor and outdoor recreational facilities including: community and recreation centers, theaters, museums, athletic fields and courts, golf courses, multi-use trails, playgrounds, picnicking areas, theme/amusement parks, alpine (downhill) ski resorts and nordic (cross country skiing) centers, boat launches and marinas. Availability of community-level facilities is typically commensurate to the population's distribution and interests, and the natural resources prominent in the vicinity. There are 23 state parks and recreation areas in Nevada (Nevada Department of Conservation and Natural Resources, 2015a). Federally, the BLM, NPS, USFS, USFWS, and U.S. Army Corps of Engineers (USACE) manage areas in Nevada with substantial recreational attributes.

This section discusses key recreational opportunities and activities representative of various regions of Nevada. The state can be categorized by three distinct recreational regions, each of which are presented in the following sub-sections. For information on visual resources such as National Scenic Byways and state-designated Byways, see Section 6.1.8, Visual Resources; for information on culturally/historically significant resources, see Section 6.1.11, Cultural Resources.

Northern Region

The Northern Region is sparsely populated and mirrors the rural, undeveloped Great Basin terrain of bordering states Oregon, Idaho, Utah, and California (Figure 6.1.7-3).[91] Communities largely developed to support tourists, recreationists, fishermen, and hunters are located near I-80 that traverses this region. The northwest Black Rock Desert area has canyons and gorges, hot springs, wilderness areas, and historic trails (BLM, 2015a). Three units of the Humboldt-Toiyabe National Forest are located in the northeast area of this region. These are especially popular for hiking, horseback and off highway vehicle (OHV) riding, camping, picnicking, fishing, hunting, and snow sports. The Ruby Mountains and Lamoille Canyon are best known for their spectacular scenery and diverse recreation opportunities (USFS, 2015f). The town of Elko spotlights western folk life and art through their annual National Cowboy Poetry Gathering activities (Travel Nevada, 2015a).

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

Central Region

Reno, Sparks, and the capital, Carson City, are this region's primary locations for entertainment, cultural, and recreational opportunities. Lake Tahoe is a renowned destination for outdoor activities associated with its clear blue water and shoreline trails. The eastern half of the lake is in Nevada and western half is in California (Figure 6.1.7-3). Pyramid Lake is treasured for fishing opportunities and Sand Mountain for ATVing and sandboarding. Near Ely, the Great Basin National Park, Wheeler Peak, and the Lehman Caves are popular recreation sites (Travel Nevada, 2015b). The majority of Nevada's Humboldt-Toiyabe National Forest units are located in this region.

Southern Region

This region of the state is bordered by and filled with an extraordinary variety of recreational opportunities. Directly to the east is the Grand Canyon National Park and Parashant National Monument in Arizona; to the west are California's Death Valley National Park and the Mojave National Preserve. To the south, Nevada and Arizona share Lake Mead National Recreation Area and the Hoover Dam (Figure 6.1.7-3). The Las Vegas casinos, resorts, restaurants, and entertainment venues are the focal points for vacationers to this city, but this highly urbanized area is also surrounded by many outdoor recreation sites. Less than 20 miles from the Las Vegas "Strip," Red Rock Canyon (BLM, 2015b) and Sloan Canyon National Conservation Area (BLM, 2015c) provide unique opportunities for hiking, biking, rock climbing, horseback riding, picnicking, and nature and petroglyph viewing. Mt. Charleston's ski resort, Tule Springs Fossil Beds National Monument, Devils Hole, and Valley of Fire State Park are also popular nearby recreational destinations. The 260-mile Silver State OHV trail is located near Caliente (BLM, 2012a). State Route 375 brings visitors curious to travel the "Extraterrestrial Highway" that skirts the famous "Area 51" and to visit its associated attractions (Travel Nevada, 2015c).

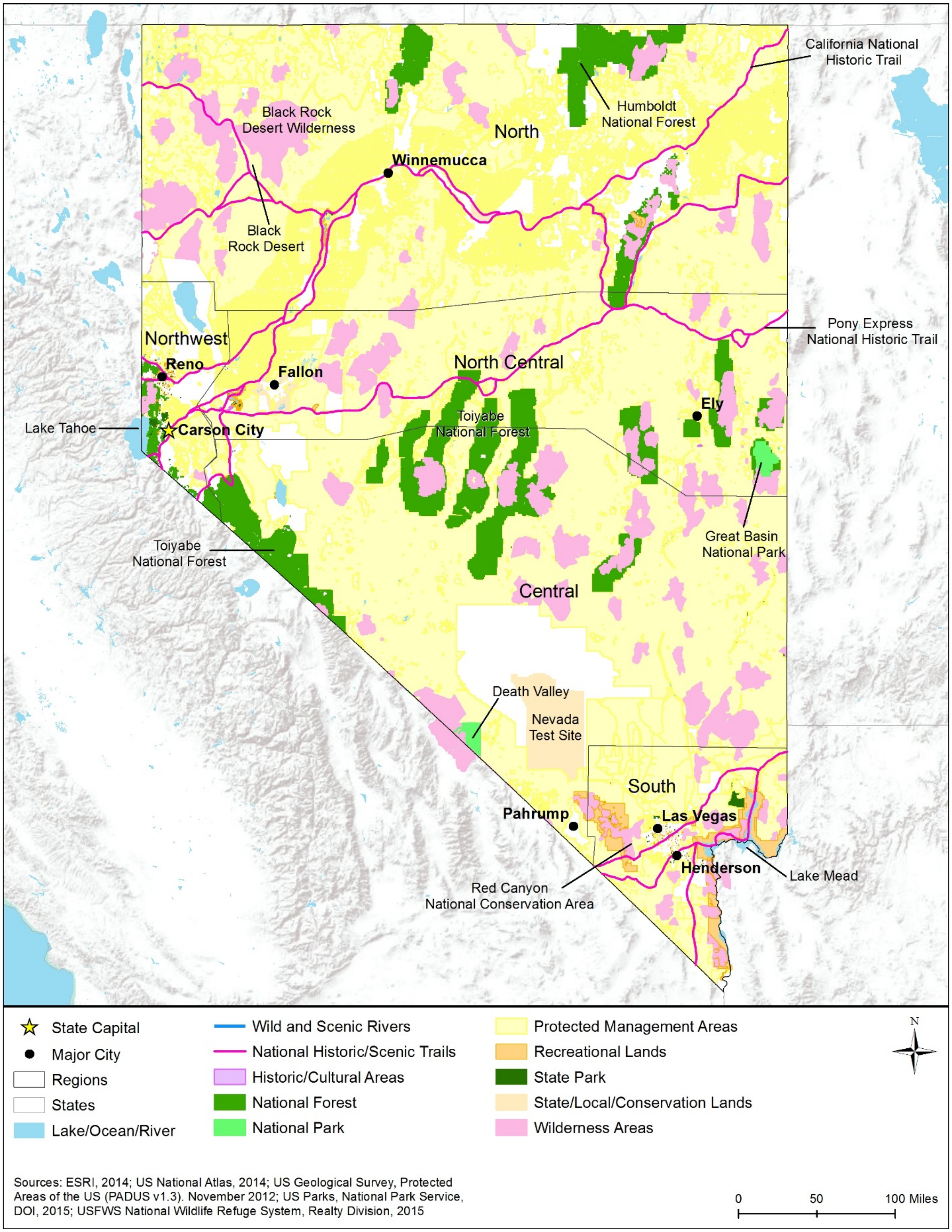

Figure 6.1.7-3: Nevada Recreation Resources

6.1.7.5. Airspace

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

Airspace Categories

There are two categories of airspace or airspace areas:

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

Within each of these two categories, there are four types of airspace: controlled, uncontrolled, special use, and other airspace. The categories and types of airspace are dictated by the complexity or density of aircraft movements, the nature of the operations conducted within the airspace, the level of safety required, and the national and public interest.

Figure 6.1.7-4 depicts the different classifications and dimensions for controlled airspace. Air Traffic Control (ATC)[92] service is based on the airspace classification (FAA, 2008).

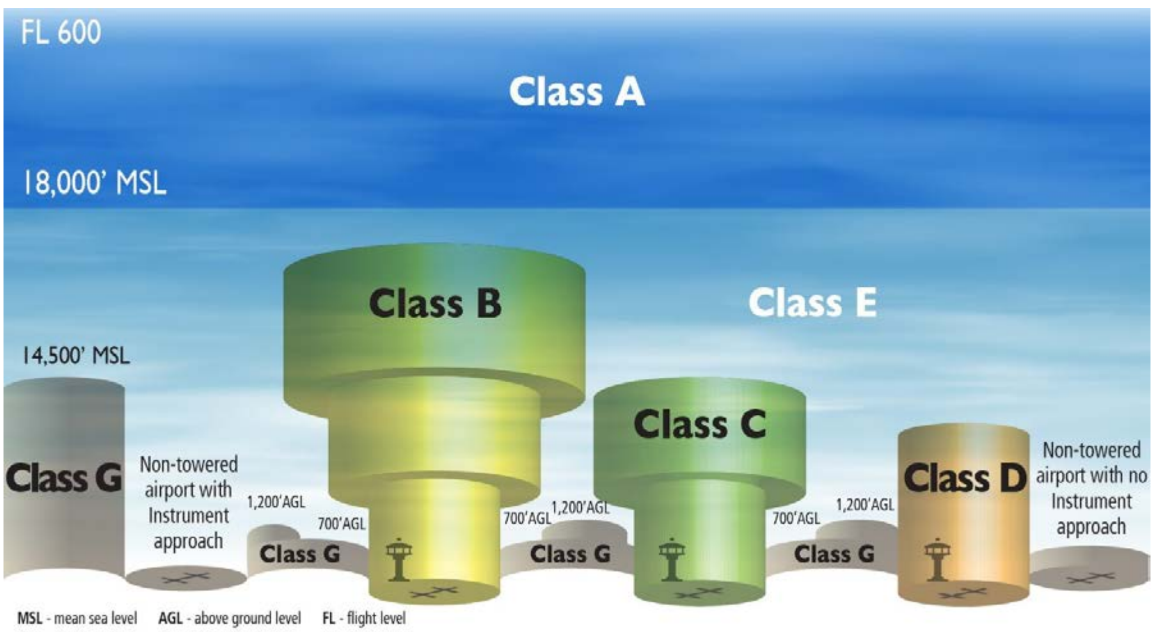

Figure 6.1.7-4: National Air Space Classification Profile

Source: Derived from (FAA, 2008)

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

Controlled Airspace

- **Class A:** Airspace from 18,000 feet to 60,000 feet Mean Sea Level (MSL).[93] 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).[94]
- **Class B:** Airspace from the surface up to 10,000 feet MSL near the busiest airports with heavy traffic operations. The airspace is tailored to the specific airport in several layers. An ATC clearance is required for all aircraft to operate in this area.
- **Class C:** Airspace from the surface to 4,000 feet above the airport elevation surrounding the airport. Applies to airports with an operational control tower, serviced by a radar approach control, and certain number of IFR operations or total number of passengers boarding aircrafts. Airspace is tailored in layers, but usually extends out to 10 NM from 1,200 feet to 4,000 feet above the airport elevation. Entering Class C airspace requires radio contact with the controlling ATC authority, and an ATC clearance is ultimately required for landing.
- **Class D:** Airspace from the surface to 2,500 feet above the airport elevation surrounding airports with an operational control tower. Airspace area is tailored. Aircraft entering the airspace must establish and maintain radio contact with the controlling ATC.
- **Class E:** Controlled airspace not designated as Class A, B, C, or D. Class E airspace extends upward from the surface or a designated altitude to the overlying or adjacent controlled airspace.

Uncontrolled Airspace

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

Special Use Airspace

SUA designates specific airspace that confines or imposes limitations on aircraft activities (See Table 6.1.7-6).

Table 6.1.7-6: 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

[93] 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, 2015b)
[94] IFR: Rules for the conduct of flights under instrument meteorological conditions. (FAA, 2015a)

SUA Type	Definition
	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."
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, 2015c) (FAA, 2008)

Other Airspace Areas

Other airspace areas, explained in Table 6.1.7-7, 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 6.1.7-7: Other Airspace Designations

Type	Definition
Airport Advisory	There are 3 types: • Local Airport Advisory - Operated within 10 statute miles of an airport where there is a Flight Service Station (FSS) located on an airport, but no operational control tower. The FSS advises the arriving and departing aircraft on particular conditions. • Remote Airport Advisory - Operated within 10 statute miles for specific high activity airports with no operational control tower. • Remote Airport Information Service – Used for short-term special events.
MTRs	MTRs are for use by the military for training, specifically low level combat tactics where low altitudes and high speed are needed.
TFRs	TFRs are established to: • Protect people and property from a hazard; • Provide safety for disaster relief aircraft during operations;

Type	Definition
	• 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 Draft PEIS, since it indicates a longer, standing condition of the airspace. Other TFRs are typically a shorter duration of for a one-time specific event.
Parachute Jump Aircraft Operations	Parachute jump area procedures are in 14 CFR Part 105, while the United States parachute jump areas are contained in the regional Airport/Facility Directory.
Published VFRs and IRs	These are established routes for moving around and through complex airspace, like Class B airspace. VFRs are procedures used to conduct flights under visual conditions. IFRs are procedures used to conduct flights with instruments and meteorological conditions.
Terminal Radar Service Areas	Airspace areas that are not one of the established U.S. airspace classes. These areas provide additional radar services to pilots.

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

Aerial System Considerations

Unmanned Aerial Systems

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

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.
    - within 5,000 ft. of a public use heliport which exceeds a 25:1 surface
- Any highway, railroad, or other traverse way whose prescribed adjusted height would exceed the above noted standards
- When requested by the FAA
- Any construction or alteration located on a public use airport or heliport regardless of height or location." (FAA, 2015d)

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.

Nevada Airspace

The State Aviation Planning Section is under the NevadaDOT Planning Division. The stated responsibilities are "…The Aviation Planning Section ensure safety requirements are adhered to by Nevada airports – both general aviation public and private use." The Aviation Planning Section ensures airports "provide maximum utility to their communities and the flying public. The NevadaDOT Aviation Planning Section facilitates the establishment of a viable, balanced, and integrated system of aviation facilities. NevadaDOT also prepares and administers the State Airport Systems Plan. It incorporates metropolitan regional airport system planning and provides direction for airport master planning" (NevadaDOT, 2015d). There are two FAA FSDOs, located in Las Vegas and Reno (FAA, 2015b).

Nevada airports are classified as those included in the State Aviation System Plan (SASP) and those that are not part of the SASP. The SASP addresses the strategic planning and future development for the state's airport system, as well as addressing key associated with their airports (NASAO, 2015). Figure 6.1.7-5 presents the different aviation airports/facilities residing in Nevada, while Figure 6.1.7-6 and Figure 6.1.7-7 present the breakout by public and private airports/facilities. There are approximately 126 airports within Nevada as presented in Table 6.1.7-8 and Figures 6.1.7-5 through Figure 6.1.7-7 (FAA, 2015a).

Table 6.1.7-8: Type and Number of Nevada Airports/Facilities

Type of Airport or Facility	Public	Private
Airport	49	48
Heliport	0	27
Seaplane	0	0
Ultralight	0	1
Balloonport	0	0
Gliderport	0	1
Total	**49**	**77**

Source: (FAA, 2015a)

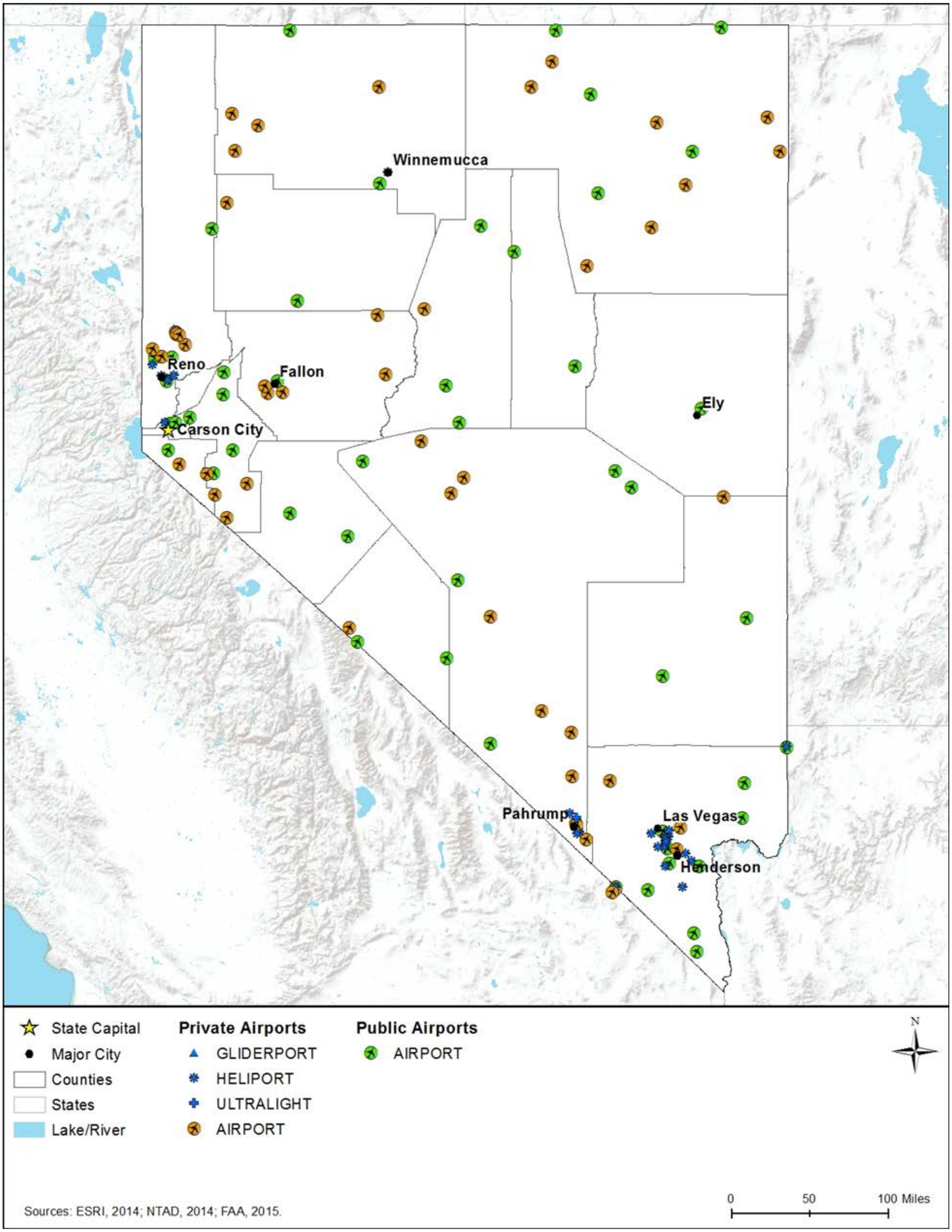

Figure 6.1.7-5: Composite of Nevada Airports/Facilities

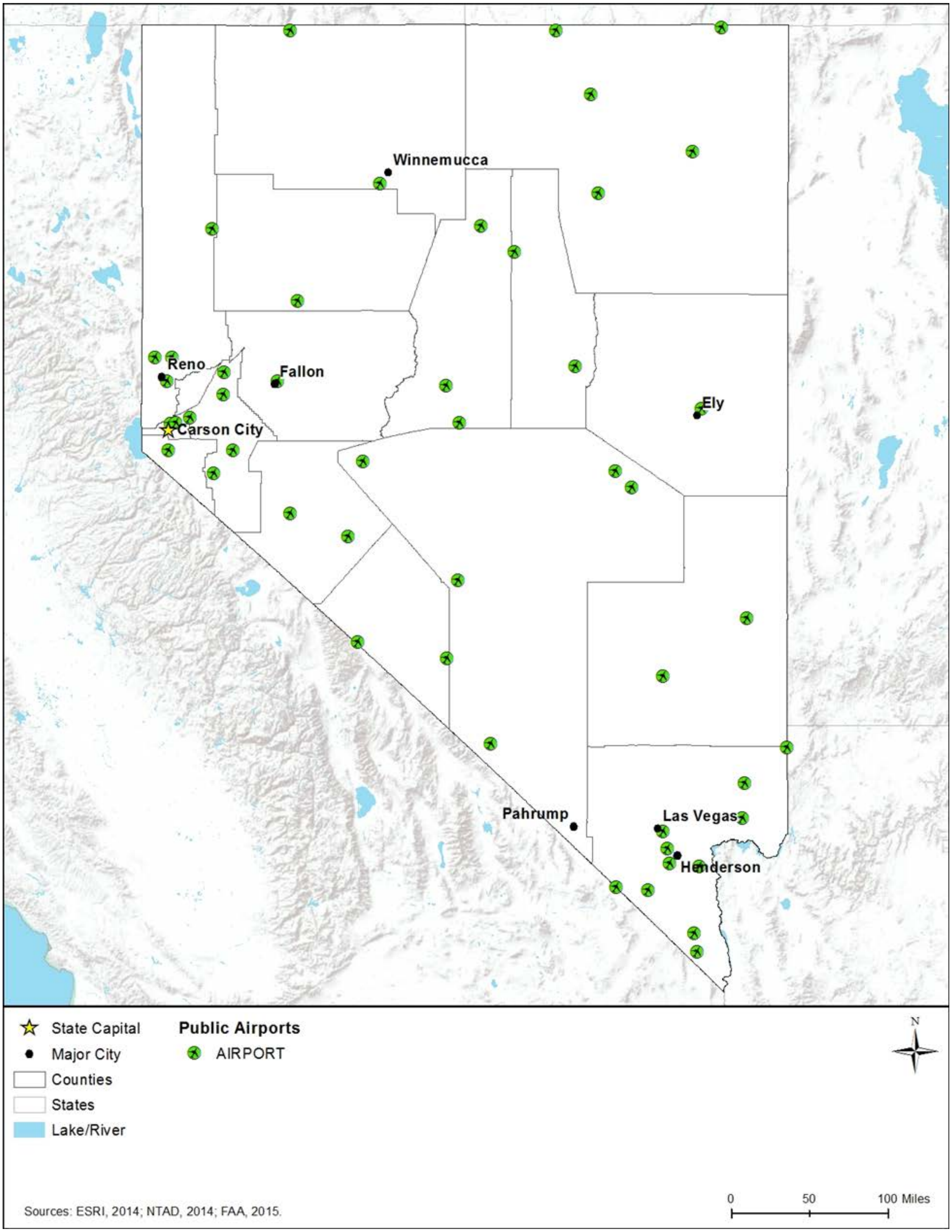

Figure 6.1.7-6: Public Nevada Airports/Facilities

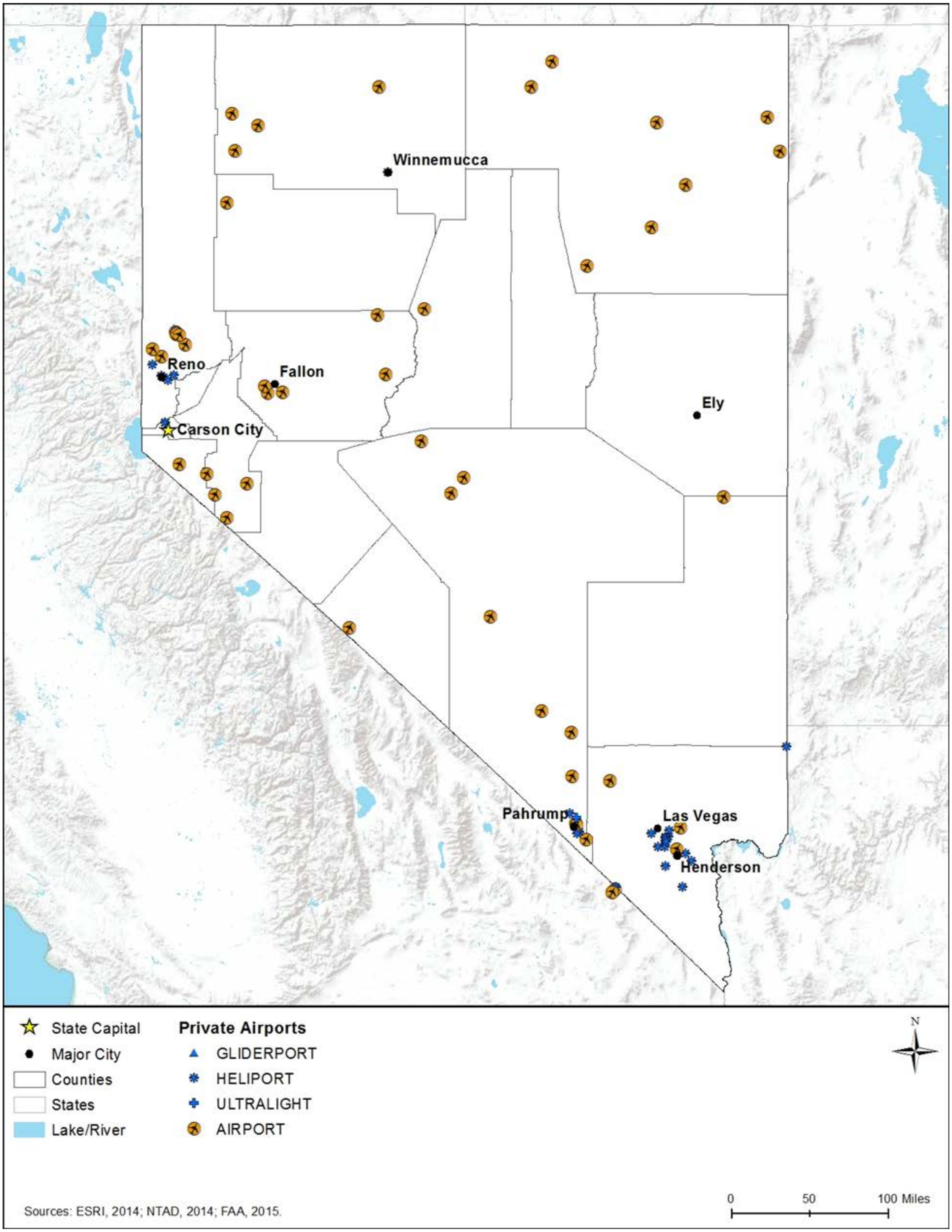

Figure 6.1.7-7: Private Nevada Airports/Facilities

There are Class B, C, and D controlled airports for Nevada as follows:

- One Class B –
  - McCarran International
- One Class C –
  - Reno Cannon International
- Four Class D –
  - Fallon Naval Air Station (Van Voorhis Field)
  - Henderson
  - Indian Springs Air Force Auxiliary Field
  - North Las Vegas Air Terminal (FAA, 2015e).

SUAs (i.e., 17 restricted) located in Nevada are as follows:

- Fallon (Restricted)
  - R-4803 – Surface to, but not including, FL 180
- Twin Peaks (Restricted)
  - R-4804A – Surface to, but not including, FL 180 excluding 2,000 feet aboveground level (AGL) up to but not including 8,500 feet MSL, north of and within 1 NM of U.S. Highway 50 between the intersection of U.S. Highway 50 with long. 118°26’00” W., and long. 118°08’00”W
  - R-4804B – FL 180 to and including FL 350
- Las Vegas (Restricted)
  - R-4806E – 100 feet AGL to unlimited
  - R-4806W – Unlimited
  - R-4808N – Unlimited
  - R-4808S – Unlimited
- Tonopah (Restricted)
  - R-4807A – Unlimited
  - R-4807B – Unlimited
  - R-4809 – Unlimited
- Desert Mountain (Restricted)
  - R-4810 – Surface to and including 17,000 feet MSL
- Hawthorne (Restricted)
  - R-4811 – Surface to 15,000 feet MSL
- Sand Springs (Restricted)
  - R-4812 – Surface to, but not including, FL 180 excluding that portion from 2,000 feet AGL up to 8,500 feet MSL, which lies north of and 1 NM from U.S. Highway 50, between the intersections of U.S. Highway 50 with long. 118°25’33”W, and long. 118°07'33"W
- Carson Sink (Restricted)
  - R-4813A – Surface to, but not including, FL 180
  - R-4813B – FL 180 to and including FL 350
- Dixie Valley (Restricted)
  - R-4816NH – 1,500 feet AGL to, but not including, FL 180

  - R-4816S – 500 feet AGL to, but not including, FL 180 (FAA, 2015f).

The restricted area R-6404C (100 feet AGL to FL 280) Hill Air Force Base (AFB), Utah and R-6405 (100 feet AGL to FL 580) Wendover, Utah extends into the upper northeast portion of Nevada. (FAA, 2015f) The 22 MOAs in Nevada are as follows:

- Carson – 500 feet AGL to, but not including, FL180
- Churchill –
  - High – 9,000 feet MSL to, but not including FL 180
  - Low – 500 feet AGL to 9,000 feet MSL
- Desert – 100 feet AGL to, but not including, FL 180 excluding the airspace 1,500 feet AGL and below within a 3 NM radius of the Alamo, and Lincoln County Airports
- Fallon –
  - North 1 – 100 feet AGL up to, but not including FL 180
  - North 2 – 100 feet AGL up to, but not including FL 180
  - North 3 – 100 feet AGL up to, but not including FL 180, southeast of the line beginning at 40o06’00”N., long. 117o48’03”W to 39o29’50”N., long. 117o04’03”W, 200 feet AGL up to but not including FL 180, northeast of the line beginning at 40o06’00”N., long. 117o48’03”W to 39o29’50”N. long. 117o04’03”W
  - North 4 – 200 feet AGL up to, but not including, FL 180
  - South 1 – 100 feet AGL up to, but not including, FL 180
  - South 2 – 100 feet AGL up to, but not including, FL 180
  - South 3 – 100 feet AGL up to, but not including, FL 180
  - South 4 – 200 feet AGL up to, but not including, FL 180
  - South 5 – 200 feet AGL up to, but not including, FL 180
- Jarbidge South – 3,000 feet AGL or 10,000 feet MSL, whichever is higher up to 17,999 feet MSL
- Owyhee South – 3,000 feet AGL or 10,000 feet MSL, whichever is higher up to 17,999 feet
- Paradise South – 3,000 feet AGL or 10,000 feet MSL, whichever is higher up to 17,999 feet
- Ranch –
  - High – 9,000 feet MSL to 13,000 feet MSL
  - Low – 500 feet AGL to 9,000 feet MSL
- Reno – 13,000 feet MSL to but not including FL 180
- Reveille –
  - North – 100 feet AGL to, but not including, FL 180
  - South – 100 feet AGL to, but not including, FL 180
- White Elk – 14,000 feet MSL to, but not including, FL 180 (FAA, 2015f).

MOAs of other states extends into the airspace of Nevada as follows:

- Gandy (100 feet AGL to, but not including, FL 180) in Utah extends into the upper northeastern portion.
- Saline (200 feet AGL to, but not including, FL 180; except 3,000 feet AGL floor over Death Valley National Monument) in California extends in the southwest edge.
- Hart South (11,000 feet MSL to, but not including, FL 180) in Oregon extends in the northwest corner.

- Lucin A (100 feet AGL to 9,000 feet MSL) and Lucin C (100 feet AGL to 6,500 feet MSL) of Utah extend into the upper northeast portion.

There is one Alert Area at Nellis AFB, A-481 – 7,000 feet MLS up to and including 17,000 feet MSL. The SUAs for Nevada are presented in Figure 6.1.7-8. There are no TFRs for Nevada (FAA, 2015g). MTRs in Nevada, presented in Figure 6.1.7-9, consist of 25 Visual Routes, 26 Instrument Routes, and 3 Slow Routes.

UAS Considerations

Nevada's unmanned aircraft systems test site is operational and is one of the six congressionally mandated test sites in the U.S. to assist the FAA in determining operational and certification requirements to safely integrate UAS into the NAS. In 2014, the FAA issued a two-year Certificate of Waiver or Authorization to the Nevada UAS Team to operate at the Desert Rock Airport near Mercury, NV. This is a private airport owned by the Department of Energy (AirNav, 2016). Research activities at Desert Rock Airport will focus on "how air traffic control procedures will evolve with the introduction of UAS into the civil environment and how these aircraft will integrate with NextGen,[95] the modernization of the national airspace system" (FAA, 2014b). Flight altitudes during the research at Desert Rock Airport will be at or below 3,000 feet AGL (FAA, 2014b).

The NPS signed a policy memorandum on June 20, 2014 that "directs superintendents nationwide to prohibit launching, landing, or operating unmanned aircraft on lands or waters administered by the [NPS]" (NPS, 2014c). There are four NPS units in Nevada that have to comply with this agency directive (NPS, 2014d).

Obstructions to Airspace Considerations

The NevadaDOT Planning Division, Aviation Planning website, *Nevada Airport Buffer Zone*, provides by state and airport specific information on the applicable buffer zone regulations, standards, and for filing the FAA Form 7460 for any to construction near airports and meeting FAA criteria. (NevadaDOT, 2015e)

[95] Next Generation (NextGen) is an FAA modernization effort – "a shift to smarter, satellite-based and digital technologies and new procedures that combine to make air travel more convenient, predictable and environmentally friendly." (FAA, 2015c)

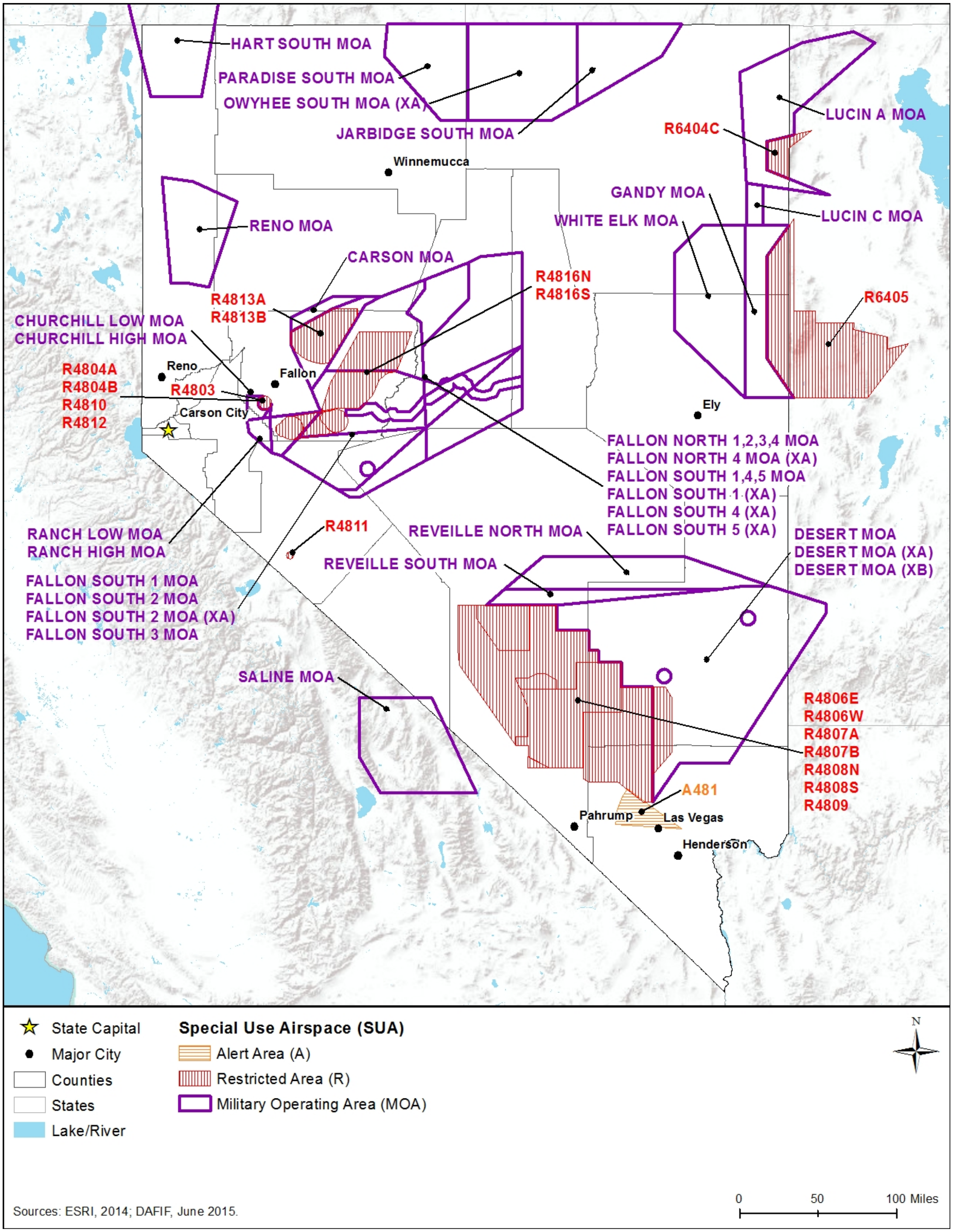

Figure 6.1.7-8: SUAs in Nevada

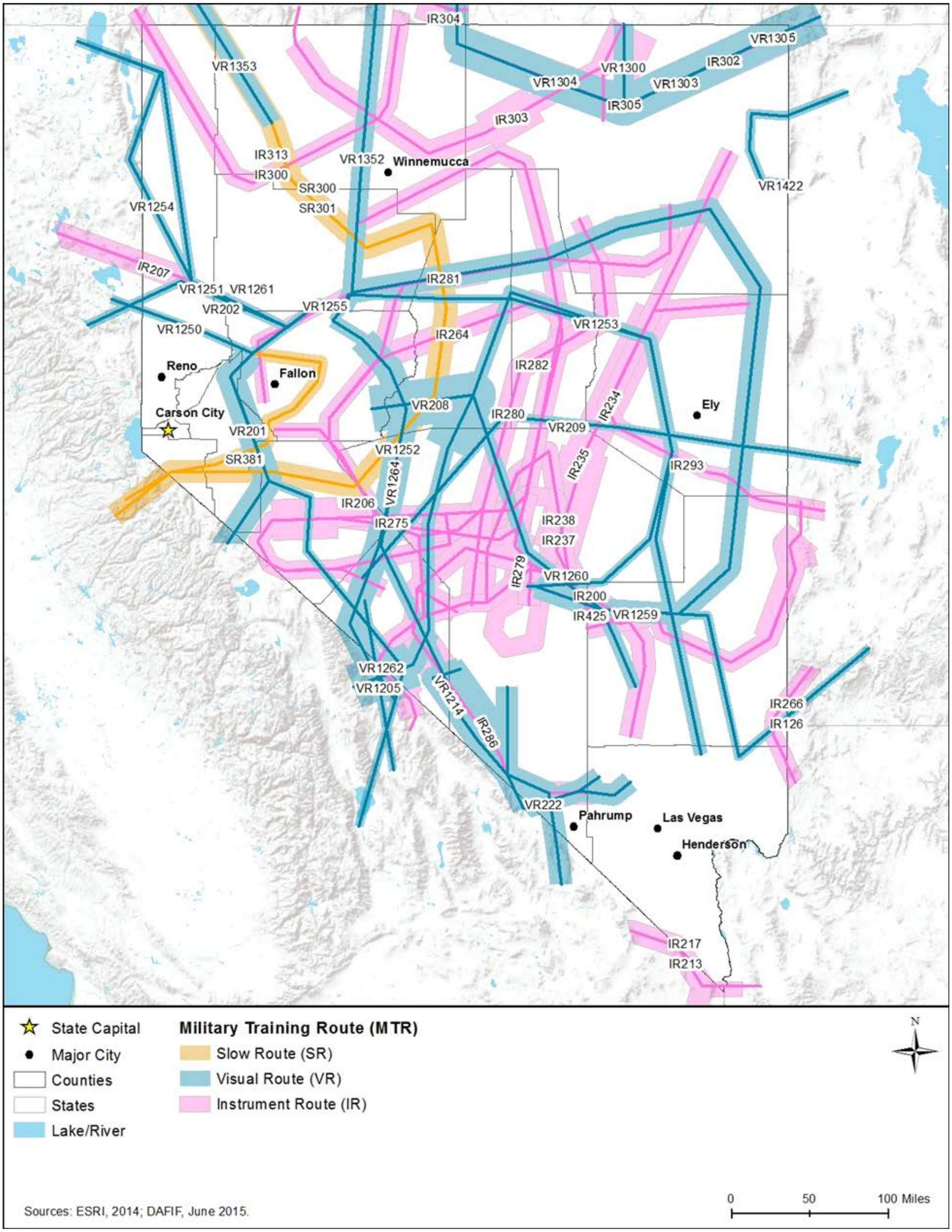

Figure 6.1.7-9: MTRs in Nevada

6.1.8. Visual Resources

6.1.8.1. 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, ocean views, 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 National Historic Preservation Act (NHPA) compliance. The federal government does not have a single definition of what constitutes a visual resource; therefore, this PEIS will use the general definition of visual resources used by the Bureau of Land Management, “the visible physical features on a landscape (e.g., land, water, vegetation, animals, structures, and other features)” (BLM, 1984).

6.1.8.2. Specific Regulatory Considerations

Table 6.1.8-1 presents state and local laws and regulations that relate to visual resources for Nevada.

Table 6.1.8-1: Relevant Nevada Visual Resources Laws and Regulations

State Law/Regulation	Regulatory Agency	Applicability
NRS: Chapter 268	Cities and Towns	Conservation of open spaces, natural resources, scenic spaces or areas.
NRS: Chapter 278	Cities and Towns	Develop and recommend, to the extent practicable, standardized classifications for impact that the project may have on historic, archaeological, paleontological, cultural, scenic and natural resources.
NRS: Chapter 484B	State, Counties, Cities and Districts and other Public Agencies	Establishes protection of the natural environment and state scenic byways.
NRS: Chapter 37	State of Nevada	Eminent domain for the conservation of open space and the protection of other natural and scenic resources from unreasonable impairment.
NRS: Chapter 407	Division of State Parks	Acquire, protect, develop and interpret a well-balanced system of areas of outstanding scenic, recreational, scientific and historical importance for the inspiration, use and enjoyment of the people of the State of Nevada and that such areas shall be held in trust as irreplaceable portions of Nevada’s natural and historical heritage.

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 and cities as they look at the future planning of their municipalities.

6.1.8.3. Character and Visual Quality of the Existing Landscape

Nevada has a wide range of visual resources, both scenic and cultural. Most of the state is within the Great Basin, while the southern portion is within the Mojave Desert. Nevada is known for its desert landscapes, forested mountains, and scenic lakes. Nevada has several different types of land areas. The higher mountain ranges, such as the Sierra Nevada, consist of evergreen conifer forests, aspen, canyon streams, and pristine lakes. The lower desert elevations offer expansive valley views, red rock formations, and rocky outcroppings. Nevada is also rich is cultural sites with petroglyphs, pictographs, and historic buildings.

One aspect of importance for visual resources is to maintain the character of the area. For example, in a rural community, keeping the character of the town consistent with farm-style houses, barns, and ranches 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 6.1.7 discusses land use and contains further descriptions of land cover within the state.

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

6.1.8.4. 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 6.1.8-1[96] shows areas that are included in the National Register of Historic Places (NRHP) that may be considered visually sensitive. In Nevada, there are 375 NRHP listed sites, which include 1 National Heritage Route, 1 National Historic Area, and 8 National Historic Landmarks (NPS, 2014e) (NPS, 2014d).

[96] Figure 6.1.8-1 map data includes some overlapping sites, hence not all 373 NRHP listed sites are distinctly visible.

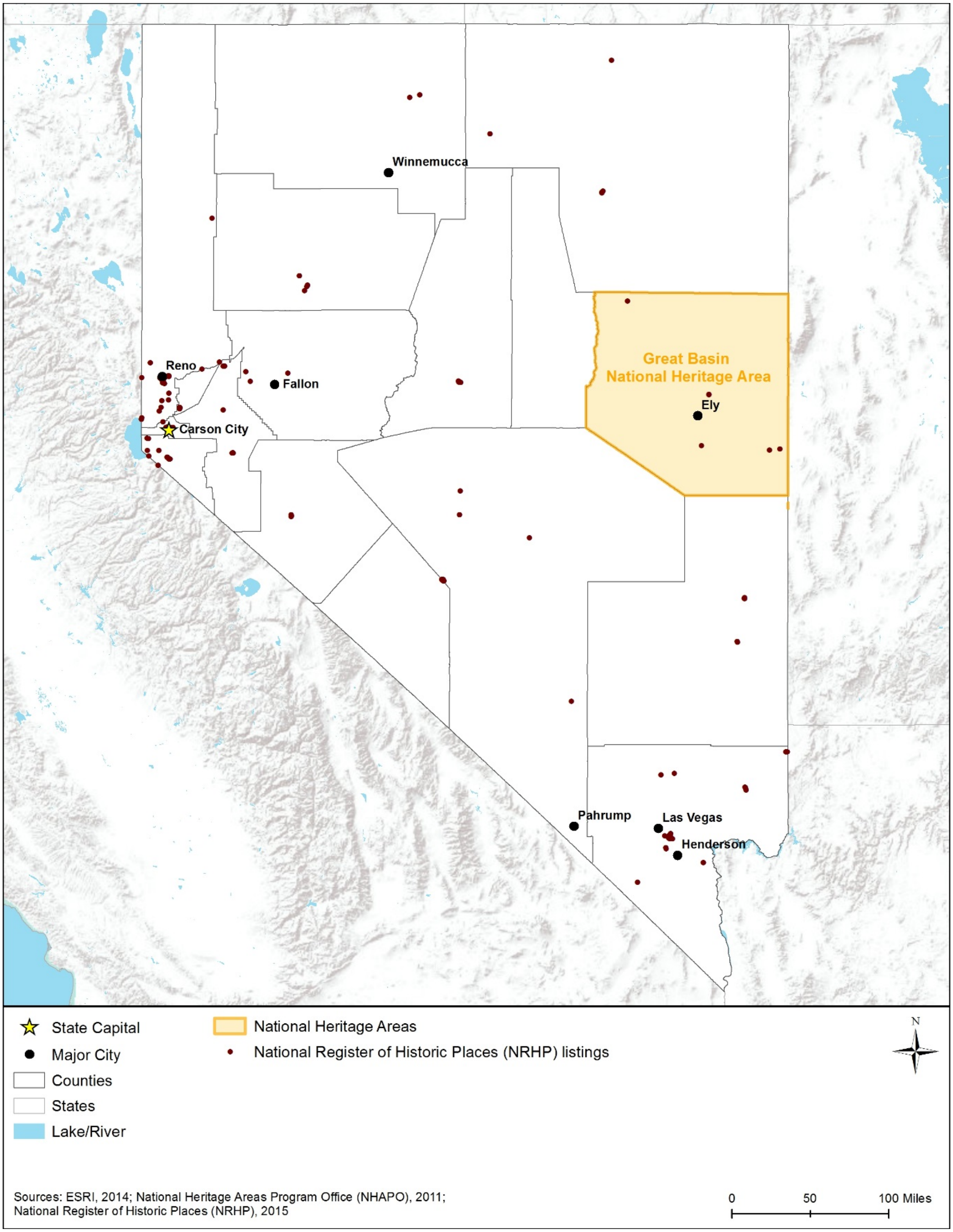

Figure 6.1.8-1: Representative Sample of Some Historic and Cultural Resources that May be Visually Sensitive

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).

National Heritage Areas (NHAs) are "places where natural, cultural, and historic resources combine to form a cohesive, nationally important landscape" (NPS, 2016a). These areas help tell the history of the United States. Based on this criteria, the Great Basin National Heritage Route in Nevada may contain scenic or aesthetic areas considered visual resources or visually sensitive. The NHA is comprised of the classic western landscape with historic sites from the history of westward expansion, to the American Indian archeological sites detailing the history of the Shoshone, Paiute, and Goshute tribes. (NPS, 2015d)

National Historic Landmarks

National Historic Landmarks (NHLs) are defined as "nationally significant historic places designated by the U.S. Secretary of the Interior because they possess exceptional value or quality in illustrating or interpreting the heritage of the United States" (NPS, 2015e). NHLs may include "historic buildings, sites, structures, objects, and districts" (NPS, 2016c). Other types of historic properties include battlefields and canals. The importance of NHL-designated properties can be attributed to scenic or aesthetic qualities, among other attributes, that may be considered visual resources or visually sensitive at these sites. In Nevada, there are eight NHLs (Table 6.1.8-2) (NPS, 2012b). By comparison, there are over 2,500 NHLs in the United States (NPS, 2015f). Figure 6.1.8-1 provides a representative sample of some historic and cultural resources that may be visually sensitive.

Table 6.1.8-2: Nevada National Historic Landmarks

National Historic Landmark Name	
Fort Churchill	Fort Ruby
Hoover Dam	Leonard Rockshelter
McKeen Motor Car #70	Nevada Northern Railway, East Ely Yards
Francis G. Newlands Home	Virginia City Historic District

Source: (NPS, 2015e)

National and State Register of Historic Places

Within Nevada, there are 375 National Register listings, with 107 of those being district nominations and four identified as traditional cultural places. Most of the listings are in areas that have undergone the greatest amount of survey work for new construction and development projects. Because of this, few prehistoric archaeological sites have received formal designation. Most listings are architectural and historic, rather than prehistoric. (Nevada SHPO, 2012)

National and State Historic Places are likely to contain scenic or aesthetic components that may be considered visual resources or visually sensitive. Examples of historic places on the register include the Las Vegas Mormon Fort, the Governor's Mansion, the Nevada State Capitol, and the East Walker River Petroglyphs. For additional information regarding these properties and resources, see Section 6.1.11, Cultural Resources.

6.1.8.5. 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. Table 6.1.7-3 in Section 6.1.7, Land Use, Recreation, and Airspace, identifies parks and recreational resources that may be visually sensitive in Nevada. For additional information about recreation areas, including national and state parks, see Section 6.1.7, Land Use, Recreation, and Airspace.

State Parks

State parks contain natural, historic, cultural, and/or recreational resources of significance to Nevada residents and visitors. There are 23 state parks throughout Nevada (Figure 6.1.8-2), most of which contain scenic or aesthetic areas considered to be visual resources or visually sensitive, such as the Valley of Fire State Park (Nevada Department of Conservation and Natural Resources, 2015b).[97] Table 6.1.8-3 contains a sampling of state parks and their associated visual attributes. A complete list of state parks can be found on the Nevada State Parks website, parks.nv.gov. (Nevada Department of Conservation and Natural Resources, 2015b).

Table 6.1.8-3: Examples of Nevada State Parks and Associated Visual Attributes

State Park	Visual Attributes
Big Bend of the Colorado State Recreation Area	Views of the Colorado River and surrounding mountains.
Cathedral Gorge State Park	Vistas of dramatic and unique patterns in soft bentonite clay.
Mormon Station State Historic Park	Views of historic sites.
Valley of Fire State Park	Views of red rock formations, petroglyphs, and petrified wood.

Source: (Nevada Department of Conservation and Natural Resources, 2015b)

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

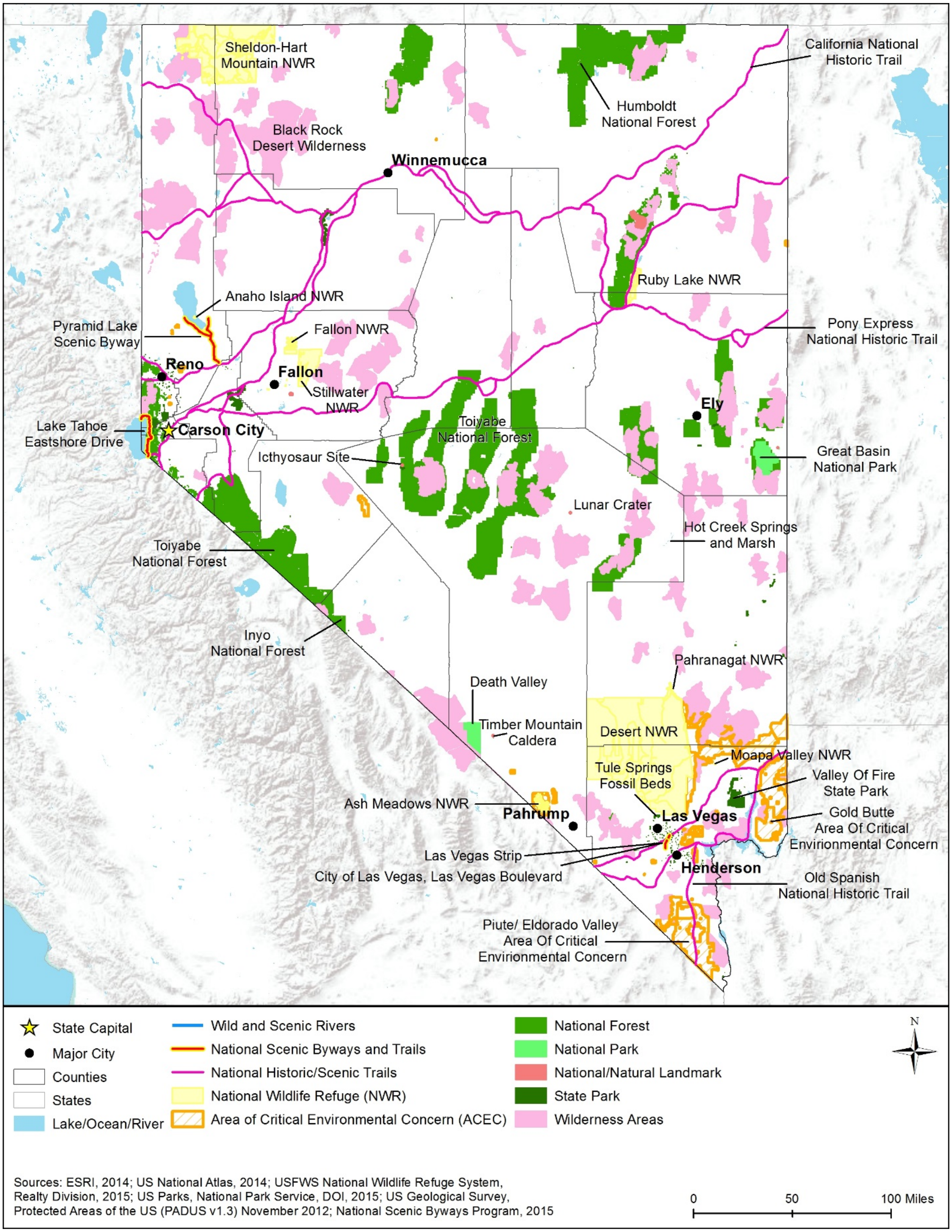

Figure 6.1.8-2: Natural Areas that May be Visually Sensitive

National Park Service and Bureau of Land Management

National Parks are managed by the NPS, and contain natural, historic, cultural, visual, ecological, and recreational resources of significance to the nation and are maintained for the public's use. In Nevada (Figure 6.1.8-2), there are four[98] officially designated National Parks in addition to other NPS affiliated areas, such as National Heritage Areas. The National Parks include Death Valley (Figure 6.1.8-3) and Great Basin, Lake Mead National Recreation Area and Tule Springs Fossil Beds National Monument. For additional information regarding parks and recreation areas, see Section 6.1.7, Land Use, Recreation, and Airspace.

Figure 6.1.8-3: Death Valley National Park

Source: (NPS, 2015g)

BLM also manages land throughout Nevada including 45 Wildernesses, 1 National Monument (Basin and Range National Monument) and 3 National Conservation Areas (Black Rock Desert-High Rock Canyon Emigrant Trails, Red Rock Canyon, and Sloan Canyon) (BLM, 2015d) (BLM, 2014a). These lands are managed under a multiple use mandate of the Federal Land Policy and Management Act (FLPMA) meaning that BLM must allow many uses of the lands, from recreation, to livestock grazing, forestry, wildlife habitat, and energy development (BLM, 2015e). 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, will be managed for high quality visual resources. Other areas, such as where energy development is occurring, may be managed for lower quality visual resources (BLM, 2012b).

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

National Forests

The USFS owns and maintains national forests that may contain natural, historic, cultural, visual, ecological, and recreational resources of significance to the nation. In Nevada, there is one complete National Forest, the Humboldt-Toiyabe National Forest, which has 16 separated sections throughout the state (Figure 6.1.8-2) (USFS, 2016a). Additionally, a small portion of the Inyo National Forest resides in Nevada as well as part of the LTBMU, which is managed similarly by USFS to a National Forest (USFS, 2016b) (USFS, 2016a).

Federal and State Trails

Designated under Section 5 of the National Trails System Act (16 U.S.C. 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). There are three National Historic Trails (NHT) within Nevada: the California NHT, the Pony Express NHT, and the Old Spanish NHT, all administered by the NPS (NPS, 2014f). These trails cover thousands of miles across portions of the country and allow visitors to follow the routes taken by pioneers as they traveled west. Figure 6.1.8-2 shows the locations of these trails in Nevada.

In 2005, the Nevada Division of State Parks conducted an inventory of trails within state parks. The inventory identified 139 trails within 20 state parks, totaling over 271 miles (Nevada Department of Conservation and Natural Resources, 2005). Visual resources along these trails include scenic valley and mountain views, geological formations, streams, ponds, lakes, forest, and desert scenery. Additional information regarding Nevada state trails is available on the Nevada Department of Conservation and Natural Resources Recreational Trails Program website (http://parks.nv.gov/trails/).

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).

6.1.8.6. Natural Areas

National Wildlife Refuges and State Wildlife Management Areas

National Wildlife Refuges (NWRs) are a network of lands and waters managed by the USFWS (Figure 6.1.8-2). These lands and waters are "set aside for the conservation, management and, where appropriate, restoration of fish, wildlife, and plant resources and their habitats" (USFWS, 2015h). There are nine NWRs in Nevada (Table 6.1.8-4) (Figure 6.1.8-2). Visual resources within the NWRs include views and sites of valleys and mountains, wildlife, and naturally vegetated areas.

Table 6.1.8-4: National Wildlife Refuges in Nevada

NWR Name	Acres
Sheldon	572,896
Fallon	17,848
Stillwater	79,570
Pahranagat	5,382
Ash Meadows	23,000
Anaho Island	247
Ruby Lake	39,928
Desert	1,600,000
Moapa Valley	116
Total	**2,338,987**

Source: (USFWS, 2016a)

State Wildlife Management Areas (WMAs) are lands owned by Nevada for the “protection of wetlands and waterfowl including the use of the areas as public hunting grounds” (NDOW, 2012b). WMAs are under the control and management of the NDOW. There are 12 WMAs scattered throughout the state, covering over 120,000 acres (Table 6.1.8-5) (NDOW, 2012b).

Table 6.1.8-5: Nevada State Wildlife Management Areas

WMA Name	Acres
Alkali Lake	No acres listed
Fernley	No acres listed
Franklin Lake	No acres listed
Key Pittman	1,337
Overton	17,229
Steptoe Valley	6,426
Bruneau River	No acres listed
Fort Churchill Cooperative	No acres listed
Humboldt	36,060
Mason Valley	16,635
Scripps	No acres listed
Wayne E. Kirch	14,815

Source: (NDOW, 2012b)

National Natural Landmarks

National Natural Landmarks (NNLs) are sites designated by the U.S. Secretary of the Interior that “contain outstanding biological and/or geological resources, regardless of land ownership, and are selected for their outstanding condition, illustrative value, rarity, diversity, and value to science and education” (NPS, 2012b). These landmarks may be considered visual resources or visually sensitive. In Nevada, six NNLs exist entirely within the state (Table 6.1.8-6). Some of the natural features located within these areas include the Berlin-Ichthyosaur State Park, “the only known site containing fossil remains of 37 of the largest forms of Ichthyosaur;” Ruby Marsh, “one of the largest and finest natural wetlands in Nevada;” Lunar Crater, a 400-acre site believed to have been formed by a volcanic eruption; and Valley of Fire, one of the best known sites for thrust faulting[99] (NPS, 2012b). Additionally, these NNL "sites range in size from 15 acres to nearly 264,000 acres and are owned by a variety of landowners including USFS, USFWS, DoD, BLM, Nevada State Parks, NDOW, and private individuals. (NPS, 2012b)

Table 6.1.8-6: Nevada National Natural Landmarks

NNL Name	
Ruby Marsh	Ichthyosaur Site
Lunar Crater	Hot Creek Springs and Marsh
Timber Mountain Caldera	Valley of Fire

Source: (NPS, 2012b)

6.1.8.7. Additional Areas

National and State 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 FHWA (FHWA, 2015c). Nevada has four designated National Scenic Byways (Figure 6.1.8-2) (FHWA, 2016):

- City of Las Vegas, Las Vegas Boulevard, 3.4 miles (FHWA, 2015e);
- Lake Tahoe Eastshore Drive, 28 miles (FHWA, 2015f);
- Las Vegas Strip, 4.5 miles (FHWA, 2015g); and
- Pyramid Lake Scenic Byway, 30.2 miles (FHWA, 2015h).

Similar to National Scenic Byways, Nevada Scenic Byways are transportation corridors that are of particular statewide interest. There are 19[100] State Scenic Byways (Table 6.1.8-7) (NevadaDOT, 2015b).

Table 6.1.8-7: Nevada Scenic Byways

Scenic Byway	Miles
US 50 (Carson City County)	7.6
SR 28 (North Shore Road)	1.2
SR 156 (Mt. Charleston/Lee Canyon Road)	17.5
SR 157 (Kyle Canyon Road)	13
SR 158 (Deer Creek Road)	8.8
SR 159 (Red Rock Road)	8.8
Valley of Fire Road (State Park)	10.5
White Domes Road (Valley of Fire State Park)	6.9
North Las Vegas Strip	2.9
South Las Vegas Strip	4.5
US 50 (Douglas County)	14.6
SR 445 (Pyramid Lake Road)	12.5
SR 446 (Sutcliffe/Nixon Road)	13.2
SR 447 (Gerlach Road)	4.5
US 6/US 50/US 93 (White Pine County)	63
US 93 (White Pine County)	26

[99] A thrust fault is defined as a "reverse fault with a dip of 45 degrees or less" (USGS, 2016e)
[100] Note that the text on NevadaDOT's scenic byways page indicates there are 20 state scenic byways but only lists 19.

Scenic Byway	Miles
SR 231 (Angle Lake Road) 11.7	11.7
Lamoille Canyon Road 12.5	12.5
US 93 (Lincoln County)	122.8

Source: (NevadaDOT, 2015b)

6.1.9. Socioeconomics

6.1.9.1. Definition of the Resource

NEPA requires consideration of socioeconomics in NEPA analysis; specifically, Section 102(A) of NEPA requires federal agencies to "insure the integrated use of the natural and social sciences…in planning and in decision making" (42 U.S.C. § 4332(A)). Socioeconomics refers to a broad, social science-based approach to understanding a region's social and economic conditions. It typically includes population, demographic descriptors, economic activity indicators, housing characteristics, property values, and public revenues and expenditures (BLM, 2005). When applicable, it includes qualitative factors such as community cohesion. Socioeconomics provides important context for analysis of FirstNet 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. 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 (EO) 12898 (see Section 1.8, Overview of Relevant Federal Laws and Executive Orders). This PEIS addresses environmental justice in a separate section (Section 6.1.10). This PEIS also addresses the following topics, sometimes included within socioeconomics, in separate sections: land use, recreation, and airspace (Section 6.1.7, Land Use, Recreation, and Airspace), infrastructure (Section 6.1.1, Infrastructure), and aesthetic considerations (Section 6.1.8, Visual Resources).

Wherever possible, this section draws on nationwide datasets from federal sources such as the U.S. Census Bureau (Census Bureau)[101] and U.S. Bureau of Labor Statistics (BLS). This ensures

[101] For U.S. Census Bureau sources, a URL (see references section) that begins with "http://factfinder.census.gov" indicates that the American FactFinder (AFF) interactive tool can be used to retrieve the original source data via the following procedure. If the reference's URL begins with "http://dataferrett.census.gov," significant socioeconomic expertise is required to navigate this interactive tool to the specific data. However, the data can usually be found using AFF. As of May 24, 2016, the AFF procedure is as follows: 1) Go to http://factfinder.census.gov. 2) Select "Advanced Search," then "Show Me All." 3) Select from "Topics" choices, select "Dataset," then select the dataset indicated in the reference; e.g., "American Community Survey, 2013 1-Year

consistency of data and analyses across the states examined in this PEIS. In all cases, this section uses the most recent data available for each geography at the time of writing. At the county, state, region, and United States levels, the data are typically for 2013 or 2014. For smaller geographic areas, this section uses data from the Census Bureau's American Community Survey (ACS). The ACS is the Census Bureau's flagship demographic estimates program for years other than the decennial census years. This PEIS uses the 2009-2013 ACS, which is based on surveys (population samples) taken across that five-year period; thus, it is not appropriate to attribute its data values to a specific year. It is a valuable source because it provides the most accurate and consistent socioeconomic data across the nation at the sub-county level (U.S. Census Bureau, 2016).

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

6.1.9.2. Specific Regulatory Considerations

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

6.1.9.3. Communities and Populations

This section discusses the population and major communities of Nevada (NV) and includes the following topics:

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

Estimates" or "2012 Census of Governments." Click "Close." Note: ACS is the abbreviation in the AFF for the American Community Survey. SF is the abbreviation used with the 2000 and 2010 "Summary Files." For references to the "2009-2013 5-Year Summary File," choose "2013 ACS 5-year estimates" in the AFF. 4) Click the "Geographies" box. Under "Select a geographic type," choose the appropriate type; e.g., "United States – 010" or "State – 040" or "... County – 050" then select the desired area or areas of interest. Click "Add to Your Selections," then "Close." For Population Concentration data, select "Urban Area - 400" as the geographic type, then select 2010 under "Select a version" and then choose the desired area or areas. Alternatively, do not choose a version, and select "All Urban Areas within United States." Regional values cannot be viewed in the AFF because the regions for this PEIS do not match Census Bureau regions. All regional values were developed by downloading state data and using the most mathematically appropriate calculations (e.g., sums of state values, weighted averages, etc.) for the specific data. 5) In "Refine your search results," type the table number indicated in the reference; e.g., "DP04" or "LGF001." The dialogue box should auto-populate with the name of the table(s) to allow the user to select the table number/name. Click "Go." 6) In the resulting window, click the desired table under "Table, File, or Document Title" to view the results. If multiple geographies were selected, it is often easiest to view the data by clicking the "Download" button above the on-screen data table. Choose the desired comma-delimited format or presentation-ready format (includes a Microsoft Excel option). In some cases, the structure of the resulting file may be easier to work with under one format or another. Note that in most cases, the on-screen or downloaded data contains additional parameters besides those used in the FirstNet PEIS report table. Readers must locate the FirstNet PEIS-specific data within the Census Bureau tables. In many cases, the FirstNet PEIS report tables contain data from multiple Census Bureau tables and sometimes incorporate other sources.

Statewide Population and Population Growth

Table 6.1.9-1 presents the 2014 population and population density of Nevada in comparison to the West region[102] and the nation. The estimated population of Nevada in 2014 was 2,839,099. The population density was 24.6 persons per square mile (sq. mi.), which was lower than the population density of both the region (98 persons/sq. mi.) and the nation (90 persons/sq. mi.). In 2014, Nevada was the 35th largest state by population among the 50 states and the District of Columbia, 7th largest by land area, and had the 43rd greatest population density (U.S. Census Bureau, 2015e; U.S. Census Bureau, 2015f).

Table 6.1.9-1: Land Area, Population, and Population Density of Nevada

Geography	Land Area (sq. mi.)	Estimated Population 2014	Population Density 2014 (persons/sq. mi.)
Nevada	109,781	2,839,099	24.6
West Region	624,241	61,039,316	98.0
United States	3,531,905	318,857,056	90.0

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

Population growth is an important aspect for this PEIS given FirstNet's mission. Table 6.1.9-2 presents the population growth trends of Nevada from 2000 to 2014 in comparison to the West region and the nation. The state's annual growth rate declined from 3.06 percent in the 2000 to 2010 to 1.26 percent in the 2010 to 2014 period. The growth rate of Nevada in the latter period was somewhat higher than the growth rate of the region, 1.08 percent. Both the region and the nation showed lower growth rates in both periods compared to the Nevada's growth rates.

Table 6.1.9-2: Recent Population Growth of Nevada

Geography	Population			Numerical Population Change		Rate of Population Change (AARC)[a]	
	2000	2010	2014 (estimated)	2000 to 2010	2010 to 2014	2000 to 2010	2010 to 2014
Nevada	1,998,257	2,700,551	2,839,099	702,294	138,548	3.06%	1.26%
West Region	51,610,010	58,469,720	61,039,316	6,859,710	2,569,596	1.26%	1.08%
United States	281,421,906	308,745,538	318,857,056	27,323,632	10,111,518	0.93%	0.81%

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

Demographers prepare future population projections using various population growth modeling methodologies. For this nationwide PEIS, it is important to use population projections that apply the same methodology across the nation. It is also useful to consider projections that use different methodologies, since no methodology is a perfect predictor of the future. The Census Bureau does not prepare population projections for the states. Therefore, Table 6.1.9-3 presents

[102] The West region is comprised of the states of Arizona, California, Idaho, Nevada, Oregon, and Washington. Throughout the socioeconomics section, figures for the West 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 West region is the sum of the populations of all its states, divided by the sum of the land areas of all its states.

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) (UVA 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 Nevada's population will increase by approximately 735,000 people, or 25.9 percent, from 2014 to 2030. This reflects an average annual projected growth rate of 1.45 percent, which is similar to the historical growth rate from 2010 to 2014 of 1.26 percent. The projected growth rate of the state is higher than both the projected growth rate of the region (1.03 percent) and the nation (0.80 percent).

Table 6.1.9-3: Projected Population Growth of Nevada

Geography	Population 2014 (estimated)	Projected 2030 Population			Change Based on Average Projection		
		UVA Weldon Cooper Center Projection	Proximity One Projection	Average Projection	Numerical Change 2014 to 2030	Percent Change 2014 to 2030	Rate of Change (AARC)[a] 2014 to 2030
Nevada	2,839,099	3,939,244	3,208,465	3,573,855	734,756	25.9%	1.45%
West Region	61,039,316	73,661,854	70,107,981	71,884,918	10,845,602	17.8%	1.03%
United States	318,857,056	360,978,449	363,686,916	362,332,683	43,475,627	13.6%	0.80%

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

Population Distribution and Communities

Figure 6.1.9-1 presents the distribution and relative density of the population of Nevada. 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, 2015g).

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

Other groupings of brown dots on the map represent additional, but smaller, population concentrations. Dispersed dots indicate dispersed population across the less densely settled areas of the state. In Nevada's case, there are very few close groupings of dots outside of the 10 largest population concentrations. Nevada is one of the most sparsely populated states in the nation. This is due largely to the presence of the Great Basin, a desert and desert-like region. For more information about the various regions of Nevada, see Section 6.1.7, Land Use, Recreation, and Airspace.

Table 6.1.9-4 provides the populations of the 10 largest population concentrations in Nevada, based on the 2010 census. It also shows the changes in population for these areas between the 2000 and 2010 censuses.[103] In 2010, the largest population concentration by far was the Las Vegas/Henderson area, which had over 1.8 million people. The state had no other population concentrations over 1 million and none over 500,000. All other areas had populations between 392,132 (Reno area, Nevada portion) and 13,866 (Boulder City area). The fastest growing areas, by average annual rate of change from 2000 to 2010, were the Fernley and Pahrump areas, with annual growth rates of 10.01 percent and 6.81 percent, respectively. However, the large population increases from 2000 to 2010 for the Fernley and Pahrump areas reflect correspondingly large increases in the area definitions for these two areas. These area expansions may have taken in some existing populations; thus, the growth rates of these areas may reflect this factor as well as organic growth (net in-migration and/or births exceeding deaths). The Carson City area experienced a slight decline in population during this period.

Table 6.1.9-4 also shows that the top 10 population concentrations in Nevada accounted for 91.3 percent of the state's population in 2010. Further, population growth in the 10 areas from 2000 to 2010 amounted to 99.4 percent of the entire state's growth.

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

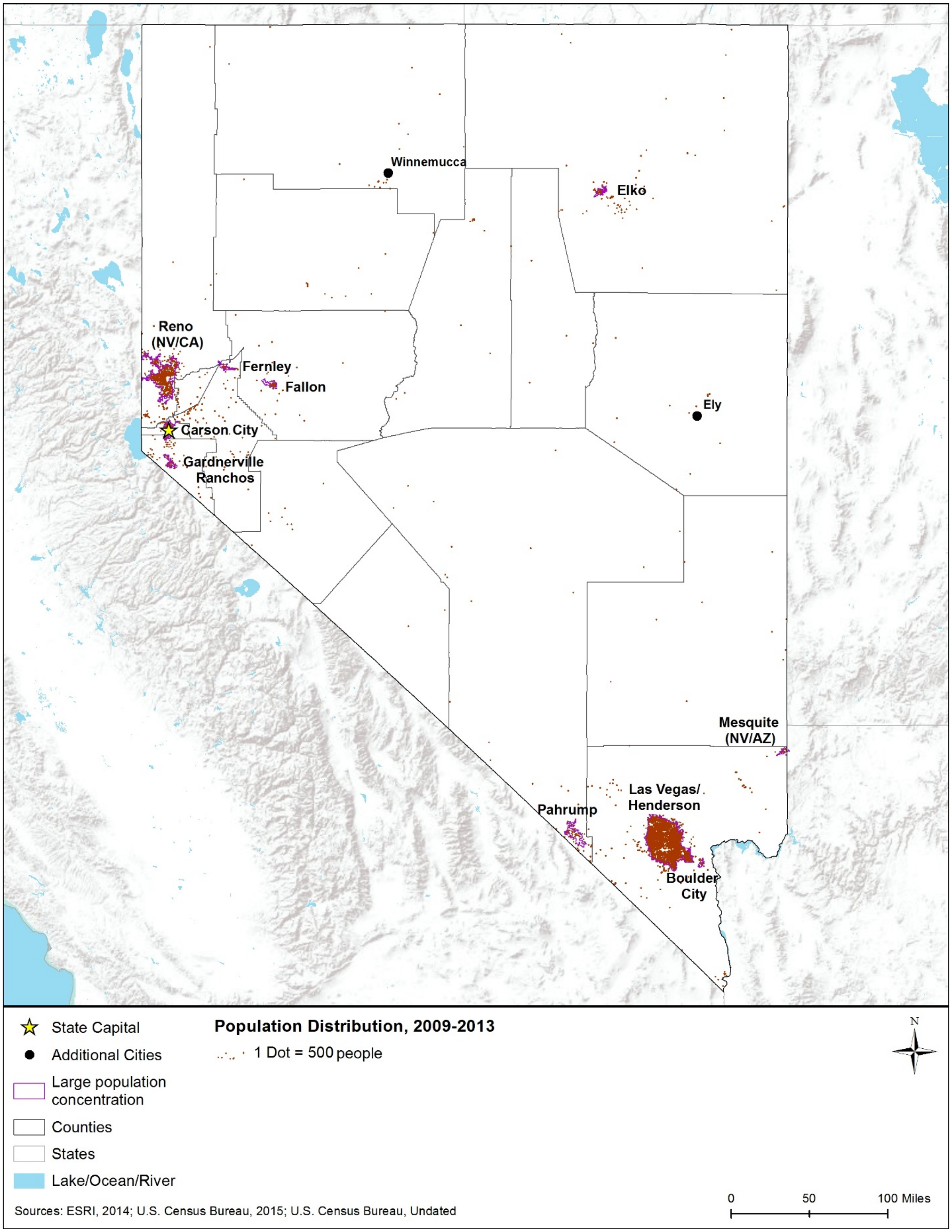

Figure 6.1.9-1: Population Distribution in Nevada, 2009–2013

Table 6.1.9-4: Population of the 10 Largest Population Concentrations in Nevada

Area	Population				Population Change 2000 to 2010	
	2000	2010	2009–2013	Rank in 2010	Numerical Change	Rate (AARC)[a]
Boulder City	12,059	13,866	14,295	10	1,807	1.41%
Carson City	58,263	58,079	57,594	3	(184)	-0.03%
Elko	17,015	18,948	19,076	7	1,933	1.08%
Fallon	15,337	16,241	16,701	8	904	0.57%
Fernley[b]	7,312	18,979	18,919	6	11,667	10.01%
Gardnerville Ranchos	17,341	20,107	20,654	5	2,766	1.49%
Las Vegas/Henderson	1,314,357	1,886,011	1,911,594	1	571,654	3.68%
Mesquite (NV/AZ) (NV Portion)	8,764	13,871	14,053	9	5,107	4.70%
Pahrump[c]	14,719	28,446	28,686	4	13,727	6.81%
Reno (NV/CA) (NV Portion)	303,689	392,132	395,908	2	88,443	2.59%
Total for Top 10 Population Concentrations	**1,768,856**	**2,466,680**	**2,497,480**	**NA**	**697,824**	**3.38%**
Nevada (statewide)	**1,998,257**	**2,700,551**	**2,730,066**	**NA**	**702,294**	**3.06%**
Top 10 Total as Percentage of State	**88.5%**	**91.3%**	**91.5%**	**NA**	**99.4%**	**NA**

[a] AARC = Average Annual Rate of Change (compound growth rate)
[b] The large population increases from 2000 to 2010 for the Fernley area reflect correspondingly large increases in the area definitions for this area.
The large population increases from 2000 to 2010 for the Pahrump area reflect correspondingly large increases in the area definitions for this area.
Sources: (U.S. Census Bureau, 2015h) (U.S. Census Bureau, 2012) (U.S. Census Bureau, 2015i)

6.1.9.4. Economic Activity, Housing, Property Values, and Government Revenues

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

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

Social institutions – educational, family, political, public service, military, and religious – are present throughout the state. The institutions most relevant to FirstNet projects are public services such as medical and emergency medical services and facilities. This PEIS addresses public services in Section 6.1.1, Infrastructure. Project-level NEPA analyses may need to examine other institutions, depending on specific locations and specific types of actions.

Economic Activity

Table 6.1.9-5 compares several economic indicators for Nevada to the West region and the nation. The table presents two indicators of income[104]–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 6.1.9-5, the per capita income in Nevada in 2013 ($25,918) was $2,740 lower than that of the region ($28,658), and $2,266 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 6.1.9-5 shows that in 2013, the MHI in Nevada ($51,250) was $5,821 lower than that of the region ($57,071), and $1,000 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 6.1.9-5 compares the unemployment rate in Nevada to the West region and the nation. In 2014, Nevada's statewide unemployment rate of 7.8 percent was higher than the rate for the region (7.2 percent) and considerably higher than the rate for the nation (6.2 percent).[105]

Table 6.1.9-5: Selected Economic Indicators for Nevada

Geography	Per Capita Income 2013	Median Household Income 2013	Average Annual Unemployment Rate 2014
Nevada	$25,918	$51,250	7.8%
West Region	$28,658	$57,071	7.2%
United States	$28,184	$52,250	6.2%

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

[104] 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)

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

Figure 6.1.9-2 and Figure 6.1.9-3 show how MHI in 2013 (U.S. Census Bureau, 2015w) and unemployment in 2014 (BLS, 2015b) varied by county across the state. These maps also incorporate the same population concentration data as Figure 6.1.9-1 (U.S. Census Bureau, 2012; U.S. Census Bureau, 2015d). Following these two maps, Table 6.1.9-6 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 Nevada.

Figure 6.1.9-2 shows that, in general, counties with a MHI above the national median were located in the northern portions of the state. Most of the remainder of the state had MHI levels below the national average. Table 6.1.9-6 shows that MHI in the Las Vegas/Henderson, Boulder City, and Elko areas was above the state average ($52,800). MHI in all other population concentrations was below the state average. MHI was highest in the Elko area ($71,503) and lowest in the Pahrump area ($38,679).

Figure 6.1.9-3 presents variations in the 2014 unemployment rate across the state, by county. It shows that counties in the northeastern region of the state of Nevada had unemployment rates below the national average (that is, better employment performance). Most of the remainder of the state had unemployment rates above the national average, with the exception of one county (i.e., Esmeralda County) located in west-central Nevada. When comparing unemployment in the population concentrations to the state average (Table 6.1.9-6), most areas had a 2009–2013 unemployment rate that was similar to or lower than the state average (12.5 percent). Only three of these areas (i.e., Carson City, Fernley, and Pahrump areas) had unemployment rates considerably higher than the state average.

Detailed employment data provides useful insights into the nature of a local, state, or national economy. Table 6.1.9-7 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 somewhat higher in Nevada than in the West region and the nation. The percentage of government workers was lower in the state than in the region and nation. The percentage of self-employed workers was also lower in the state when compared to the region and the nation.

By industry, Nevada has a mixed economic base and some notable figures in the table are as follows. Nevada in 2013 had considerably lower percentages of persons working in "manufacturing" and "educational services, and health care and social assistance" than did the region or the nation. It had a considerably higher percentage of workers in "arts, entertainment, and recreation, and accommodation and food services" than the region and nation. This is probably due to the importance of the entertainment-oriented economy of the Las Vegas area to the state's overall economy. All other industries had employment percentages that were similar to (within two percentage points of) the figures for the region and the nation.

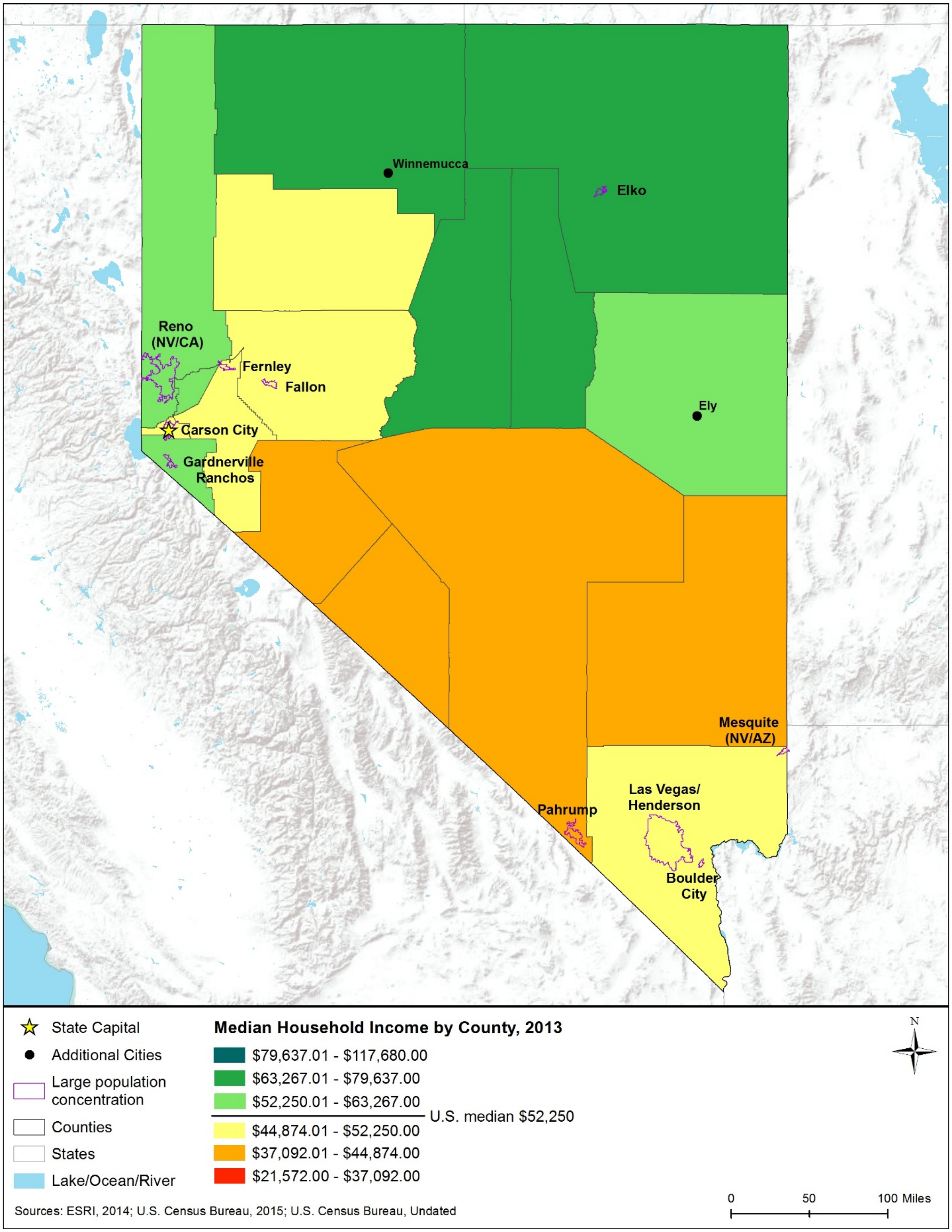

Figure 6.1.9-2: Median Household Income in Nevada, by County, 2013

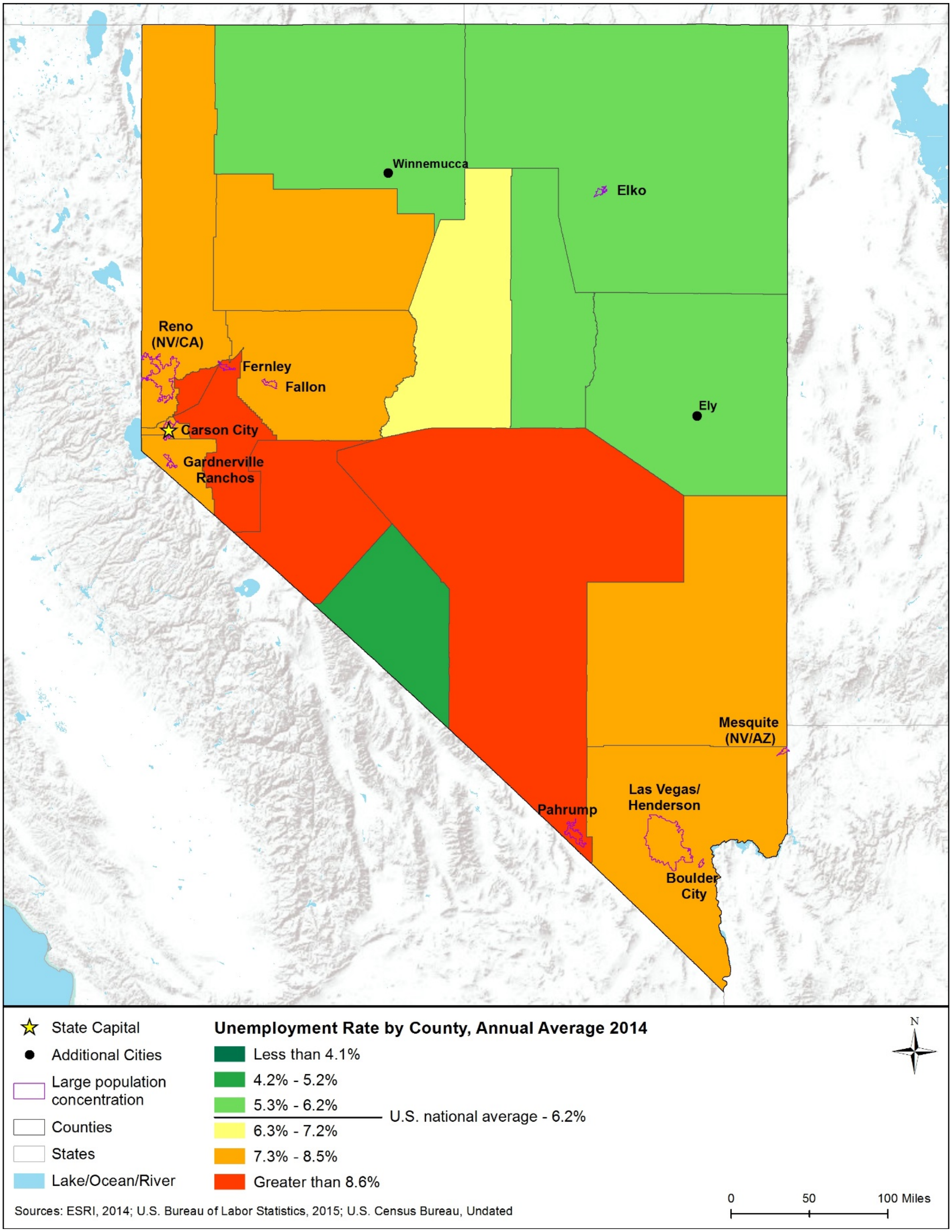

Figure 6.1.9-3: Unemployment Rates in Nevada, by County, 2014

Table 6.1.9-6: Selected Economic Indicators for the 10 Largest Population Concentrations in Nevada, 2009–2013

Area	Median Household Income	Average Annual Unemployment Rate
Boulder City	$56,914	12.3%
Carson City	$50,141	17.3%
Elko	$71,503	6.0%
Fallon	$51,944	10.0%
Fernley	$50,368	19.9%
Gardnerville Ranchos	$52,306	12.0%
Las Vegas/Henderson	$52,986	12.7%
Mesquite (NV/AZ) (NV Portion)	$43,183	13.4%
Pahrump	$38,679	21.5%
Reno (NV/CA) (NV Portion)	$51,727	11.3%
Nevada (statewide)	$52,800	12.5%

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

Table 6.1.9-7: Employment by Class of Worker and by Industry, 2013

Class of Worker and Industry	Nevada	West Region	United States
Civilian Employed Population 16 Years and Over	1,262,730	26,912,315	145,128,676
Percentage by Class of Worker			
Private wage and salary workers	82.6%	78.4%	79.7%
Government workers	12.2%	13.9%	14.1%
Self-employed in own not incorporated business workers	5.1%	7.5%	6.0%
Unpaid family workers	0.1%	0.2%	0.2%
Percentage by Industry			
Agriculture, forestry, fishing and hunting, and mining	1.9%	2.5%	2.0%
Construction	5.9%	6.1%	6.2%
Manufacturing	4.2%	9.5%	10.5%
Wholesale trade	2.0%	2.9%	2.7%
Retail trade	11.8%	11.6%	11.6%
Transportation and warehousing, and utilities	5.2%	4.7%	4.9%
Information	1.7%	2.6%	2.1%
Finance and insurance, and real estate and rental and leasing	5.4%	6.3%	6.6%
Professional, scientific, management, administrative, and waste management services	11.2%	12.3%	11.1%
Educational services, and health care and social assistance	15.7%	20.9%	23.0%
Arts, entertainment, and recreation, and accommodation and food services	25.5%	10.9%	9.7%
Other services, except public administration	4.7%	5.2%	5.0%
Public administration	4.7%	4.6%	4.7%

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

Table 6.1.9-8 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 6.1.9-7 for 2013.

Table 6.1.9-8: Employment by Selected Industries for the 10 Largest Population Concentrations in Nevada, 2009–2013

Area	Construction	Transportation and Warehousing, and Utilities	Information	Professional, Scientific, Management, Administrative and Waste Management Services
Boulder City	11.4%	6.2%	1.6%	8.6%
Carson City	4.7%	3.6%	0.7%	9.1%
Elko	6.1%	4.1%	1.3%	5.7%
Fallon	4.9%	5.0%	1.2%	10.2%
Fernley	6.3%	9.5%	3.3%	6.8%
Gardnerville Ranchos	8.2%	3.3%	0.6%	7.2%
Las Vegas/Henderson	6.4%	4.8%	1.6%	11.1%
Mesquite (NV/AZ) (NV Portion)	5.7%	2.8%	1.7%	5.6%
Pahrump	12.4%	5.4%	1.3%	7.8%
Reno (NV/CA) (NV Portion)	6.2%	5.4%	2.0%	11.0%
Nevada (statewide)	6.5%	5.0%	1.7%	10.7%

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

6.1.9.5. 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 6.1.9-9 compares Nevada to the West region and nation on several common housing indicators.

As shown in Table 6.1.9-9 in 2013, Nevada had a slightly lower percentage of housing units that were occupied (84.5 percent) than the region (89.9 percent) or nation (87.6 percent). Nevada's housing and occupancy and units is similar to the region and nation. Of the occupied units, Nevada had a somewhat lower percentage of owner-occupied units (54.3 percent) than the region (56.8 percent) or nation (63.5 percent). The percentage of detached single-unit housing (also known as single-family homes) in Nevada in 2013 (59.6 percent) nearly matched that of the region (60.3 percent) and nation (61.5 percent). The homeowner vacancy rate in Nevada (1.9 percent) matched the rate for the nation and was higher than the rate for the region (1.6 percent). This rate reflects "vacant units that are 'for sale only'" (U.S. Census Bureau, 2015j). The vacancy rate among rental units in Nevada, at 10.5 percent, was more than double the rate of the region (5.1 percent) and considerably higher than the national rate of 6.5 percent.

Table 6.1.9-9: Selected Housing Indicators for Nevada, 2013

Geography	Total Housing Units	Housing Occupancy & Tenure				Units in Structure
		Occupied Housing	Owner-Occupied	Homeowner Vacancy Rate	Rental Vacancy Rate	1-Unit, Detached
Nevada	1,186,936	84.5%	54.3%	1.9%	10.5%	59.6%
West Region	23,159,156	89.9%	56.8%	1.6%	5.1%	60.3%
United States	132,808,137	87.6%	63.5%	1.9%	6.5%	61.5%

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

Table 6.1.9-10 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 6.1.9-10: Selected Housing Indicators for the 10 Largest Population Concentrations in Nevada, 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
Boulder City	6,859	88.5%	71.4%	1.2%	8.9%	56.6%
Carson City	24,481	90.6%	57.3%	1.6%	9.6%	56.6%
Elko	7,208	94.2%	64.2%	0.0%	4.3%	58.3%
Fallon	7,369	86.0%	58.4%	0.0%	14.0%	66.0%
Fernley	7,667	84.8%	62.2%	5.8%	13.3%	77.0%
Gardnerville Ranchos	9,196	93.6%	66.0%	1.2%	5.0%	76.2%
Las Vegas/Henderson	812,732	84.4%	54.1%	3.7%	11.6%	58.7%
Mesquite (NV/AZ) (NV Portion)	7,857	72.0%	61.7%	2.4%	15.2%	40.4%
Pahrump	14,355	83.4%	73.0%	4.7%	7.0%	54.4%
Reno (NV/CA) (NV Portion)	168,403	90.0%	56.2%	2.7%	9.3%	57.9%
Nevada (statewide)	1,177,751	84.8%	56.7%	3.3%	10.9%	59.2%

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

Table 6.1.9-10 shows that during this period the percentage of occupied housing units ranged between 72.0 to 94.2 percent across these population concentrations; the state percentage was 84.8 percent.

Property Values

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

Table 6.1.9-11 provides indicators of residential property values for Nevada and compares these values to values for the West region and nation. The figures on median value of owner-occupied units are from the Census Bureau's ACS, based on owner estimates of how much their property (housing unit and land) would sell for if it were for sale (U.S. Census Bureau, 2015j).

The table shows that the median value of owner-occupied units in Nevada in 2013 ($165,300) was considerably lower than the value for the West region ($301,787) and slightly lower than the nation's figure ($173,900).

Table 6.1.9-11: Residential Property Values in Nevada, 2013

Geography	Median Value of Owner-Occupied Units
Nevada	$165,300
West Region	$301,787
United States	$173,900

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

Table 6.1.9-12 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 values in the 10 top population concentrations in Nevada ranged from $120,400 in the Pahrump area to $225,700 in the Gardnerville Ranchos area. The state median value was $169,100. The lowest value was in the same area (i.e., Pahrump) that had the lowest median household income (Table 6.1.9-6).

Table 6.1.9-12: Residential Property Values for the 10 Largest Population Concentrations in Nevada, 2009–2013

Area	Median Value of Owner-Occupied Units
Boulder City	$202,200
Carson City	$184,900
Elko	$201,500
Fallon	$153,500
Fernley	$125,800
Gardnerville Ranchos	$225,700
Las Vegas/Henderson	$164,200
Mesquite (NV/AZ) (NV Portion)	$177,000
Pahrump	$120,400
Reno (NV/CA) (NV Portion)	$194,300
Nevada (statewide)	$169,100

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

Government Revenues

State and local governments obtain revenues from many sources. FirstNet projects may affect flows of revenue sources between different levels of government due to program financing and intergovernmental agreements for system development and operation. Public utility taxes are a subcategory of selective sales taxes that 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 6.1.9-13 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 were 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 6.1.9-13 shows that state and local governments in Nevada received less total revenue in 2012 on a per capita basis than their counterpart governments in the region and nation. The Nevada state government had higher levels per capita of intergovernmental revenues[106] from the federal government than its regional counterparts did, and lower levels compared to its counterparts in the nation. Local governments in Nevada had lower levels of intergovernmental revenues from the federal government than their counterparts in both the region and the nation. The Nevada state government obtained considerably lower levels of property taxes per capita than state governments in the region, but slightly higher levels than its counterparts in the nation. Local governments in Nevada obtained lower levels of property taxes per capita than local governments in the region and nation. General sales taxes were considerably higher on a per capita basis for the Nevada state government, and lower for Nevada local governments, compared to their counterparts in the region and nation. Selective sales tax revenues for Nevada's state and local governments were higher on a per capita basis than for state and local governments in both the region and nation. However, per capita public utility tax revenues specifically, for the state government in Nevada, were considerably lower than for state governments in the region and nation. On the other hand, local governments in Nevada obtained higher levels of revenue from public utility taxes than other local governments. Finally, Nevada state and local governments did not report revenue from individual and corporate income taxes.

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

Table 6.1.9-13: State and Local Government Revenues, Selected Sources, 2012

Type of Revenue		Nevada		Region		United States	
		State Govt. Amount	Local Govt. Amount	State Govt. Amount	Local Govt. Amount	State Govt. Amount	Local Govt. Amount
Total Revenue	**($M)**	$14,318	$12,726	$372,535	$354,200	$1,907,027	$1,615,194
	Per capita	$5,190	$4,613	$6,235	$5,928	$6,075	$5,145
Intergovernmental from Federal	($M)	$2,798	$602	$44,368	$15,822	$514,139	$70,360
	Per capita	$1,014	$218	$743	$265	$1,638	$224
Intergovernmental from State	($M)	$0	$4,518	$87,966	$117,358	$0	$469,147
	Per capita	$0	$1,638	$1,472	$1,964	$0	$1,495
Intergovernmental from Local	($M)	$220	$0	$880	$0	$19,518	$0
	Per capita	$80	$0	$15	$0	$62	$0
Property Taxes	($M)	$235	$2,609	$52,387	$71,927	$13,111	$432,989
	Per capita	$85	$946	$877	$1,204	$42	$1,379
General Sales Taxes	($M)	$3,434	$325	$31,184	$14,896	$245,446	$69,350
	Per capita	$1,245	$118	$522	$249	$782	$221
Selective Sales Taxes	($M)	$1,798	$616	$13,934	$7,418	$133,098	$28,553
	Per capita	$652	$223	$233	$124	$424	$91
Public Utilities Taxes	($M)	$23	$235	$3,644	$4,323	$14,564	$14,105
	Per capita	$8	$85	$61	$72	$46	$45
Individual Income Taxes	($M)	$0	$0	$10,133	$0	$280,693	$26,642
	Per capita	$0	$0	$170	$0	$894	$85
Corporate Income Taxes	($M)	$0	$0	$1,270	$52	$41,821	$7,210
	Per capita	$0	$0	$21	$1	$133	$23

Sources: (U.S. Census Bureau, 2015q; U.S. Census Bureau, 2015r)
Note: This table does not include all sources of government revenue. Summation of the specific source rows does not equal total revenue.

6.1.10. Environmental Justice

6.1.10.1. Definition of the Resource

EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, issued in 1994, sets out principles of environmental justice and requirements that federal agencies should follow to comply with the EO (see Section 1.8.12, Executive Order 12898 – Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations).[107] 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, 2015c). 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

[107] See https://www.epa.gov/laws-regulations/summary-executive-order-12898-federal-actions-address-environmental-justice.

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 (USDOC, 2013b).

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

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

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

6.1.10.2. Specific Regulatory Considerations

Nevada does not have formal policies or programs to address environmental justice. Nevada established a Tribal Liaison Program in 2003 to improve communications and relations with tribes. In 2004, the NDEP and the state's Inter-tribal Council signed a memorandum of understanding to work together on environmental issues that affect tribes. (University of California, Hastings College of Law, 2010). Federal laws relevant to environmental justice are summarized Section 1.8, Overview of Relevant Federal Laws and Executive Orders.

6.1.10.3. Environmental Setting: Minority and Low-Income Populations

Table 6.1.10-1 presents 2013 data on the composition of Nevada's population by race and by Hispanic origin. The state of Nevada has a population with a higher percentage of individuals who identify as Black/African American (8.4 percent) when compared to populations of the West region (5.2 percent); however, this percentage is lower than that of the nation (12.6 percent). The percentages of the population in Nevada that identify as Asian (7.7 percent) or Some Other Race (9.6 percent) are smaller than those of the West region (10.5 and 10.0 percent, respectively), but larger than those of the nation (5.1 and 4.7 percent, respectively). The state's population of persons identifying as White (68.3 percent) matches that of the West region (68.3 percent) and it is slightly smaller than the nation's (73.7 percent).

The percentage of the population in Nevada that identifies as Hispanic (27.5 percent) is smaller than in the West region (31.5 percent), but larger than 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. Nevada's All Minorities population percentage (47.9 percent) is lower than that of the region (51.2 percent) and higher than that of the nation (37.6 percent).

Table 6.1.10-2 presents the percentage of the population living in poverty in 2013, for the state, region, and nation. The figure for Nevada (15.8 percent) is lower than that for the West region (16.6 percent) and matches the figure for the nation (15.8 percent).

Table 6.1.10-1: Population by Race and Hispanic Status, 2013

Geography	Total Population (estimated)	Race							Hispanic	All Minorities
		White	Black/ African Am	Am. Indian/ Alaska Native	Asian	Native Hawaiian /Pacific Islander	Some Other Race	Two or More Races		
Nevada	2,790,136	68.3%	8.4%	1.1%	7.7%	0.7%	9.6%	4.2%	27.5%	47.9%
West Region	60,262,888	68.3%	5.2%	1.3%	10.5%	0.4%	10.0%	4.3%	31.5%	51.2%
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, 2015s)
"All Minorities" is defined as all persons who consider themselves Hispanic or of any race other than White. Because some Hispanics identify as both Hispanic and of a non-White race, "All Minorities" is less than the sum of Hispanics and non-White races.

Table 6.1.10-2: Percentage of Population (Individuals) in Poverty, 2013

Geography	Percent Below Poverty Level
Nevada	15.8%
West Region	16.6%
United States	15.8%

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

6.1.10.4. Environmental Justice Screening Results

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

Figure 6.1.10-1 visually portrays the results of the environmental justice population screening analysis for Nevada. The analysis used block group data from the Census Bureau's American Community Survey 2009-2013 5-Year Estimates (U.S. Census Bureau, 2012).

Figure 6.1.10-1 shows that Nevada has many areas with high potential for environmental justice populations. The distribution of these high potential areas is fairly even across the state, and occurs both within and outside of the 10 largest population concentrations. The distribution of areas with moderate potential for environmental justice populations is also fairly even across the state.

It is important to understand how the data behind Figure 6.1.10-1 affect the visual impact of this map. Block groups have similar populations (hundreds to a few thousand individuals) regardless of population density. In sparsely populated areas, a single block group may cover tens or even hundreds of square miles, while in densely populated areas, block groups each cover much less than a single square mile. Thus, while large portions of the state outside the areas defined as large population concentrations show moderate or high potential for environmental justice populations, these low density areas reflect modest numbers of minority or low-income individuals compared to the potential environmental justice populations within densely populated areas. The overall effect of this relative density phenomenon is that the map visually shows large areas of the state having environmental justice potential, but this over-represents the presence of environmental justice populations.

It is also very important to note that Figure 6.1.10-1 does not definitively identify environmental justice populations. It indicates *degrees of likelihood of the presence* of populations of potential concern from an environmental justice perspective. Two caveats are important. First, environmental justice communities are often highly localized. Block group data may under- or over-represent the presence of these localized communities. For instance, in the large block groups in sparsely populated regions of the state, the data may represent dispersed individuals of minority or low-income status rather than discrete, place-based communities. Second, the definition of the moderate potential category draws a wide net for potential environmental justice populations. As discussed in Appendix D, the definition includes some commonly used thresholds for environmental justice screening that tend to over-identify environmental justice potential. Before FirstNet deploys projects, additional site-specific analyses to identify specific, localized environmental justice populations may be warranted. Such analyses could tier-off the methodology of this PEIS.

This map also does not indicate whether FirstNet projects would have actual impacts on environmental justice populations. An environmental justice effect on minority or low-income populations only occurs if the effect is harmful, significant (according to significance criteria), and "appreciably exceeds or is likely to appreciably exceed the risk or rate to the general population or other appropriate comparison group" (CEQ, 1997). The Environmental Consequences section (Section 6.2) addresses the potential for disproportionately high and adverse environmental or human health impacts on environmental justice populations.

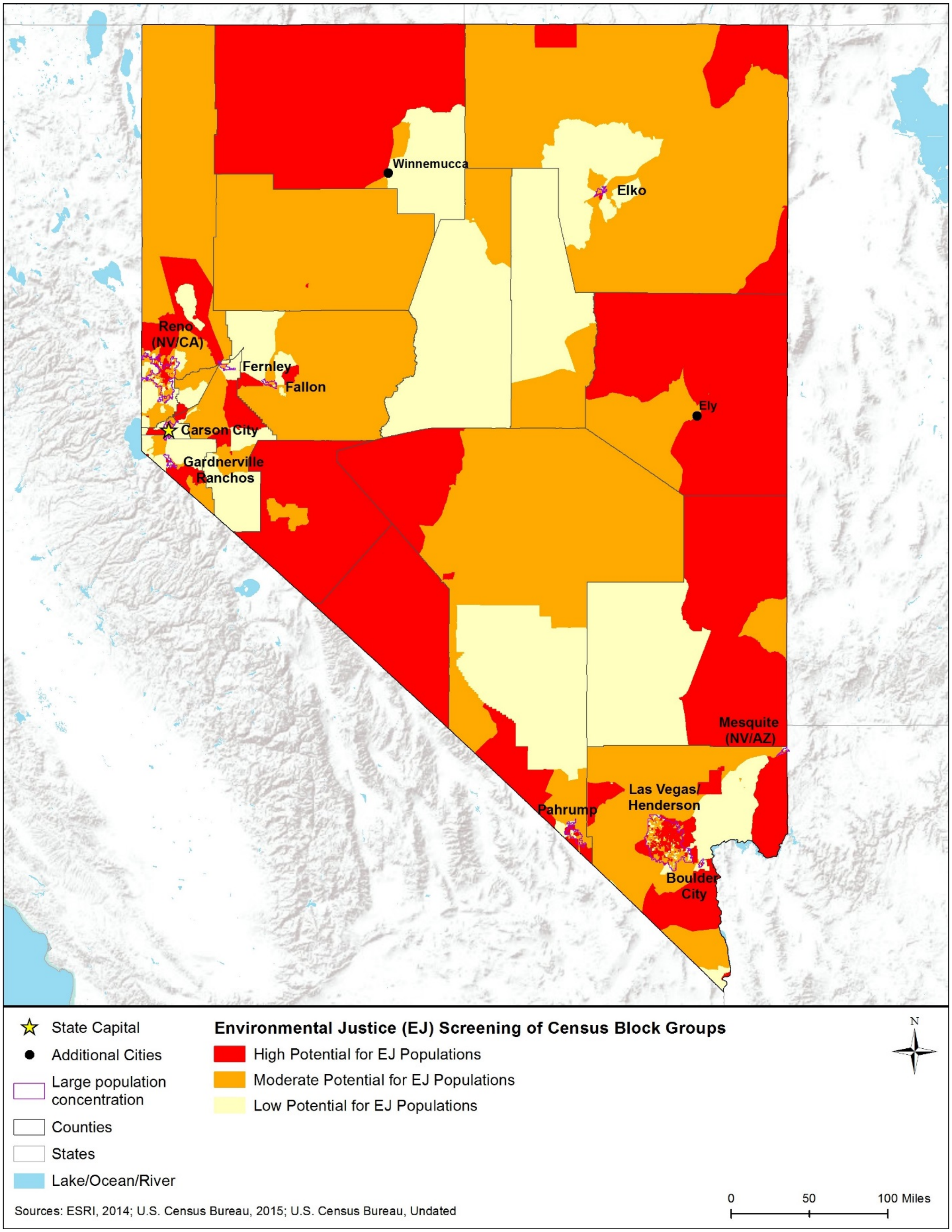

Figure 6.1.10-1: Potential for Environmental Justice Populations in Nevada, 2009-2013

6.1.11. Cultural Resources

6.1.11.1. Definition of Resource

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

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

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

- Statutory language and implementing regulations for Section 106 of the NHPA, formerly 16 U.S.C. 470a(d)(6)(A) (now 54 U.S.C. 306131(b)) and 36 CFR 800.16(l)(1);
- Statutory language and Implementing regulations for the Archaeological Resources Protection Act of 1979 (ARPA), 16 U.S.C. 470cc(c) and 43 CFR 7.3(a);
- Statutory language and implementing regulations for the Native American Graves Protection and Repatriation Act (NAGPRA), 25 U.S.C. 3001(3)(D) and 43 CFR 10.2(d);
- NPS's program support of public and private efforts to identify, evaluate, and protect America's historic and archeological resources (NPS, 2015d); 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).

6.1.11.2. 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, such as 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.

While Nevada does not have state regulations that are strictly similar to the NHPA or NEPA, the SHPO is established by state regulation (Table 6.1.11-1) to provide reviews of projects for state and local government agencies "as a service" (Nevada SHPO, 2010a). However, federal regulations supersede these regulations. While federal agencies may take into account compatible state laws and regulations, their actions that are subject to federal environmental review under NEPA and NHPA are not subject to compliance with such state laws and regulations.

Table 6.1.11-1: Relevant Nevada Cultural Resource Laws and Regulations

State Law/Regulation	Regulatory Agency	Applicability
NRS: Chapter 383.021, Creation of SHPO	SHPO	Created Nevada SHPO to (a) encourage, plan and coordinate historic preservation and archeological activities within the State, including programs to survey, record, study and preserve or salvage cultural resources, (b) compile and maintain an inventory of cultural resources, and (c) designate repositories for the materials that comprise the inventory.

6.1.11.3. Cultural and Natural Setting

Human beings have inhabited the state of Nevada for some 14,000 years (Nevada Archaeological Association, 2015; Nevada SHPO, 2010b; Nevada Site Stewards, 2013; Johnson, Sharpe, Bullard, & Lup, 2005). The majority of Nevada'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 31 archaeological sites listed on the NRHP in Nevada, of which there are 16 prehistoric sites, seven historic archaeological sites, seven that have historic and prehistoric provenance, and one shipwreck (Tahoe) (NPS, 2014e).

Archaeologists typically divide large study areas into regions. As shown in Figure 6.1.11-1, Nevada occupies two physiographic regions: Intermontane Plateau and Pacific Mountain System. Nevada is almost entirely within the Intermontane Plateau Region and the Basin and Range Province; a small portion of northeastern Nevada is within the Columbia Plateau Province within the Intermontane Plateau Region. In addition, a small area near Carson City and Lake Tahoe falls within the Pacific Mountain System Region and Cascade-Sierra Mountains Province

Evidence at most archeological sites in Nevada come from relatively shallow deposits, within one to two feet of the surface, or on the surface. However, in some cases, natural factors 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 Nevada's prehistoric periods (approximately 12000 B.C. to A.D. 1600) and the historic period since European colonization in the 1700s. Section 6.1.11.3 presents an overview of the initial human habitation in Nevada and the cultural development that occurred before European contact. Section 6.1.11.4 discusses the federally recognized American Indian Tribes with a cultural affiliation to the state. Section 6.1.11.5 provides a current list of significant archaeological sites in Nevada and tools that the state has developed to ensure their preservation. Section 6.1.11.6 document the historic context of the state since European contact, and Section 6.1.11.7 summarizes the architectural context of the state during the historic period.

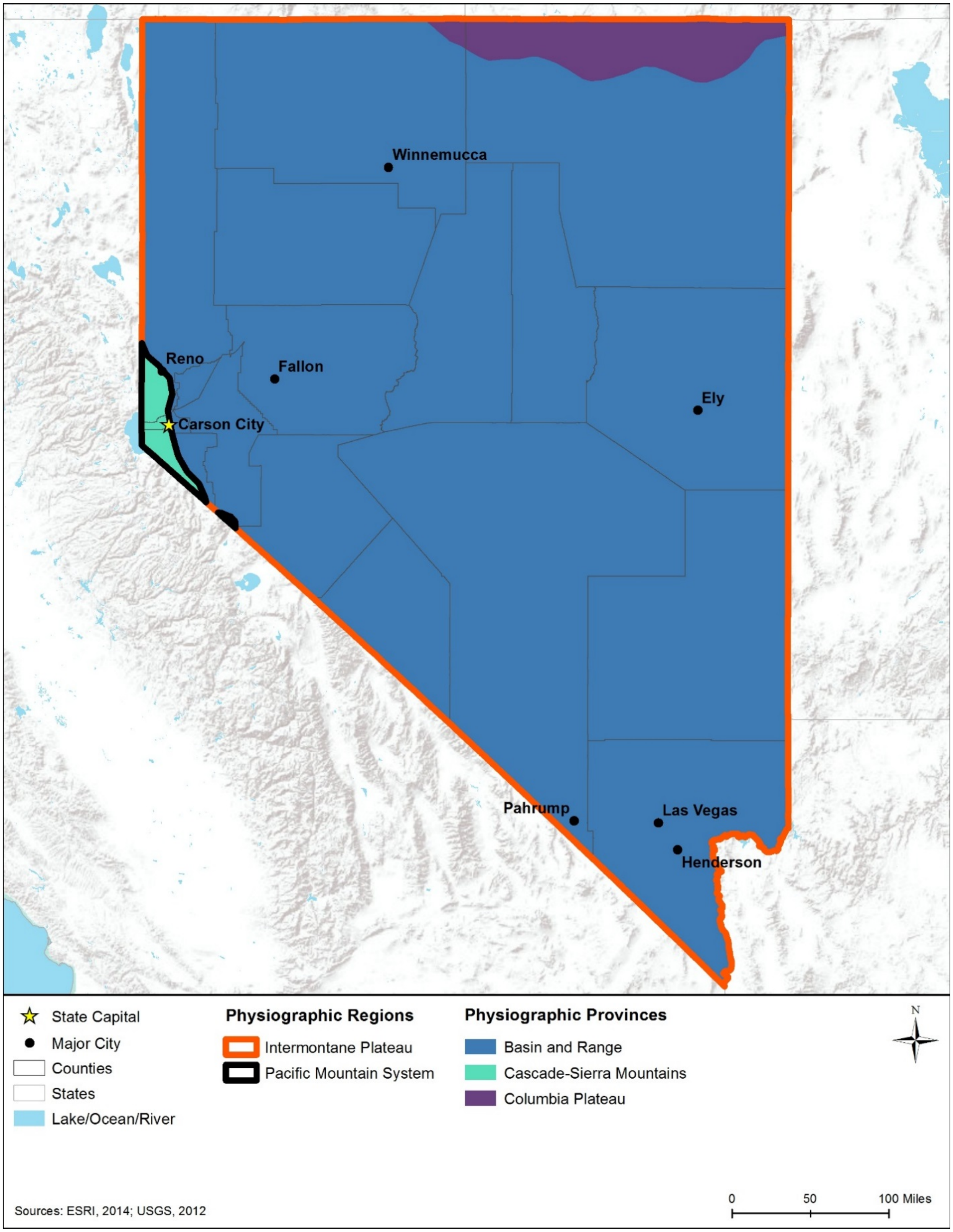

Figure 6.1.11-1: Nevada Physiographic Regions

6.1.11.4. Prehistoric Setting

There are four distinct periods associated with the prehistoric human populations that inhabited present day Nevada and the greater central geography of North America: The Pre-Archaic Period (12000 – 8000 B.C.), Early Archaic Period (8000 B.C. – 2000 B.C.), Middle Archaic Period (2000 B.C. – A.D. 500), and the Late Archaic Period (A.D. 500 – European Contact) (Nevada Site Stewards, 2013). Figure 6.1.11-2 shows a timeline representing these periods of early human habitation in North America, including present day Nevada. It is important to note that there is potential for undiscovered archaeological remains representing every prehistoric period throughout the state. Evidence of human occupation in each of Nevada's physiographic regions is prevalent. Due to advancements in techniques and associating artifacts discovered with similar ones previously assigned to a particular range of the archaeological record, continue to become increasingly accurate (Pauketat, 2012; Haynes, Donahue, Jull, & Zabel, 1984; Haynes, Johnson, & Stafford, 1999).

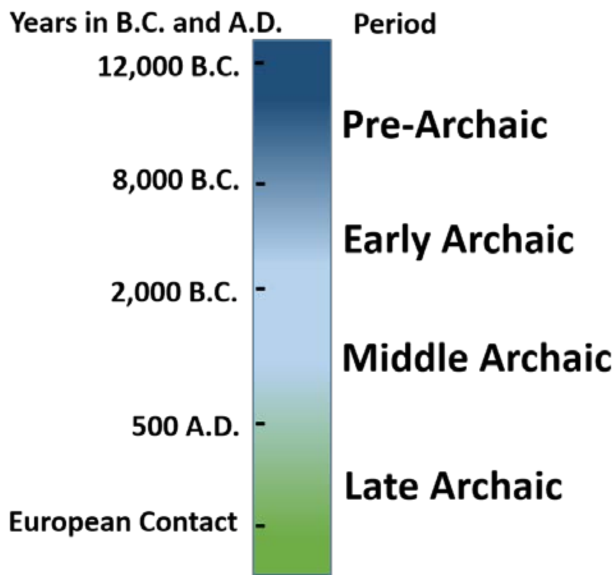

Figure 6.1.11-2: Timeline of Prehistoric Human Occupation

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

Pre-Archaic Period (12000 B.C. – 8000 B.C.)

The Pre-Archaic Period represents the earliest human habitation Nevada. Many of the sites identified from this period are "ground surface" sites and had yielded few artifacts. The people who inhabited this region during the Pre-Archaic period are most likely related to those that migrated to North America via a land bridge at the Bering Strait during the latter part of the last ice age (Late Pleistocene epoch). These people lived in small groups of nomadic hunters and gatherers, which used chipped-stone tools, including the "fluted javelin head" arrow and spear points, also referred to as the Clovis fluted point. Recent studies show that such technology was prevalent in northeastern Asia, the Arabian Peninsula, and Spain prior to human arrival into North America (Charpentier, Inizan, & Feblot-Augustins, 2002).

Most of the oldest evidence of human settlement in Nevada is from multifunctional tools, such as scrapers and gravers, found in surface and shallow deposits throughout the state. Clovis period projectile points (arrowheads) from this region are from the typical Pre-Archaic inhabitants who were big game hunters throughout North America. Archaeologists hypothesize that the people of this period ranged across the state in small bands that followed migratory game (Nevada Site Stewards, 2013; Kelly, 2015; Rafferty, 1988; Johnson, Sharpe, Bullard, & Lup, 2005). There are at least six bison kill site locations in Nevada, dated more than 10,000 years ago (Johnson, Sharpe, Bullard, & Lup, 2005). These bands established seasonal camps, some of which likely became permanent settlements. There is little evidence that Pre-Archaic inhabitants of Nevada used plant-processing tools (Nevada Site Stewards, 2013).

Early, Middle, and Late Archaic Periods (8000 B.C. – European Contact)

As presented in the sections below, the Archaic Period is subdivided into the stages of cultural development — Early, Middle, and Late — largely defined by the warming climate, expanding food resources, increasing populations, and the development of sociocultural traditions from contact with other groups through travel or trade (Ritchie, 1969).

The archaeological record from the Early Archaic period in Nevada is incomplete, but indicates advances in projectile point technology, based on the increase in variation of types discovered in this region of the western United States. Hunting became more commonplace during this period. The mano and metate are tools for the grinding of seeds. The mano was an elongated stone with a rounded end; the seeds were placed in the metate (stone bowl), and ground using the mano. Figure 6.1.11-3 shows an example of a mano and metate and its use (NPS, 2015h). The people ground the seeds to make a simple form of bread, presumably baked over an open flame. Sites from the Early Archaic in Nevada include caves and rock shelters, where the people stored their food (Nevada Site Stewards, 2013).

Figure 6.1.11-3: Example of Mano and Metate

Source: (NPS, 2015h)

By the Middle Archaic Period, people began live and store food in pit houses, as well as in caves and rock shelters. Pit houses are underground shelters with hearths and food storage areas. Archaeological evidence suggests that the people were occupying and reoccupying these dwellings for many years (Nevada Department of Conservation and Natural Resources, 2010; Nevada Site Stewards, 2013). (Nevada Site Stewards, 2013; Johnson, Sharpe, Bullard, & Lup, 2005).

Due to the limited range of food sources associated with the desert-like environment, it became important for the people to be extremely efficient in various hunting practices within all the various ecological settings such as basins and ranges. Also during the Middle Archaic Period, trade appears to have become an increasingly important part of subsistence and cultural development, based in part on evidence such as marine shells and obsidian found at Nevada archeological sites (Simons & Hutchins, 2000). There was a gradual increase in average annual rainfall during the Middle Archaic Period, which gave way to increasing human populations in the region. Small ponds and lakes began to form which provided a new resource for the people to tap for subsistence (Nevada Site Stewards, 2013).

Fish Valley, in the western part of the Great Basin, is an example of a site occupied in the Middle Archaic and Late Archaic Periods. Some of the sites are larger than 20 acres in size and diagnostic tools found show that people were occupying this region during this time. As previously mentioned, an increase of precipitation in the region allowed for an increased abundance of food sources for the inhabitants (Rafferty, 1988). The people took advantage of the increase in trees, such as the Pinyon Pine, which flourished during the period. The pine nuts (seeds) were harvested, and provided an added source of protein to their diet (Kelly, 2015).

The number of inhabitants on Nevada continued to increase during the Late Archaic period. Hunting became more efficient with the advent of the bow and arrow. “This new technology also allowed for utilization of the few productive ecological zones not already in use. This proved timely, as the region became more arid (again), after the previous period of increased moisture” (Nevada Site Stewards, 2013).

The ability to expand on previous technology for processing plants was imperative for the survival the people from this period. Due to increased aridity and a limited supply of food sources, they had to become increasingly creative in the types of food they consumed and the way they prepared it (Nevada Site Stewards, 2013).

6.1.11.5. Federally Recognized Tribes of Nevada

According to the Bureau of Indian Affairs and the National Conference of State Legislators, there are 19 federally recognized Tribes in Nevada: Confederated Tribes of the Goshute Reservation (Nevada and Utah), the Duckwater Shoshone Tribe of the Duckwater Reservation, the Ely Shoshone Tribe of Nevada, the Fort McDermitt Paiute and Shoshone Tribes of the Fort McDermitt Indian Reservation (Nevada and Oregon), the Fort Mojave Indian Tribe (Arizona, California and Nevada), the Las Vegas Tribe of Paiute Indians of the Las Vegas Indian Colony, the Lovelock Paiute Tribe of the Lovelock Indian Colony, the Moapa Band of Paiute Indians of the Moapa River Indian Reservation, the Paiute-Shoshone Tribe of the Fallon Reservation and

Colony, the Pyramid Lake Paiute Tribe of the Pyramid Lake Reservation, the Reno-Sparks Indian Colony, the Shoshone-Paiute Tribes of the Duck Valley Reservation, the Summit Lake Paiute Tribe of Nevada, the Te-Moak Tribe of Western Shoshone Indians of Nevada (Four constituent bands: Battle Mountain Band; Elko Band; South Fork Band; Wells Band), the Walker River Paiute Tribe of the Walker River Reservation, the Washoe Tribe (Nevada and California) (Carson Colony, Dresslerville Colony, Woodfords Community, Stewart Community and Washoe Ranches), the Winnemucca Indian Colony of Nevada, the Yerington Paiute Tribe of the Yerington Colony & Campbell Ranch, and the Yomba Shoshone Tribe of the Yomba Reservation (NCSL, 2016). The locations of federally recognized tribes are shown in Figure 6.1.11-4. The figure also shows the general boundaries of major tribal nations that were known to exist in this region of the United States historically.

6.1.11.6. Significant Archaeological Sites of Nevada

As previously mentioned in Section 6.1.11, there are 31 archaeological sites in Nevada listed on the NRHP. Table 6.1.11-2 lists the names of the sites, the city they are closest to, and type of site. The list includes both prehistoric and historic archaeological sites. The number of archaeological sites may increase with the discovery of new sites. A current list of NRHP sites can be found on the NRHP website at http://www.nps.gov/nr/ (NPS, 2014e).

Nevada State Cultural Resources Database and Tools

Nevada SHPO

The Nevada State Historic Preservation Office’s website (http://shpo.nv.gov/) hosts a variety of resources for those who wish to learn more about Nevada’s cultural heritage, including links to relevant preservation websites and a calendar of upcoming events. The SHPOs Nevada Cultural Resource Information System (NVCRIS) is a collection of GIS databases that house archaeological and historic information on the state. To access the system is restricted to professional researchers, who must request from the NVCRIS data manager. For amateur researchers and other interested parties, the SHPO's Nevada Site Stewards is a program that enlists and trains citizens to act as monitors for historic sites. (Nevada SHPO, 2010b)

Nevada Archaeological Association (NAA)

The Nevada Archaeological Association is an organization with the purpose of encouraging and educating the public in archaeological awareness. The association publishes a quarterly newsletter called *In-Situ* and an annual journal, the *Nevada Archaeologist*. Both publications can be downloaded from the NAA website (http://www.nvarch.org/). Users can also find information about the association and upcoming events on the website. (Nevada Archaeological Association, 2015)

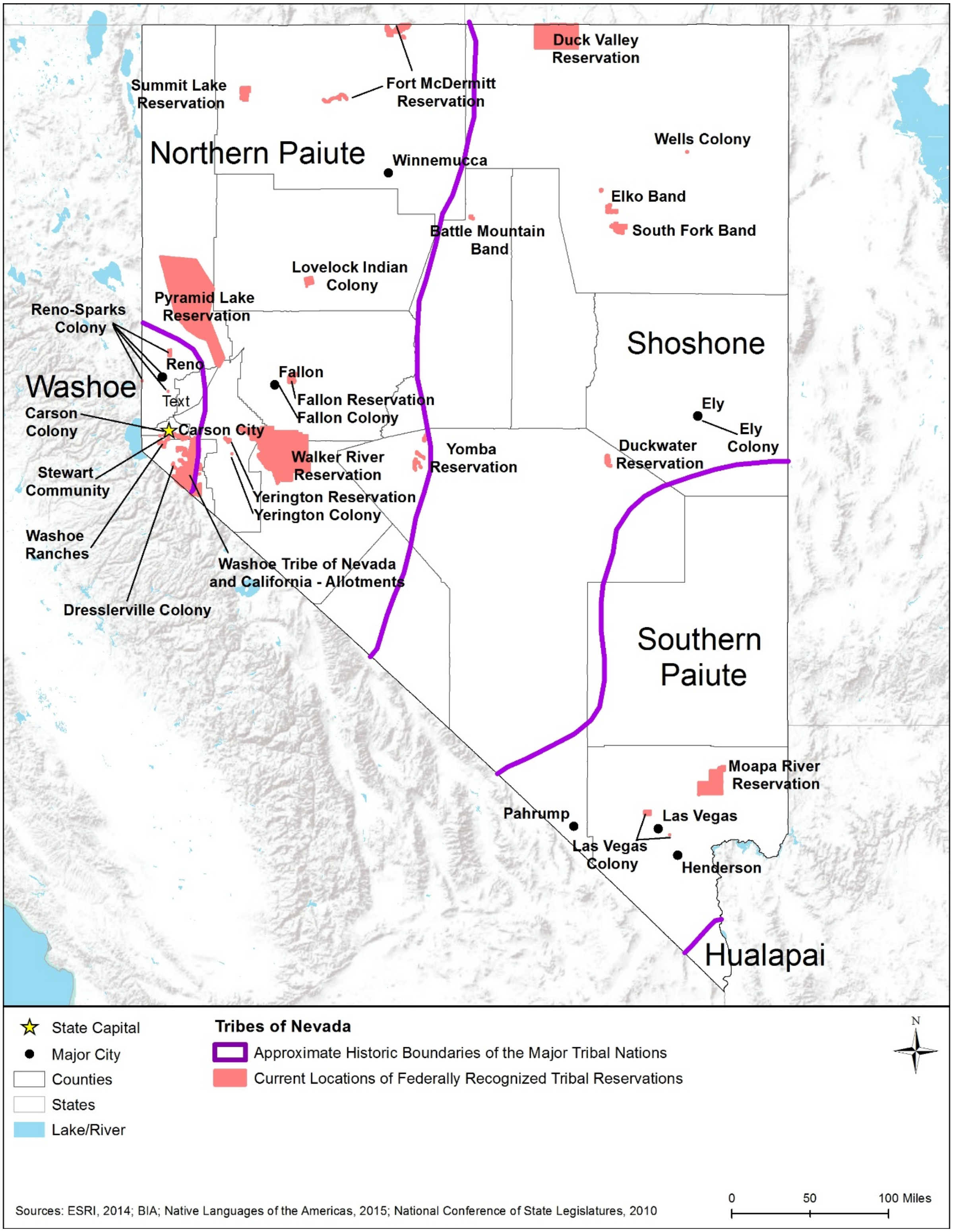

Figure 6.1.11-4: Federally Recognized Tribes in Nevada

Table 6.1.11-2: Archaeological Sites on the National Register of Historic Places in Nevada

Closest City	Site Name	Type of Site
Alamo	Black Canyon Petroglyphs	Prehistoric
Austin	Cold Springs Station Site	Historic
Austin	Toquima Cave	Prehistoric
Boulder City	Gold Strike Canyon--Sugarloaf Mountain Traditional Cultural Property	Historic
Denio	Last Supper Cave	Historic - Aboriginal, Prehistoric
Ely	Sunshine Locality	Prehistoric
Fallon	Grimes Point	Prehistoric
Fallon	Sand Springs Station	Historic
Fallon	Stillwater Marsh	Historic - Aboriginal, Prehistoric
Frenchman	Cold Springs Pony Express Station Ruins	Historic - Aboriginal
Glenbrook	TAHOE (Shipwreck)	Shipwreck
Hiko	White River Narrows Archeological District	Prehistoric
Indian Springs	Tim Springs Petroglyphs	Prehistoric
Las Vegas	Brownstone Canyon Archeological District	Historic - Aboriginal, Prehistoric
Las Vegas	Corn Creek Campsite	Historic - Aboriginal, Prehistoric
Las Vegas	Gypsum Cave	Prehistoric
Las Vegas	Las Vegas Springs	Prehistoric
Las Vegas	Sheep Mountain Range Archeological District	Historic - Aboriginal, Prehistoric
Las Vegas	Sloan Petroglyph Site	Historic - Aboriginal, Prehistoric
Las Vegas	Sloan Petroglyph Site (Boundary Increase)	Historic - Aboriginal, Prehistoric
Las Vegas	Tule Springs Archeological Site	Prehistoric
Laughlin	Grapevine Canyon Petroglyphs (AZ:F:14:98 ASM)	Prehistoric
Laughlin	Spirit Mountain	Historic - Aboriginal
Lovelock	Lovelock Cave	Prehistoric
Lovelock	Dave Canyon, Se'aquada, Table Mountain	Historic - Aboriginal
Lovelock	Leonard Rock Shelter	Prehistoric
Lovelock	Rye Patch Archeological Sites	Prehistoric
Panaca	Panaca Summit Archeological District	Prehistoric
Searchlight	Homestake Mine	Historic
Virginia City	Lagomarsino Petroglyph Site	Prehistoric
Yerington	East Walker River Petroglyph Site	Prehistoric

Source: (NPS, 2015i)

6.1.11.7. Historic Context

The first Europeans known to have travelled through Nevada were Spanish explorers and missionaries during the late 18th century. In 1821, after Spain lost control of Mexico, the southwest region of the United States was targeted by American and British fur traders, who traversed Nevada using existing Spanish and American Indian routes, but did not settle permanently. Starting in the 1830s, the federal government sponsored exploratory ventures into the region. Following the Mexican-American War, and the onset of the California gold rush, the federal government sought to establish reliable trade and transportation routes through the southwest.[108] Ultimately the goal was to build a transcontinental railroad; however, the railroad did not reach Nevada until the 1860s (McBride, 2002).

In 1850, the Territory of Utah was formed, which included the majority of present-day Nevada. Permanent non-indigenous settlement of Nevada began in mid-19th century. "Genoa, Nevada's first Euroamerican settlement with a permanent structure, was established in 1851 by John Reese, a Mormon businessman from Salt Lake City" (McBride, 2002). Genoa is near present-day Carson City, which had a hospitable environment and was close to trade routes. In the south, Las Vegas developed as a Mormon fort in 1855, and although it did not become incorporated as a town until the 20th century, ruins associated with this early settlement remain. These ruins constitute the oldest non-indigenous structures in Nevada today (McBride, 2002).

Nevada became a "territory on March 2, 1861, and then a state on October 31, 1864" (Green, 2015). While no Civil War battles occurred in Nevada, a number of residents were either mustered or volunteered to fight for the Union. In 1869, the first transcontinental railroad was completed, opening the region to further trade and settlement. The city of Reno grew largely because it was a stopping point along the railroad between Salt Lake City and Sacramento. The discovery of the silver and gold Comstock Lode in 1859 marked a major turning point for Nevada, and led to the development of "boomtowns" in the Carson Valley, including Virginia City. Additional mining towns arose near mining lodes throughout the state, with historic resources associated with these towns remaining on the landscape today (Green, 2015).

Although the mining industry waned during the late 19th century, contributing to a two-decade recession, mining continued to be important. Modern day Las Vegas began to develop after the location was chosen as the site of a railroad hub in 1902, with mining activity in the area serving as the driving force for settlement (Green, 2015). Ranching was also important, particularly cattle and sheep ranching, as it provided food for settlers. Logging was important around Carson City and the Lake Tahoe Region beginning in the 1860s, while farming activities expanded as well after land reclamation projects in the early 20th century allowed for new lands to be irrigated and cultivated (Nicoletta, 2004).

During World War I (WWI), Nevada boomed once again as mining activities increased to support the war effort. The Great Depression has a significant effect on the state, but the area around Las Vegas was helped by the construction of the Hoover Dam beginning in 1933 (Green,

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[108] Gold was first discovered in 1848, and prospectors began moving west at that time; however, it took until 1849 for the prospecting rush to fully develop.

2015). In 1931, in an attempt to spark further growth, gambling was legalized and divorce restrictions loosened. This legislation promoted economic growth by allowing Las Vegas, Reno, and other gaming locations to develop into the cities they are today. Federal government decisions to develop several military facilities in Nevada during World War II (WWII) affected development and land use of large parts of the state. As bases and training facilities were established, cities grew around them (Green, 2015). Nellis Air Force Base, near Las Vegas, NV, is one example.

The gaming industry continued to grow following WWII, but mining remained important as the state experienced another boom during the 1950s. Nuclear bomb testing became a part of Nevada's history beginning in the 1950s, as bombs were detonated aboveground at first, and later in underground facilities at the Nevada Test Site near Las Vegas (Green, 2015). Sprawling suburban development characterizes residential Las Vegas today, while the downtown areas is regularly rebuilt and reimagined to offer tourists the most up to date accommodations.

Nevada has 373 NRHP listed sites, as well as 8 NHLs and 1 National Heritage Area (NPS, 2014d) (NPS, 2015d). Figure 6.1.11-5 shows the location of NRHP sites in Nevada.[109]

6.1.11.8. Architectural Context

European architecture did not appear in Nevada until the middle of the 19th century. While trappers and pioneers had been exploring the region for some time, the harsh environment served as a deterrent to permanent settlement. Historic trails used by early pioneers still can be seen, with the Old Spanish Trail in southern Nevada being one example. American Indian dwellings constructed of adobe remain as well, but are rare (Nicoletta, 2004). Lost City, also known as Pueblo Grande de Nevada, is located outside of Las Vegas. The Lost City is a collection of American Indian ruins that are located near the former town of St. Thomas, which was submerged following the construction of the Hoover Damn. Portions of St. Thomas, as well as formerly submerged portions of the Lost City, have recently become visible again as water levels in Lake Meade have dropped in recent years (NPS, 2015j).

As reported above, the town of Genoa, near present day Carson City, was settled by Mormons from Salt Lake City in 1851. Genoa served travelers as they moved between eastern settlements and newly established settlements in the southwest and on the west coast. Initially, Genoa consisted of simple homes and agricultural support buildings constructed of logs, but evolved to include wood-framed and brick buildings as mining activities brought additional population and wealth. The Carson Valley continued to grow as settlers were attracted by logging, prospecting, and ranching activities. In the south, Las Vegas was established as a Mormon fort in 1855, where adobe was the building material of choice due to the lack of trees; portions of these early Mormon structures still exist today (Nicoletta, 2004).

Construction in northern Nevada boomed following the discovery of the Comstock Lode, a large silver deposit, in the Carson Valley. The town of Virginia City, located between Carson City and Reno, quickly grew into a boomtown as a result of silver mining during the middle of the

[109] See Section 6.1.7 for a more in-depth discussion of additional historic resources as they relate to recreational resources.

19th century. Early architecture in Virginia City followed general trends throughout the state, with canvas tents appearing first, followed by log and wood-framed structures (both commercial and domestic), and, eventually, buildings of masonry. If a mine that supported a new community failed, then the town was often abandoned without developing any structures more permanent than tents or basic wooden structures. Consequently, a wide variety of architecture styles was common in Nevada's mining boomtowns (Nicoletta, 2004).

One building type that was common in western pioneer states was the "false-front" building (Nicoletta, 2004). False-front buildings were constructed of logs or other cheap materials, and featured wood-framed façades that were large, decorated with signage, and sought to create the appearance of a developed urban environment. Streets became lined with what appeared to be modern, well-built buildings, that sought to assure residents that the settlement was thriving and permanent; in reality the exact opposite was often true (Heath, 1989). Structures associated with mining and milling activities were common as well. Today, historic mining-related resources still exist on the landscape; however, many have been removed due to federal regulations requiring companies to reclaim land once mining activities have ceased (Nicoletta, 2004).

Railroads had a substantive effect on Nevada's developmental history. As railroads were built across the state, towns and cities arose, often built of materials brought by the railroads themselves. For example, Reno grew into a city as result its location along the route of the Union Pacific-Central Pacific, the first transcontinental railroad. Railroad architecture, including depots, warehouses, and engine houses became common in the mid-to-late 19th century, with a town's streets often oriented on a grid pattern in relation to the railroad. Moving beyond railroads, large civic buildings were uncommon in early Nevada; however, examples did exist and were built to impress upon the citizenry the importance of these institutions; the U.S. Mint in Carson City is one example. Schools were also built, and were seen as being critical representations of civilization coming to Nevada (Nicoletta, 2004).

Military instillations and federal engineering projects have come to define much of the Nevada landscape. The Hoover Dam, constructed between 1931 and 1936, aided in the growth of Las Vegas by providing reliable electricity and drinking water. Additional damming and irrigation projects throughout the state occurred in an attempt to aid in settlement. The Truckee-Carson Irrigation Project of 1902 is one such example (Nicoletta, 2004). Military installations have also been common for much of the 20th century due to the large expanses of uninhabited land that were suitable for military testing. This architecture is generally utilitarian and features minimal ornamentation (Nicoletta, 2004). Nuclear weapon testing was conducted at the Nevada Test Site near Las Vegas. "Formerly the Nevada Proving Grounds, the Nevada Test Site is located in Nye County about sixty-five miles northwest of Las Vegas, and covers approximately 1,375 square miles" (Nevada Humanities, 2015).

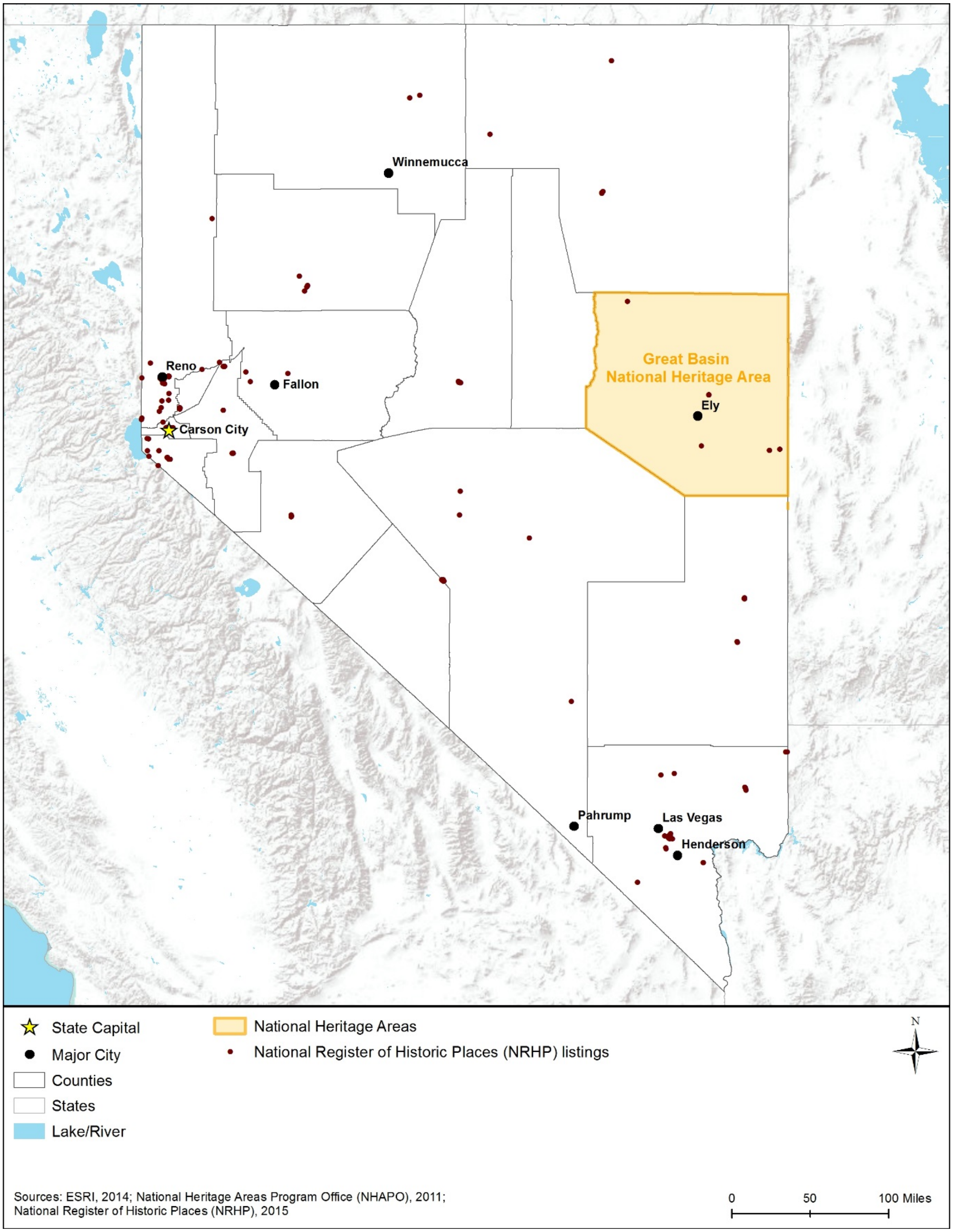

Figure 6.1.11-5: NRHP Sites in Nevada

Present day Nevada relies on the tourism industry, primarily in Las Vegas, Reno, and the Lake Tahoe region. Following the legalization of gambling in 1931, Nevada began to dominate the professional gaming industry. Casinos are built and replaced quickly, resulting in a low rate of survival for historic examples of this building type. Casinos are generally designed to maximize visibility, signage, flashiness, or represent a particular theme (Nicoletta, 2004).

Housing in Nevada followed a similar pattern to the rest of the state's architecture. Early examples were utilitarian and often lacked permanence due to the fleeting nature of mining settlements. A variety of popular architectural styles existed; however, Italianate is common among high-style houses as it was popular during the mining booms of the 19th century. Boarding houses were common for mineworkers during the 19th and early 20th centuries. Today many of these workers live in mobile homes. Suburban development became common after WWII. As the landscape around cities is often undeveloped and open for growth, real estate developers have tended to neglect construction density in favor of expanding housing tracts further outward (Nicoletta, 2004).

Figure 6.1.11-6: Representative Architectural Styles of Nevada

- Top Left – Hoover Dam (Boulder City, NV) – (Highsmith, Aerial view of Hoover Dam, Nevada, 1980a)
- Top Right – Genoa Main Street (Genoa, NA) – (Rothstein, 1940)
- Bottom Left – United States Mint (Carson City, NV) – (Historic American Buildings Survey, 1933)
- Bottom Right – Las Vegas Strip (Las Vegas, NV) – (Highsmith, Dusk at the Las Vegas Strip, Las Vegas, Nevada, 1980b)

6.1.12. Air Quality

6.1.12.1. Definition of the Resource

Air quality in a geographic area is determined by the type and amount of pollutants emitted into the atmosphere, the size, and topography[110] 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)[111] or micrograms per cubic meter ($\mu g/m^3$) determined over various periods of time (averaging time).[112] This section discusses the existing air quality in Nevada. The USEPA designates areas within the United States as attainment,[113] nonattainment,[114] maintenance,[115] or unclassifiable[116] 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.

The state of Nevada has three separate and distinct air regulatory authorities – The NDEP Bureau of Air Pollution Control (BAPC), the Clark County Department of Air Quality (DAQ), and the Washoe County Health District–Air Quality Management Division (AQMD). The Nevada BAPC is responsible for the entire state with exception of Clark and Washoe Counties. Each air regulatory authority has different air regulations, state implementation plan (SIP), and ambient air quality standards.

6.1.12.2. Specific Regulatory Considerations for the NDEP BAPC

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[117] or secondary,[118] 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

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

111 Equivalent to 1 milligram per liter (mg/L).

112 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, 2015o).

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

114 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, 2015p).

115 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, 2015p).

116 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, 2015p).

117 Primary standard: The primary standard is set to provide public health protection, including protecting the health of sensitive populations such as asthmatics, children, and the elderly (USEPA, 2014b).

118 Secondary standards: The secondary standard is set to provide public welfare protection, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings (USEPA, 2014b).

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, 2016b). HAPs can have severe adverse impacts on human health and the environment, including increased risk of cancer, reproductive issues, or birth defects. HAPs are federally regulated under the CAA via the National Emission Standards for Hazardous Air Pollutants (NESHAPs). USEPA developed the NESHAPs for sources and source categories emitting HAPs that pose a risk to human health. Appendix E presents a list of federally regulated HAPs.

In conjunction with the federal NAAQS, Nevada maintains its own air quality standards, the Nevada Ambient Air Quality Standards (Nevada AAQS). Table 6.1.12-1 presents an overview of the Nevada AAQS as defined by NDEP, Bureau of Air Quality Planning (BAQP).

Table 6.1.12-1: Nevada Ambient Air Quality Standards (Nevada AAQS)

Pollutant	Averaging Time	Primary Standard		Secondary Standard		Notes
		µg/m³	ppm	µg/m³	ppm	
CO	8-hour	-	9	-	-	Not to be exceeded more than once per year.
	1-hour	-	35	-	-	
Lead	3-month	0.15	-	Same as primary		Not to be exceeded.
NO_2	1-hour	-	0.1	-	-	98th percentile, averaged over 3 years.
	Annual	-	0.053	Same as primary		Annual Mean.
PM_{10}	24-hour	150	-	Same as primary		Not to be exceeded more than once per year on average over 3 years.
$PM_{2.5}$	Annual	12	-	15	-	Annual mean, averaged over 3 years.
	24-hour	35	-	Same as primary		98th percentile, averaged over 3 years.
O_3	8-hour	-	0.075	Same as primary		Annual fourth-highest daily maximum 8-hr concentration, averaged over 3 years.
Sulfur Dioxide (SO_2)	1-hour	-	0.075	-	-	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years.
	3-hour	-	-	-	0.5	Not to be exceeded more than once per year.

Source: (NDEP, 2015j)

Title V Operating Permits/State Operating Permits

Nevada has authorization to issue CAA Title V operating permits on behalf of the USEPA, as outlined in 40 CFR 70 for the counties that lie in their jurisdiction (not including Clark and Washoe Counties), while Clark and Washoe Counties issue Title V operating permits for their jurisdiction. The Title V program refers to Title V of the CAA that governs permitting requirements for major industrial air pollution sources and consolidates all CAA requirements for the facility into one permit (USEPA, 2015e). The overall goal of the Title V program is to "reduce violations of air pollution laws and improve enforcement of those laws" (USEPA, 2015e). Nevada Revised Statute (NRS) 445B describes the applicability of Title V operating permits. Nevada 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 6.1.12-2). The permit issued to a facility contains both state and federal portions and incorporates a reporting schedule (USEPA, 2014c).

Table 6.1.12-2: Major Air Pollutant Source Thresholds

Pollutant	Tons Per Year (TPY)
Any Pollutant	100
Single HAP	10
Total/Cumulative HAPs	25

Source: (USEPA, 2014c)

The Nevada BAPC has six different types of air quality permits:

- Class I permits are BAPC Title V permits for facilities that emit more than the major source thresholds in Table 6.1.12-2.
- Class II permits are for sources that emit less than the major thresholds.
- Class III permits are for sources that emit less than or equal to 5 TPY of total regulated air pollutants and "emit less than one-half ton of lead per year, and must not have any emission units subject to Federal Emission Standards (i.e., New Source Performance Standards [NSPS], NESHAPS, Maximum Achievable Control Technology [MACT], etc.)" (NDEP, 2015k).
- Class IV permits are "typically for a single area source that emit 10 tons per year or less of any one HAP, and less than 25 tons of a combination of HAPs and not subject to Class 1, 2, or 3 permitting" (NDEP, 2015k).
- Surface Area Disturbance (SAD) permits are for SAD greater than 5 acres.
- General/COLA permits are for "temporary portable equipment for road and highway construction at a location" less than 12 months. (NDEP Bureau of Air Pollution Control, 2010)

Exempt Activities

According to the NAC 445B.288, the following insignificant activities are exempt from any operating permit:

- "The following emission units are considered to be insignificant activities unless the emission unit is otherwise subject to another specific applicable requirement, including, without limitation, any requirement or standard set forth in 40 CFR Part 60, 61 or 63:
  - Any equipment or other contrivance used exclusively for the processing of food for human consumption.
  - An incinerator, which has a rated burning capacity that is less than 25 pounds per hour.

- An emission unit that has a maximum allowable throughput or batch load rate of less than 50 pounds per hour, unless the emission unit directly emits, or has the potential to emit, a hazardous air pollutant.
- A storage container for petroleum liquid, or a storage facility for volatile organic liquid, that has a capacity of less than 40,000 gallons.
- Except as otherwise provided in paragraphs (f), (g) and (h), air-conditioning equipment or fuel-burning equipment that, individually, has a rating which is:
  - (1) Less than 4,000,000 Btu's per hour; or
  - (2) Equal to or greater than 4,000,000 Btu's per hour if the equipment operates less than 100 hours per calendar year.
- A portable internal combustion engine that has a rating for output which is:
  - Less than 500 horsepower; or
  - Equal to or greater than 500 horsepower if the engine operates less than 100 hours per calendar year.
- A stationary internal combustion engine that has a rating for output which is:
  - Less than 250 horsepower; or
  - Equal to or greater than 250 horsepower if the engine operates less than 100 hours per calendar year.
- An emergency generator."[119] (NDEP, 2015j)

Temporary Emissions Sources Permits

The Nevada BAPC issues a general permit for temporary portable equipment used for road and highway construction at any given location as long as that equipment remains onsite less than 12 months. All other activities should review applicable stationary source requirements, or contact the Nevada BAPC for additional assistance.

State Preconstruction Permits

The Nevada BAPC does not issue Preconstruction Permits, however as defined under NAC 445B.141, required by NAC 445B.3375 (Class IB Application: Filing Requirements). A Class IB application (also known as a preconstruction review) is required for the following activities:

- Sources that are required to obtain a Class I permit (for both new and existing stationary sources);[120]
- New Class I stationary sources that are subject to the federal standards of performance for new stationary sources and Hazardous air pollutants; and

[119] Emergency generator is only an insignificant activity if it is an internal combustion engine only used during power outages to keep essential operations running. The potential to emit should not exceed 500 hours of operation in one year. (NDEP, 2015k)

[120] Existing Stationary Source: the Nevada BAPC defines an existing stationary source as a "stationary source which was constructed, or for which the owner or operator submitted a complete application for an operating permit, before the effective date of the program" and "for stationary sources subject to 42 U.S.C. § 7412, any stationary source other than a new stationary source." (FAA, 2015h)

- Class II permit sources that when modified equal or exceed the Major Source Thresholds as defined in NAC 445B.094 (see Table 6.1.12-2). (NDEP, 2015j)

The Nevada BAPC also issues SAD Permits, which are for projects that disturb a surface area greater than 5 acres (NDEP, 2015k).

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 SIP (USEPA, 2013b). An action in designated nonattainment and maintenance areas would be evaluated for the emission of those particular pollutants under the General Conformity Rule through an applicability analysis. Pursuant to Title 40 CFR 93.153(d)(2) and (e), federal actions "in response to emergencies which are typically commenced on the order of hours or days after the emergency" and actions "which are part of part of a continuing response to emergency or disaster" that are taken up to 6 months after beginning response activities, will be exempt from any conformity determinations (GPO, 2010).

The estimated pollutant emissions are compared to *de minimis* levels.[121] These values are the minimum thresholds for which a conformity determination must be performed (see Table 6.1.12-3). No Nevada counties lie in the Ozone Transport Region (OTR).

Table 6.1.12-3: *De Minimis* Levels

Pollutant	Area Type	TPY
Ozone (Volatile Organic Compounds [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: (GPO, 2010)

If an action does not result in an emissions increase above the *de minimis* levels in Table 6.1.12-3, 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 6.1.12-3, then the

[121] 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, 2016d)

action must undergo a conformity determination. The federal agency must first show that the action would meet all SIP control requirements and that any new emissions would not cause a new violation of the NAAQS. To demonstrate conformity,[122] the agency would have to fulfill one or more of the following:

- Show any emissions increase is specifically identified and accounted for in the respective state's SIP;
- Receive acknowledgement from the state that any increase in emissions would not exceed the SIP emission budget;
- Receive acknowledgement from the state to revise the SIP and include emissions from the action;
- Receive written acknowledgement from the relevant metropolitan planning organization (MPO) stating that on-road motor vehicle emissions are part of the current area transportation plan or transportation improvement program's regional emission analysis;
- 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 Nevada SIP is composed of many related actions to ensure ambient air concentrations of the six criteria pollutants comply with the NAAQS. Nevada's SIP is a conglomeration of separate actions taken for each of the pollutants. All of Nevada's SIP actions are codified under 40 CFR Part 52 Subpart DD. A list of all SIP actions for all six criteria pollutants can be found on NDEP's website: https://ndep.nv.gov/baqp/planmodeling/techregsip.html.

6.1.12.3. Specific Regulatory Considerations for Clark County DAQ

National and State Ambient Air Quality Standards

The Clark County DAQ follows the NAAQS, and do not maintain their own. See section 6.1.12.2 for a general discussion of the NAAQS.

Title V Operating Permits/State Operating Permits

Clark County DAQ has authorization to issue CAA Title V operating permits on behalf of the USEPA, as outlined in 40 CFR 70. Clark County rules Section 12.5: Part 70, Operating Permit Requirements, describes the applicability of Title V operating permits. The Clark County DAQ require 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 6.1.12-2). The permit issued to a facility contains both state and federal portions and incorporates a reporting schedule (USEPA, 2014c).

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

Exempt Activities

The Clark County DAQ issues Minor Source and Authority to Construct Major Permits. According to the Clark County Air Quality Regulations Section 12, stationary sources with a potential to emit less than the levels in Table 6.1.12-4 are exempt from obtaining an operating permit. (Clark County Board of County Commissioners, 2014a)

Table 6.1.12-4: Clark County Minor Source Emission Levels

Type of Air Pollutant	Potential to Emit (TPY)
$PM_{2.5}$	5
PM_{10}	5
CO	25
VOC	5
NO_x	5
SO_2	25
Lead (Pb)	0.3
H_2S	1

Source: (Clark County Board of County Commissioners, 2014a)

Temporary Emissions Sources Permits

Clark County DAQ does not have regulations for temporary emission source permitting. Any temporary emission sources should review applicable construction and stationary source requirements, or contact Clark County for additional assistance.

Dust Control Permits

The Clark County DAQ requires a Dust Control Permit prior to engaging in any construction activities. The following activities do not require a Dust Control Permit:

- "…Soil disturbing or construction activities less than 0.25 acre in overall area, mechanized trenching less than one hundred (100) feet in length, or for mechanical demolition of any structure smaller than one thousand (1,000) square feet… (Clark County Board of County Commissioners, 2004)**.**

Preconstruction Permits

The Clark County DAQ requires sources that have air pollutants equal to or greater than the air pollutants listed in in Table 6.1.12-4 to obtain an Authority to Construct pursuant to Clark County Air Quality Regulations (AQR) Section 12.4.3 or a Part 70 Operating Permit. Clark County also requires preconstruction review for the following sources:

- "…an existing major stationary source, a project that will result in a major modification as defined in Section 12.2 [permit requirements for major sources in attainment areas] or 12.3 [permit requirements for major sources in nonattainment areas];

- A new Part 70 source or a modification to an existing Part 70 source that is subject to [Clark County AQR] Section 12.4.3.2[123] [Application Submission and Processing Requirements for Part 70 Sources Not Subject to Section 12.2, Section 12.3, or Section 12.4.3.3];
- Any project that is subject to a standard, limitation, or other requirement under 40 CFR Part 60 [Standards of Performance for New Stationary Sources];
- Any project that is subject to a standard under 40 CFR Part 63 [National Emission Standards for Hazardous Air Pollutants for Source Categories (a.k.a. Maximum Achievable Control Technology (MACT)], including, but not limited to, construction or reconstruction that requires preconstruction review under 40 CFR 63.5…" (Clark County Board of County Commissioners, 2010).

General Conformity

The Clark County DAQ follows the federal General Conformity regulations and do not maintain their own. Section 6.1.12.2 has a general discussion of the Federal General Conformity laws.

State Implementation Plan Requirements

The Clark County SIP is composed of many related actions to ensure ambient air concentrations of the six criteria pollutants comply with the NAAQS. Clark Counties SIP is a conglomeration of separate actions taken for each of the pollutants. All of Clark Counties SIP actions are codified under 40 CFR Part 52 Subpart DD (included with the state of Nevada). A list of all SIP actions for all six criteria pollutants can be found on the Clark County DAQ website: http://www.clarkcountynv.gov/airquality/planning/Pages/StateImplementationPlans.aspx.

6.1.12.4. Specific Regulatory Considerations for Washoe County Health District AQMD

National and State Ambient Air Quality Standards

The Washoe County Health District AQMD follow the federal NAAQS and have not established separate air quality standards.

Title V Operating Permits/State Operating Permits

Washoe County Health District AQMD has authorization to issue CAA Title V operating permits on behalf of the USEPA, as outlined in 40 CFR 70. The Washoe County District Board of Health Regulations Governing Air Quality Management Sections 030.900 to 030.990 describes the applicability of Title V operating permits. Washoe County Health District AQMD 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 6.1.12-2). The permit issued to a

[123] Clark County AQR Section 12.4.3.2 states that a new Part 70 source which is not subject to permit requirements for major sources in attainment areas (Clark County AQR Section 12.2) or permit requirements for major sources in nonattainment areas (Clark County AQR Section 12.3) and sources that are an existing Part 70 source where proposed modifications "that increases the source's potential to emit by an amount equal to or greater than the minor NSR significant level" shall submit an application. (Clark County Board of County Commissioners, 2014b)

facility contains both state and federal portions and incorporates a reporting schedule (USEPA, 2014c).

Exempt Activities

Washoe County Health District AQMD exempts projects that consist of 1) "agricultural land use", (2) "motor vehicles, special mobile equipment licensed for highway travel and any internal combustion engines associated with the operation of licensed mobile equipment", and (3) "land clearance or covering which is less than one acre in size" from an Authority to Construct and/or Permit to Operate (Washoe County District Board of Health Regulations Governing Air Quality Management, 2011). All activities must first submit an application to the Washoe County AQMD to obtain an Authorization to Construct and/or a Permit to Operate or a letter of exemption. As per the Washoe County Permit to Operate Requirements "any source with the potential to emit two pounds per day of any criteria pollutant or one pound per day of any toxic pollutant shall be required to obtain and hold a Permit to Operate" (Washoe County District Board of Health Regulations Governing Air Quality Management, 2011).

Temporary Emissions Sources Permits

The Washoe County Health District AQMD does not have regulations for temporary emission source permitting. Any temporary emission sources should review applicable construction and stationary source requirements, or contact Washoe County for additional assistance.

Preconstruction Permits

The Washoe County AQMD Section 030.000 requires a written authority to construct permit for any non-exempted sources and equipment that are constructed, altered, or replaced that "may cause, potentially cause, reduce, control, or eliminate the issuance of air contaminants." (Washoe County District Board of Health Regulations Governing Air Quality Management, 2011)

General Conformity

The Washoe County AQMD follows the federal General Conformity regulations and do not maintain their own. See Section 6.1.12.2 for a general discussion of the Federal General Conformity laws.

State Implementation Plan Requirements

The Washoe County SIP is composed of many related actions to ensure ambient air concentrations of the six criteria pollutants comply with the NAAQS. Washoe Counties SIP is a conglomeration of separate actions taken for each of the pollutants. All of Washoe Counties SIP actions are codified under 40 CFR Part 52 Subpart DD (included with the state of Nevada). A list of all SIP actions for all six criteria pollutants can be found on the Washoe County Health District's website: https://www.washoecounty.us/health/programs-and-services/air-quality/planning-program/state-implementation-plans.php.

6.1.12.5. Environmental Setting: Ambient Air Quality

Nonattainment Areas

The USEPA classifies areas as attainment, nonattainment, maintenance, or unclassifiable for six criteria pollutants. When evaluating an area's air quality against regulatory thresholds (i.e., permitting and general conformity), maintenance areas are often combined with nonattainment, while unclassifiable areas are combined with attainment areas. Table 6.1.12-5 and Figure 6.1.12-1 present the nonattainment areas in Nevada as of January 30, 2015. Table 6.1.12-5 contains a list of the counties and their respective current nonattainment status of each criteria pollutant. The year(s) listed in the table for each pollutant indicate the date(s) when USEPA promulgated an ambient air quality standard for that pollutant; note that, for $PM_{2.5}$, O_3, and SO_2, these standards listed are in effect. Unlike Table 6.1.12-5, Figure 6.1.12-1 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 6.1.12-5: Nevada Nonattainment and Maintenance Areas by Pollutant Standard and County

County	Pollutant[a] 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
Carson City	M										
Clark	M				M			M			
Douglas	M										
Washoe	M				X-3						
White Pine										M	

Source: (USEPA, 2015f)

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

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

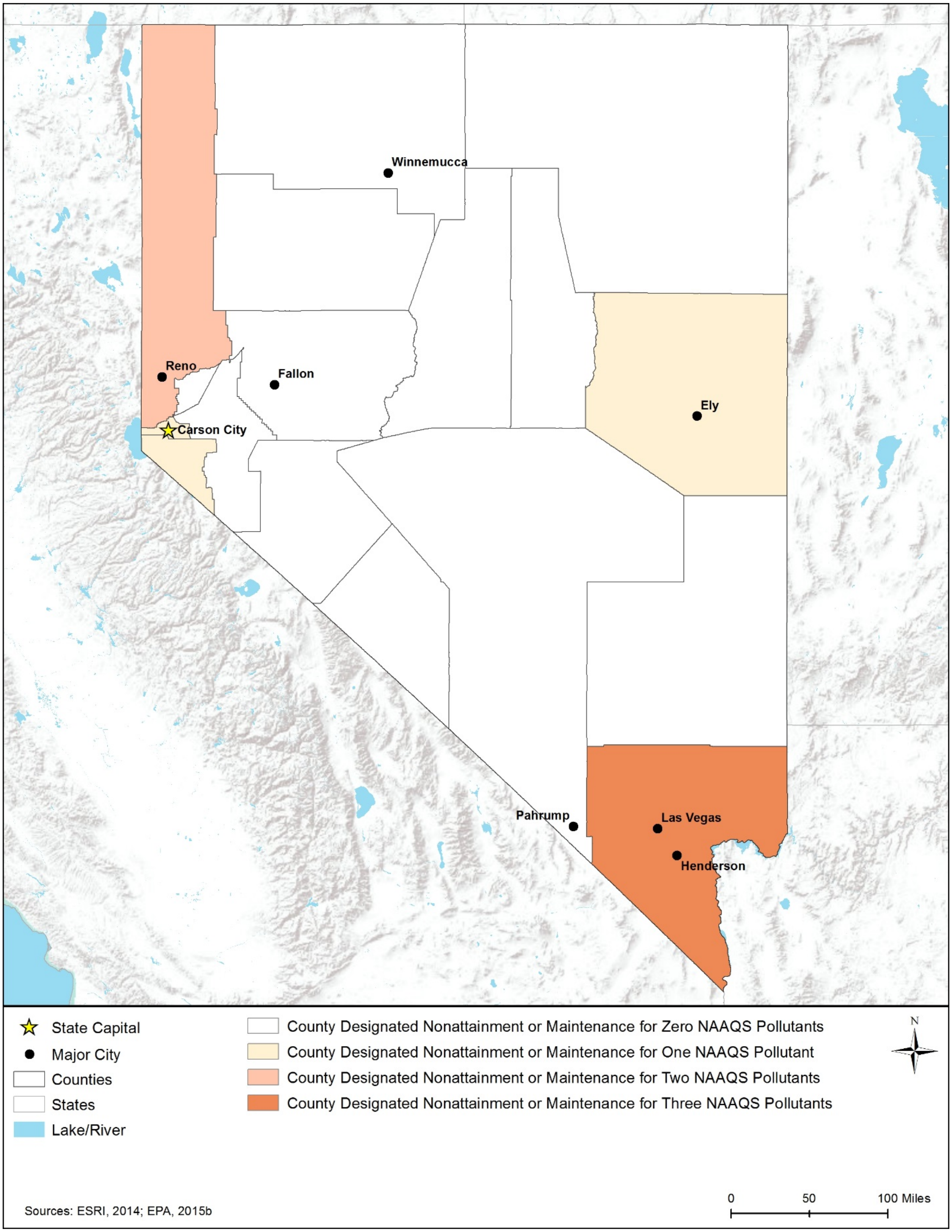


Figure 6.1.12-1: Nonattainment and Maintenance Counties in Nevada

Air Quality Monitoring and Reporting

"The State of Nevada has four jurisdictions that independently manage their own air programs as designated by statute: Department of Conservation and Natural Resources, NDEP BAQP; Washoe County District Health Department, AQMD; Clark County DAQ and Environmental Management; and various tribal agencies" (NDEP Bureau of Air Quality Planning, 2015). Additionally, several of the state's 19 federally recognized tribes conduct their own air monitoring and submit Annual Network Plans.

Across the state of Nevada both PM and O_3 are main pollutants of concern and are reported on each agencies website to inform the public. (NDEP Bureau of Air Quality Planning, 2015)

- The Nevada BAQP measures air pollutants at 10 sites across the state. The Nevada BAQP prepares the Air Quality Trends Report and Annual Monitoring Network Plan Report, which contains pollutant data summarized by location. The Nevada BAPC reports near real-time pollution levels of PM and O_3 on their website. (NDEP Bureau of Air Quality Planning, 2015)
- In 2014, the Clark County DAQ reported criteria pollutants from 18 different locations. The Clark County DAQ reports near real-time pollution levels of PM and O_3 on their website. (Clark County Board of County Commissioners, 2016)
- The Washoe County AQMD reported for all parameters using eight ambient air monitoring sites in 2014. The Washoe County AQMD does not reports real-time pollution levels, however Air Now[124] reports PM and O_3 on their website: https://www.airnow.gov/index.cfm?action=airnow.local_city&mapcenter=0&cityid=121. (Washoe County Health District, Air Quality Management Division, 2015).
- Throughout 2014, O_3 measurements exceeded the federal standard of 0.075 ppm one time at the Reno3 station. Also in 2014, $PM_{2.5}$ measurements exceeded the federal standard of 35 $\mu g/m^3$ 18 times in stations across the state; 6 times each at Galletti, Reno3, and Sparks monitoring stations. Additionally in 2014, PM_{10} measurements for the 24-hour averages exceeded the federal standard of 150 $\mu g/m^3$ one time at the Galletti station. This exceedance was also the highest 24-hour average recorded over a 3-year period.

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).

[124] AirNow is a government website that posts daily Air Quality Index for more than 400 cities.

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[125] of a Class I area. "The EPA's policy is that FLMs should be notified by the Regional Office about any project that is within 100 kilometers of a Class I area. For sources having the capability to affect air quality at greater distances, notification should also be considered for Class I areas beyond 100 kilometers" (Page, 2012). The 2005 USEPA guidelines for air quality modeling do not provide a precise modeling range for Class I areas.

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

Nevada contains one Federal Class I area; all other land in the state are classified as Class II (USEPA, 2012a). 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). Arizona and Utah have one Class I area and California has nine Class I areas where the 100-kilometer buffer intersects one or more Nevada counties. Any PSD-applicable action within these counties would require FLMs notification from the appropriate Regional Office. Figure 6.1.12-2 provides a map highlighting all relevant Class I areas and all areas within the 100-kilometer radiuses for Nevada. The numbers next to each of the Class I areas correspond to the numbers and Class I areas listed in Table 6.1.12-6.

Table 6.1.12-6: Relevant Federal Class I Areas

#	Area	Acreage	State
1	Jarbidge Wilderness Area	64,667	NV
2	Zion NP	142,462	UT
3	Grand Canyon NP	1,176,913	AZ
4	South Warner Wilderness	68,507	CA
5	Desolation Wilderness	63,469	CA
6	Mokelumne Wilderness	50,400	CA
7	Emigrant Wilderness	104,311	CA
8	Hoover Wilderness	47,916	CA
9	Yosemite NP	759,172	CA
10	Ansel Adams Wilderness	230,272	CA
11	John Muir Wilderness	484,673	CA
12	Kings Canyon NP	459,994	CA

Source: (USEPA, 2012a)
[a] The numbers correspond to the shaded regions in Figure 6.1.12-2.

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

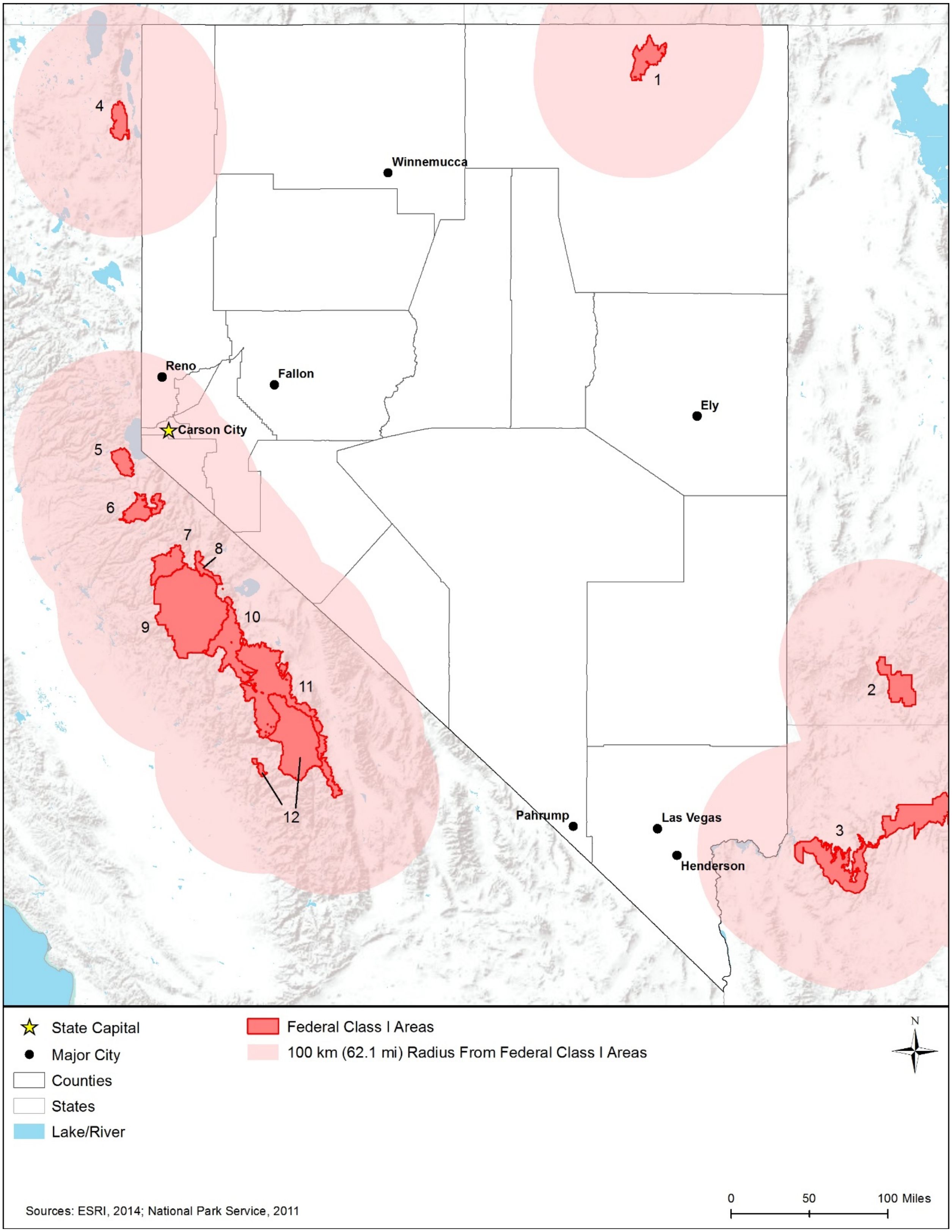


Figure 6.1.12-2: Federal Class I Areas with Implications for Nevada

6.1.13. Noise

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

6.1.13.1. Definition of the Resource

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

The effects of noise can be classified into three categories:

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

Fundamentals of Noise

For environmental noise analyses, a noise metric refers to the unit that quantitatively measures the effect of noise on the environment. The unit used to describe the intensity of sound is the decibel (dB). Audible sounds range from 0 dB ("threshold of hearing") to about 140 dB ("threshold of pain") (OSHA, 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, 2015h). The A-weighted scale, denoted as dBA, approximates the range of human hearing by filtering out lower frequency noises, which are not as damaging as the higher frequencies. The dBA scale is used in most noise ordinances and standards (OSHA, 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.
- The changes in frequency characteristics or pressure levels through time.

Figure 6.1.13-1 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.

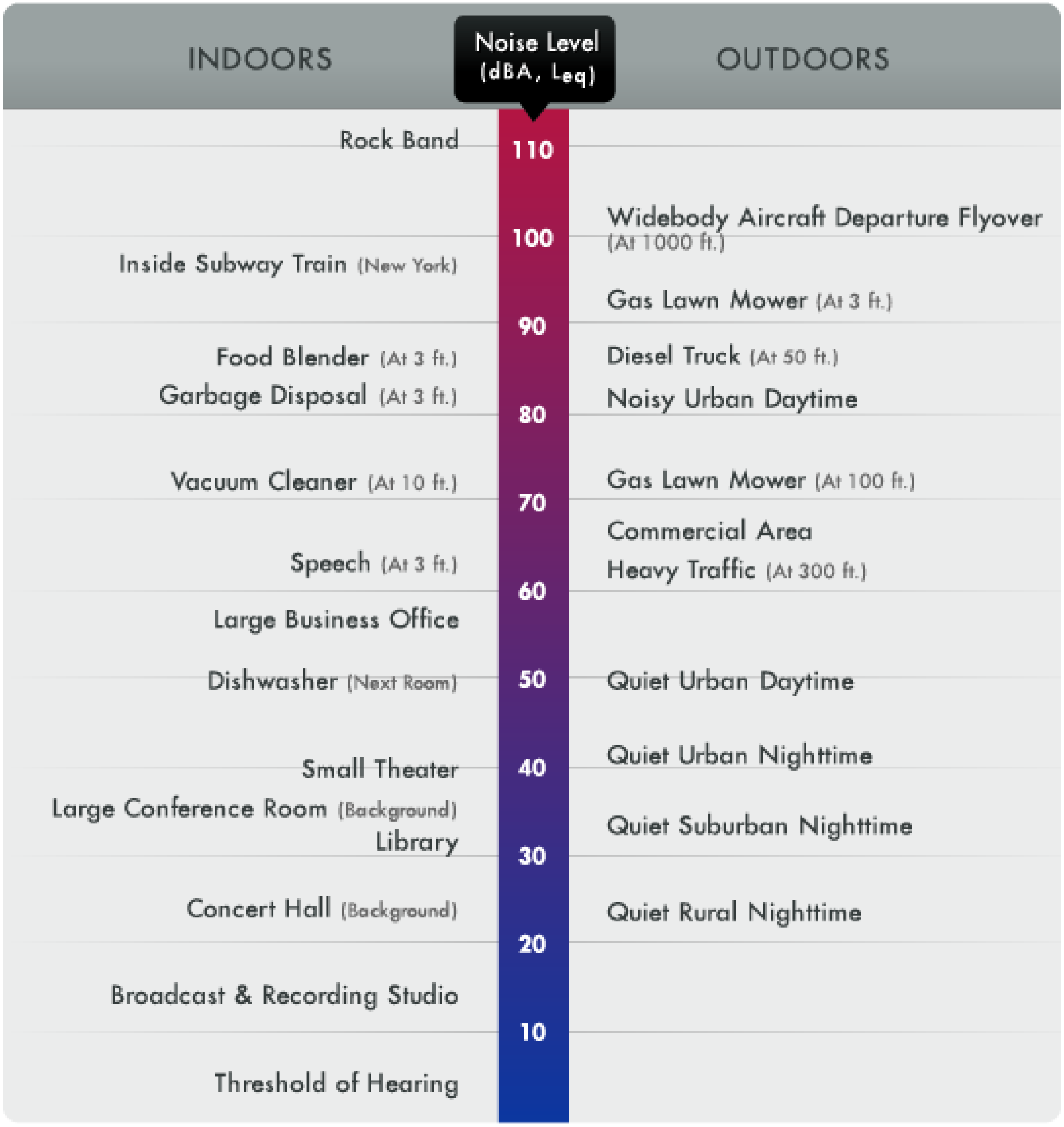


Figure 6.1.13-1: Sound Levels of Typical Sounds

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

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

The changes in human response to changes in dB levels is categorized as follows (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.

6.1.13.2. 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.

Nevada does not have any statewide noise laws that would apply to the activities covered under the Proposed Action. Statewide noise laws that do exist cover mainly motor vehicles. Several state regulations would apply to mufflers and horns on motor vehicles used as deployable technologies, but these restrictions would likely already be implemented into these vehicles before the Proposed Action even occurred.

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. Large cities and towns, such as Las Vegas, Henderson, and Reno 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).

6.1.13.3. Environmental Setting: Ambient Noise

The range and level of ambient noise in Nevada varies widely based on the area and environment of the area. The population of Nevada can choose to live and interact in areas that are large cities, rural communities, and national and state parks. Figure 6.1.13-1 illustrates noise values for typical community settings and events that are representative of what the population of Nevada may experience on a day-to-day basis. These noise levels represent a wide range and are not specific to Nevada. As such, this section describes the areas where the population of Nevada can potentially be exposed to higher than average noise levels.

- **Urban Environments:** Urban areas are likely to have higher noise levels on a daily basis due to highway traffic (70 to 90 dBA), construction noise (90 to 120 dBA), and outdoor conversations (e.g., small/large groups of people) (60 to 90 dBA) (USDOI, 2008). The areas that are likely to have the highest ambient noise levels in the state are Las Vegas (and its neighboring boroughs and cities), Henderson, and Reno.

- **Airports:** Areas surrounding airports tend to be more sensitive to noise due to aircraft operations that occur throughout the day. A jet engine aircraft can produce between 130 to 160 dBA in its direct proximity (FAA, 2007). However, commercial aircraft are most likely to emit noise levels between 70 to 100 dBA depending of the type of aircraft and associated engine (FAA, 2012). This noise will be perceived differently based on the altitude of the aircraft and its distance to the point of measurement. Airport operations are primarily arrivals and departures of commercial aircraft but — based on the type of airport — can include touch-and-go operations that are typical of general aviation airports and military airfields. The location of most commercial airports are in the proximity of urban communities; therefore, aircraft operations (arrivals/departures) can result in noise exposure in the surrounding areas to be at higher levels with the potential for increased noise levels during peak operation times (early morning and evenings), when there is an increase in air traffic. The noise levels in areas surrounding commercial airports can have significantly higher ambient noise levels than in other areas. In Nevada, McCarran International Airport (LAS) and Reno/Tahoe International Airport (RNO) have more than 21 million annual operations combined (FAA, 2015i). These operations result in increased ambient noise levels in the surrounding communities. See Section 6.1.1, Infrastructure, and Figure 6.1.7-6 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, 2015d). There are several major highways within the state that may contribute to higher ambient noise levels for residents living in those areas. The major highways in the state tend to have higher than average ambient noise levels on nearby receptors, ranging from 52 to 75 dBA (FHWA, 2015d). See Section 6.1.1, Infrastructure, and Figure 6.1.1-1 for more information about the major highways in the state.
- **Railways:** Like highways, railways tend to have higher than average ambient noise levels for residents living in close proximity (FTA, 2006). Railroad operations can produce noise ranging from 70 dBA for an idling locomotive to 115 dBA when the locomotive engineer rings the horn while approaching a crossing (FRA, 2015). Nevada has multiple rail corridors with high levels of commercial and commuter rail traffic. These major rail corridors extend from Las Vegas to Los Angeles and Denver, as well as from Reno to San Francisco and Denver. There are also a number of other rail corridors that join these major rail lines and connect with other cities (NevadaDOT, 2012b). See Section 6.1.1, Infrastructure, and Figure 6.1.1-1 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. National and state parks, historic areas, and monuments are protected areas. These areas typically have lower noise levels, as low as 30 to 40 dBA (NPS, 2014g). Nevada has four National Parks and affiliated management areas, as well as six National Natural Landmarks (NPS, 2014d). Visitors to these areas

expect lower ambient noise conditions than the surrounding urban areas. See Section 6.1.8, Visual Resources, for more information about national and state parks for Nevada.

6.1.13.4. 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 and towns in Nevada have at least one school, church, or park, in addition to likely having other noise-sensitive receptors. There are most likely thousands of sensitive receptors in Nevada.

6.1.14. Climate Change

6.1.14.1. 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, 2012c). 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),[126] which equalizes for the different global warming potential of each type of GHG. Where this document references emissions of CO_2 only, the units will be 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).

[126] "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, 2015n).

Both the GHG emissions effects of the Proposed Action and Alternatives, and the relationships of climate change effects to the Proposed Action and Alternatives, are considered in this PEIS (see Chapter 4, 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.

6.1.14.2. 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. Nevada has established goals and regulations to reduce GHG emissions to combat climate change. As shown in Table 6.1.14-1, on executive order is the primary policy driver on climate change preparedness and GHG emissions in Nevada.

Table 6.1.14-1: Relevant Nevada Climate Change Laws and Regulations

State Law/Regulation	Regulatory Agency	Applicability
Nevada Climate Change Advisory Committee (NCCAC) EO (April 2007)	State of Nevada	On April 10, 2007, Governor Gibbons signed an executive order that created the NCCAC. The executive order directed the Committee to prepare a report with recommendations on how to reduce Nevada's greenhouse gas emissions with emphasis placed on developing renewable energy resources within the state.

6.1.14.3. Nevada Greenhouse Gas Emissions

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

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

According to the EIA, Nevada emitted 35.8 MMT of CO_2 in 2013 (EIA, 2015f). Electric power was the largest emitter at 43.0 percent of total CO_2 and the transportation sector the next-largest emitter at 38.1 percent. Most emissions come from petroleum products and natural gas, with only a small share of emissions (17.1 percent) coming from coal (see Table 6.1.14-2) (EIA, 2015f). Annual emissions between 1980 and 2013 are displayed in Figure 6.1.14-1. More than 90 percent of the energy consumed in Nevada comes from out of state, so CO_2 emissions in these estimates do not reflect actual energy consumption (EIA, 2014). Between 1980 and 2005, Nevada's CO_2 emissions more than doubled from 22.2 MMT to 49.6 MMT and then decreased significantly to 33.2 MMT in 2011. In the last two years, CO_2 emissions have increased slightly to their 2013 levels. In 2013, Nevada was ranked 40th among the 50 states and the District of Columbia for total CO_2 emissions and 34th for per capita CO_2 emissions (EIA, 2015g).

Table 6.1.14-2: Nevada CO_2 Emissions by Fuel Type and Sector, 2013

Fuel Type (MMT)		**Source (MMT)**	
Coal	6.1	Residential	2.5
Petroleum Products	14.7	Commercial	1.9
Natural Gas	15.0	Industrial	2.4
		Transportation	13.6
		Electric Power	15.4
TOTAL	35.8	**TOTAL**	35.8

Source: (EIA, 2015f)

The Nevada Department of Environmental Protection published its most recent GHG inventory in 2013 for complete emissions data up to 2010 (NDEP, 2015l). The majority of Nevada's GHG emissions is CO_2, averaging 83 percent for the period 1990-2010, and 87 percent in 2010 alone. These emissions are the result of fossil fuel combustion, mostly for the transportation and electric power generation sectors. Other GHGs emitted in Nevada are CH_4, hydrofluorocarbons (HFCs), NOx, sulfur hexafluoride (SF_6) and perfluorocarbons (PFCs) (NDEP, 2015l).

Overall, total gross (i.e., not including carbon sinks) annual GHG emissions increased from 34.7 $MMtCO_2e$ in 1990 to 57.5 $MMtCO_2e$ 2005 (NDEP, 2015l). In 2006, emissions declined sharply because of the decommissioning of the coal-based Mohave Generating Station. There were also significant reductions in electricity usage, which is likely attributed to increasing efficiency at the point of use. "GHG emissions in Nevada are expected to regain a positive trend in the years following 2010 and increase during the projection period (2011-2030) with an average pace of about 0.3 $MMtCO_2$ per year" (NDEP, 2015l). Because of the on-going substitution of natural gas for coal in electricity generation, these CO_2 emissions are expected to continue to decrease from year to year (NDEP, 2015l).

Nevada's emission are relatively low because the majority of the land consists of desert, is sparsely populated, and is only a small producer of crude oil and natural gas. "Of the natural gas consumed in Nevada, about two-thirds is used for electricity generation, and almost half of the rest is consumed by the residential sector. Three in five Nevada households use natural gas as their primary heating fuel" (EIA, 2014). Nevada has one small crude oil refinery, which mainly produces asphalt. The majority of petroleum products consumed in state are from transportation fuels imported from out of state. In Nevada, roughly one out of three homes use electricity for home heating. Per capita electricity use is near the national average; however, the state's electricity consumption is higher than in-state generation can provide, and the state obtains needed electricity over high-voltage transmission lines from Arizona and the Pacific Northwest (EIA, 2015h).

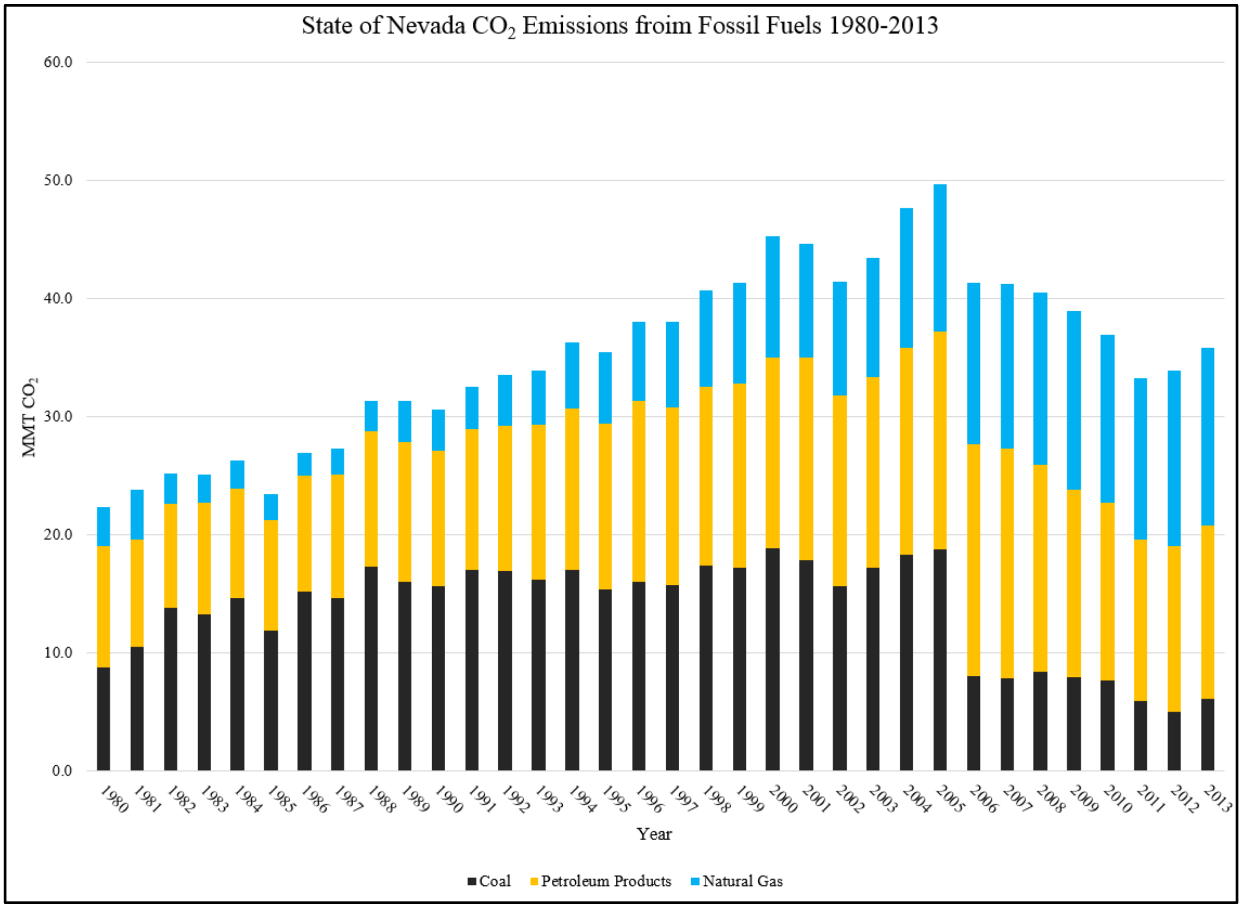


Figure 6.1.14-1: Nevada CO_2 Emissions by Fuel Type 1980-2013

Source: (EIA, 2015f)

6.1.14.4. 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 Nevada falls into climate group (B) (see Figure 6.1.14-1). 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 Nevada falls into climate group (B), a small area of western Nevada falls into climate group (C) (see Figure 6.1.14-1). Climates classified as (C) are moist, “subtropical mid-latitude climates” (NWS, 2011a). Climates classified as (C) are generally warm, with mild winters and humid summers. During winter months, “the main weather feature is the mid-latitude cyclone” (NWS, 2011a). In addition, convective thunderstorms are dominant during summer months.

Bsk – The Köppen-Geiger climate classification system classifies the majority of Nevada as 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) (NWS, 2011a) (NWS, 2011b)

BWk – The Köppen-Geiger climate classification system classifies areas of southern and western Nevada as BWk. Climates classified as BWk are mid-latitude deserts, with mean annual temperatures that are less than 64 °F and are too dry to support most plant life. Evaporation in BWk climates “exceeds precipitation on average but is less than half potential evaporation” (NWS, 2011b). Winters in BWk climates zones typically experience “below freezing temperature” (NWS, 2011b) (GLOBE SCRC, 2015).

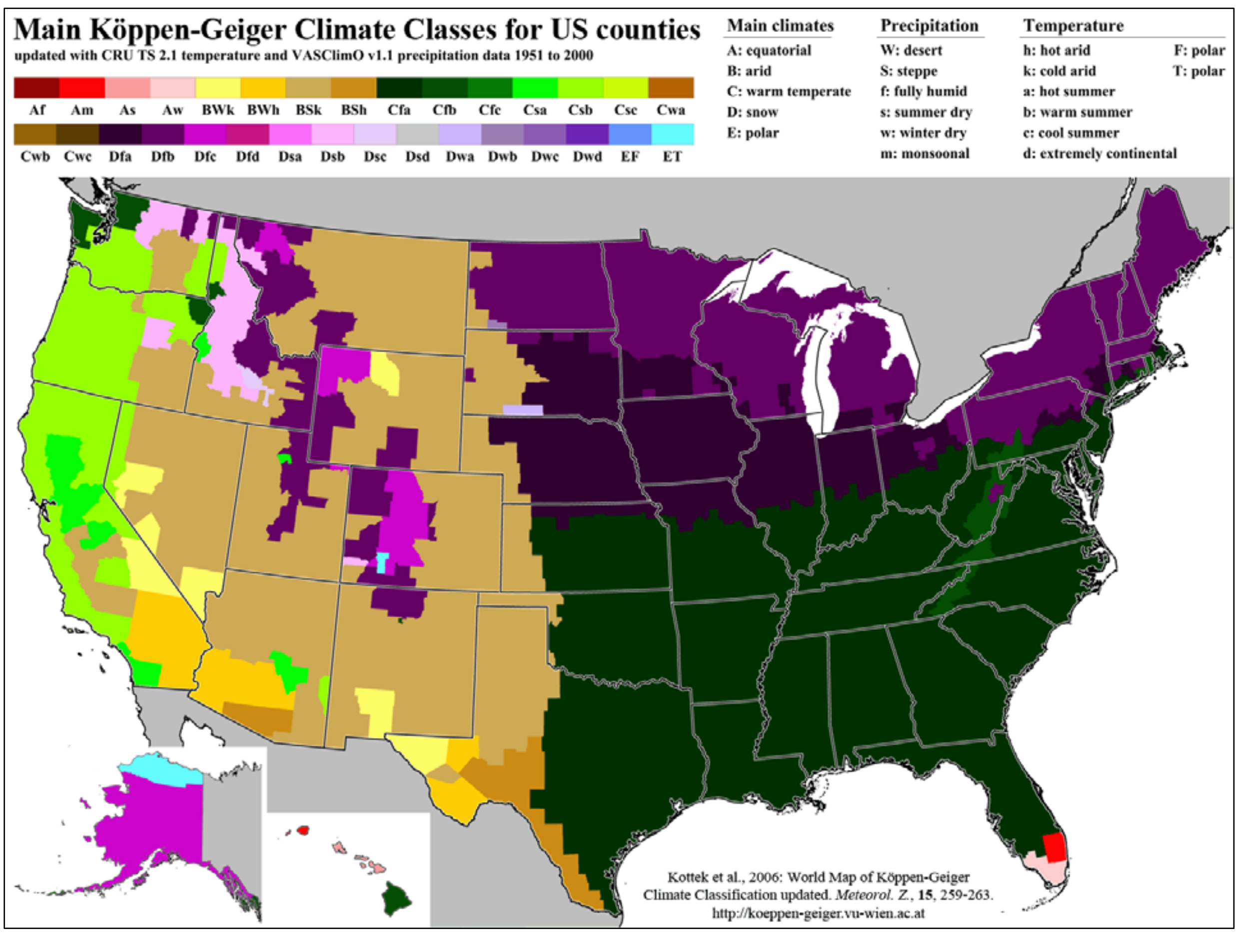


Figure 6.1.14-2: Köppen-Geiger Climate Classes for U.S. Counties

Source: (Kottek, 2006)

Csb – The Köppen-Geiger climate classification system classifies areas of western Nevada as Csb. Climates classified as Csb are Mediterranean climates, with mild temperatures and cool, dry summers. In Csb climates, the coldest months are warmer than 26 °F but cooler than 64 °F, with at least four months averaging temperatures greater than 50 °F (GLOBE SCRC, 2015) (NWS, 2011b). Summers in Csb climates are dry and mild (GLOBE SCRC, 2015). Winters in Csb climates typically have high levels of frost, with "at least three times as much precipitation during [the] wettest winter months as in the driest summer month" (NWS, 2011b). Csb climates are typically found on western sides of continents and near the coast (GLOBE SCRC, 2015).

This section discusses the current state of Nevada's climate with regard to air temperature, precipitation, and extreme weather events (e.g., severe flooding, thunderstorms, and strong winds) in Nevada's three climate regions: Bsk, BWk, and Csb.

Air Temperature

The majority of Nevada "lies within the Great Basin, a high desert plateau between the Rockies and the Sierra Nevada Mountains, where streams and rivers flow into lakes and sinks with no outlet to the ocean" (Thompson, J., 2015). The highest elevation in Nevada is "atop Boundary peak at 13,140 feet in Esmeralda County" (Thompson, J., 2015). The lowest elevation in Nevada is "479 feet in Clark County in the Colorado River Valley" (Thompson, J., 2015). This dramatic and varying topography plays a significant role in Nevada's extreme climate.

Temperatures throughout Nevada can shift drastically depending on the season or geographic location. In northeastern parts of the state, the mean annual temperature is approximately 45 °F, "where summers are short and hot, and winters are long and cold" (Thompson, J., 2015). In western and central Nevada, temperatures average approximately 50 °F, "with short, hot summers and shorter and milder winters" (Thompson, J., 2015). Southern Nevada experiences average temperatures that are in the mid-60s, "with long, hot summers and short, mild winters" (Thompson, J., 2015). Nevada "rarely experiences long periods of extremely cold weather, primarily because the mountains east and north of the state act as a barrier to continental artic air masses" (Thompson, J., 2015). In addition, diurnal[127] temperature swings of 30 °F to 35 °F "are common in Nevada due to the dry air, with the greatest daily ranges occurring in summertime" (Thompson, J., 2015).

The average temperature in Nevada is approximately 49.5 °F (NOAA, 2015a). The highest temperature to occur in Nevada was on June 29, 1994 with a record high of 125 °F (SCEC, 2015). The coldest temperature to occur in Nevada was on January 8, 1937 with a record low of negative 50 °F (SCEC, 2015).

The following paragraphs describe temperature variations as they occur within Nevada's various climate classification zones:

Bsk – Elko, located in northeastern Nevada, is within the climate classification zone Bsk. The average annual temperature at the Elko regional airport is approximately 46.7 °F; 26.9 °F during

[127] Diurnal: "Daily; related to actions which are completed in the course of a calendar day, and which typically recur every calendar day (e.g., diurnal temperature rises during the day, and diurnal falls at night). (NWS, 2009)

winter months; 66.9 °F during summer months; 45.8 °F during spring months; and 46.7 °F during autumn months (NOAA, 2015b).

BWk – Las Vegas McCarran International Airport, located in southern Nevada, is within the climate classification zone BWk. The average annual temperature in Las Vegas is approximately 69.4 °F; 49.7 °F during winter months; 90.0 °F during summer months; 68.2 °F during spring months; and 69.5 °F during autumn months (NOAA, 2015b).

Csb – The Reno Weather Forecast Office, located in western Nevada, is within the climate classification zone Csb. The average temperature in Reno is approximately 53.0 °F; 35.5 °F during winter months; 72.2 °F during summer months; 50.3 °F during spring months; and 53.5 °F during autumn months (NOAA, 2015b).

Precipitation

In addition to varying topography, Nevada is situated on the eastern side of the Sierra Nevada Range. "Due to this location, a strong rain-shadow effect deprives much of the state of most upwind moisture" (Thompson, J., 2015). On the western side, prevailing winds bring "mild, moist, Pacific Air to the windward slopes" (Thompson, J., 2015). One there, the air rapidly cools and the moisture condenses, leading to significant precipitation accumulation on the eastern side of the Sierra Crest (Thompson, J., 2015). "This rugged terrain and the resulting rain-shadow effect results in Nevada's widespread desert or steppe climate" (Thompson, J., 2015).

The state of Nevada averages a total rainfall of seven inches, "making it the nation's driest state" (Thompson, J., 2015). "Precipitation is maximized in the Sierra Nevada at Mount Rose Ski Area, where a yearly total of 40 inches of moisture and 300 inches of snowfall have been recorded" (Thompson, J., 2015). Indian Springs in Clark County experiences the driest annual precipitation in Nevada, where approximately 2.94 inches are recorded on average, typically the result of monsoonal thunderstorms (Thompson, J., 2015). In western and south-central Nevada, precipitation maximums are reached during the winter; central and northeastern Nevada during the spring; and eastern and southern Nevada during the summertime (Thompson, J., 2015).

The greatest 24-hour precipitation accumulation experienced in Nevada was on October 20, 2004 with a record of 7.78 inches (SCEC, 2015). The greatest 24-hour snowfall accumulation was on December 21, 1996 with a record of 36 inches (SCEC, 2015).

The following paragraphs describe precipitation as it occurs within Nevada's various climate classification zones:

Bsk – Elko, located in northeastern Nevada, is within the climate classification zone Bsk. The average annual precipitation accumulation in Elko is approximately 9.91 inches; 3.16 inches during winter months; 1.39 inches during summer months; 2.93 inches during spring months; and 2.43 inches during autumn months (NOAA, 2015b). Elko averages 78 days per year with 0.01 inches or more of precipitation (Western Regional Climate Center, 2015). Snowfall is typically heaviest in the mountains, mostly occurring in the northern regions of Nevada; seasonal snowfall totals of over 300 inches have been recorded in the state (Western Regional Climate Center, 2015).

BWk – Las Vegas, located in southern Nevada, is within the climate classification zone BWk. The average annual precipitation accumulation in Las Vegas is approximately 4.19 inches; 1.80 inches during winter months; 0.80 inches during summer months; 0.71 inches during spring months; and 0.88 inches during autumn months (NOAA, 2015b). Las Vegas averages 23 days per year with 0.01 inches or more of precipitation (Western Regional Climate Center, 2015).

Csb – Reno, located in western Nevada, is within the climate classification zone Csb. The average annual precipitation accumulation in Reno is approximately 8.26 inches; 3.26 inches during winter months; 1.01 during summer months; 1.98 inches during spring months; and 2.01 inches during autumn months (NOAA, 2015b). Reno averages 49 days per year with 0.01 inches or more of precipitation (Western Regional Climate Center, 2015).

Severe Weather Events

Flooding in Nevada can occur due to flash flooding, river flooding, tropical systems and coastal flooding, burn scars and/or debris flows, ice and/or debris jams, snowmelt, dry wash, and dam breaks and/or levee failures (NWS, 2015a). In Nevada, snowfall in northern mountainous areas contributes the main source of water for streamflow. “Melting of the mountain snowpack in the spring usually causes some flooding in northern and western streams during April to June, but damaging floods of this type are infrequent” (Western Regional Climate Center, 2015). However, “extensive flooding from the melting of heavy snowpack has occurred in both northern and southern parts” of Nevada (Western Regional Climate Center, 2015). Flooding in Nevada can also be the result of combined rain and melting snow, particularly in the western regions of the state. “Heavy summer thunderstorms occasionally cause flooding of local streams, but they usually occur in sparsely settled mountainous areas and are seldom destructive” (Western Regional Climate Center, 2015). These storms, termed cloudburst, are particular to Nevada, and can bring “as much rain in a few hours as would normally fall in several months” (Western Regional Climate Center, 2015).

Thunderstorms in Nevada are relatively infrequent. In Reno, a thunderstorm occurs an average of 13 days out of the year; 15 days out of the year in Las Vegas; and 33 days out of the year in Elko (Western Regional Climate Center, 2015). Tornados in Nevada are also very uncommon, however historically, they have occurred “in all months from April through September” (Western Regional Climate Center, 2015).

Nevada does not commonly experience high winds. However, high windstorms can occur along the eastern slope of the Sierra Nevada Mountains. In Reno and Las Vegas, “winds of zero to three miles per hour are most common” around 8 o’clock in the morning (Western Regional Climate Center, 2015). Dust or sand storms can also occur in Nevada, although they are rare as well. If either does occur, they are most likely to occur in southern regions of Nevada during the spring, “when storms move through the region more frequently than other seasons” (Western Regional Climate Center, 2015).

6.1.15. Human Health and Safety

6.1.15.1. Definition of the Resource

The existing environment for health and safety is defined by occupational and environmental hazards likely to be encountered during the deployment, operation, and maintenance of towers, antennas, cables, utilities, and other equipment and infrastructure at existing and potential FirstNet telecommunication sites. There are two human populations of interest within the existing environment of health and safety, (1) telecommunication occupational workers and (2) the general public near telecommunication sites. Each of these populations could experience different degrees of exposure to hazards because of their relative access to FirstNet telecommunication sites and their function throughout the deployment of the FirstNet telecommunication network infrastructure.

The health and safety issues reviewed in this section include occupational safety for telecommunications workers, contaminated sites, and manmade or natural disaster sites. This section does not evaluate the health and safety risks associated with radio frequency (RF) radiation or vehicle traffic. Vehicle traffic is evaluated in Section 6.1.1, Infrastructure.

6.1.15.2. Specific Regulatory Considerations

Federal organizations, such as the Occupational Safety and Health Administration (OSHA), USEPA, the U.S. Department of Health and Human Services, and others protect human health and the environment. In Nevada, the Nevada Department of Business and Industry (NDBI), Division of Industrial Relations, Occupational Safety and Health Administration (NVOSHA) regulates occupational safety and health, and the NDEP regulates environmental pollution. Federal OSH regulations apply to workers through either OSHA, or stricter state-specific plans that must be approved by OSHA. Nevada has an OSHA-approved “State Plan,” NVOSHA, which has adopted all OSHA standards, and allows for enforcement of state and local government and private sector employment regulations for Nevada state and local employees through NDBI (OSHA, 2015a). Federal employee regulations in Nevada are enforced by OSHA. Health and safety of the general public are regulated by the Nevada Department of Health and Human Services (NVDHHS), Division of Public and Behavioral Health (DPBH) and the Nevada Department of Public Safety (NVDPS), respectively.

Federal laws relevant to protecting occupational and public health and safety are summarized in Appendix C, Environmental Laws and Regulations, and Section 1.8, Overview of Relevant Federal Laws and Executive Orders. Table 6.1.15-1, below summarizes the major Nevada laws relevant to the state’s occupational health and safety, hazardous materials, and hazardous waste management programs.

Table 6.1.15-1: Relevant Nevada Human Health and Safety Laws and Regulations

State Law/Regulation	Regulatory Agency	Applicability
NRS: Chapter 618	NVOSHA	Specifies requirements for employers with 11 or more employees to establish a written workplace safety program and a safety committee if an employer has more than 25 employees or if an employer's employees are engaged in the manufacturing of explosives. Specifies the required responsibilities of employers, including record keeping.
NAC: 444.570 - 444.7499	NDEP	Provides permitting and general operational requirements for all solid waste management facilities, including groundwater monitoring and corrective action requirements.
NAC: 445A.226 to 445A.22755	NDEP, Bureau of Corrective Actions	Describes requirements for environmental remediation programs, such as superfund, brownfields and abandoned mine land programs.
NAC: 459.800 to 459.950	NDEP	Establishes requirements for the transportation and disposal of radioactive waste,[a] including waste classification, licensing, closure, and post-closure requirements.
NAC: 459.952 to 459.95528	NDEP	Provides Chemical Accident Prevention (CAP) Program requirements for facilities that use, store, produce or otherwise handle any highly hazardous substance in quantities above defined thresholds or manufacture explosives for sale. CAP Program requirements include accident prevention, emergency response, and public right-to-know elements.
NRS: 704.820 to 704.900	NDEP	Specifies requirements for the siting of utilities to decrease the environmental impact during new construction operations.

[a] As of August 2015, low-level radioactive waste and mixed hazardous and low-level radioactive waste are being disposed of at the DOE. Nevada National Security Site under an Agreement of Principle (AIP) between Nevada and DOE. The current AIP is in effect until June 30, 2016. (NDEP, 2014b)

6.1.15.3. Environmental Setting: Existing Telecommunication Sites

There are many inherent health and safety hazards at telecommunication sites. Telecommunication site work can be performed indoors, below ground level, on building roofs, over water bodies, and on communication towers. Tasks may also be performed at dangerous heights or in confined spaces, while operating heavy equipment, on energized equipment near underground and overhead utilities, and while using hazardous materials, such as flammable gases and liquids. Because telecommunication workers are often required to perform work outside, heat and cold exposure, precipitation, and lightning strikes also present hazard and risks depending on the task, occupational competency, and work-site monitoring (OSHA, 2016b). A summary description of the health and safety hazards present in the telecommunication occupational work environment is listed below.

Working from height, overhead work, and slips, trips, or falls – At tower and building-mount sites, workers regularly climb structures using fixed ladders or step bolts to heights up to 2,000 feet above the ground's surface (OSHA, 2015b). 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, the general public who may be observing the work or transiting the area (IFC, 2007).

Confined spaces – Installation of underground utilities, building foundations, and work in utility manholes[128] are examples of when confined space work is necessary. Installation of telecommunication activities involves laying conduit and in small trenches (generally 6 to 12 inches in width). Confined space work can involve poor atmospheric conditions, requiring ventilation and rescue equipment. Additionally, when inside a confined space, worker movement is restricted and may prevent a rapid escape or interfere with proper work posture and ergonomics (OSHA, 2016c).

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 can be 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 (OSHA, 2016c).

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 (IFC, 2007).

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 (IFC, 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 (TWA) (see Section 6.1.13, Noise) (OSHA, 2002). Fugitive noise may emanate beyond the telecommunication work site and impact the public living in the vicinity, observing the work, or transiting through the area (OSHA, 2016c).

[128] 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.

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 paint on outdoor structures or asbestos tiles and insulation in equipment sheds. The general public, unless a telecommunication work site allows unrestricted access, are typically shielded from hazardous materials and hazardous wastes that are components of telecommunication site work (OSHA, 2016c).

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 (OSHA, 2016c).

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 (OSHA, 2016c).

Telecommunication Worker Occupational Health and Safety

The U.S. Department of Labor, BLS uses established industry and occupational codes to classify telecommunications workers. For industry classifications, BLS uses the North American Industry Classification System (NAICS) codes, which identify the telecommunications industry (NAICS code 517XX) as being within the information industry (NAICS code 51). For occupational classifications, BLS uses the Standard Occupational Classification (SOC) system to identify workers as belonging to one of 840 occupations. Telecommunications occupations are identified as either telecommunication equipment installers and repairers, except line installers (SOC code 49-2022), 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 1,460 telecommunication equipment installers and repairers, and 1,450 telecommunication line installers and repairers working in Nevada (Figure 6.1.15-1) (BLS, 2015c). In 2013, the most recent data available, Nevada had 2.6 nonfatal occupational injuries or illnesses in the telecommunications industry per 100 full-time workers (BLS, 2015d). By comparison, there were 2.1 nonfatal occupational injuries or illnesses reported nationwide per 100 full-time workers in the telecommunications industry (BLS, 2014a).

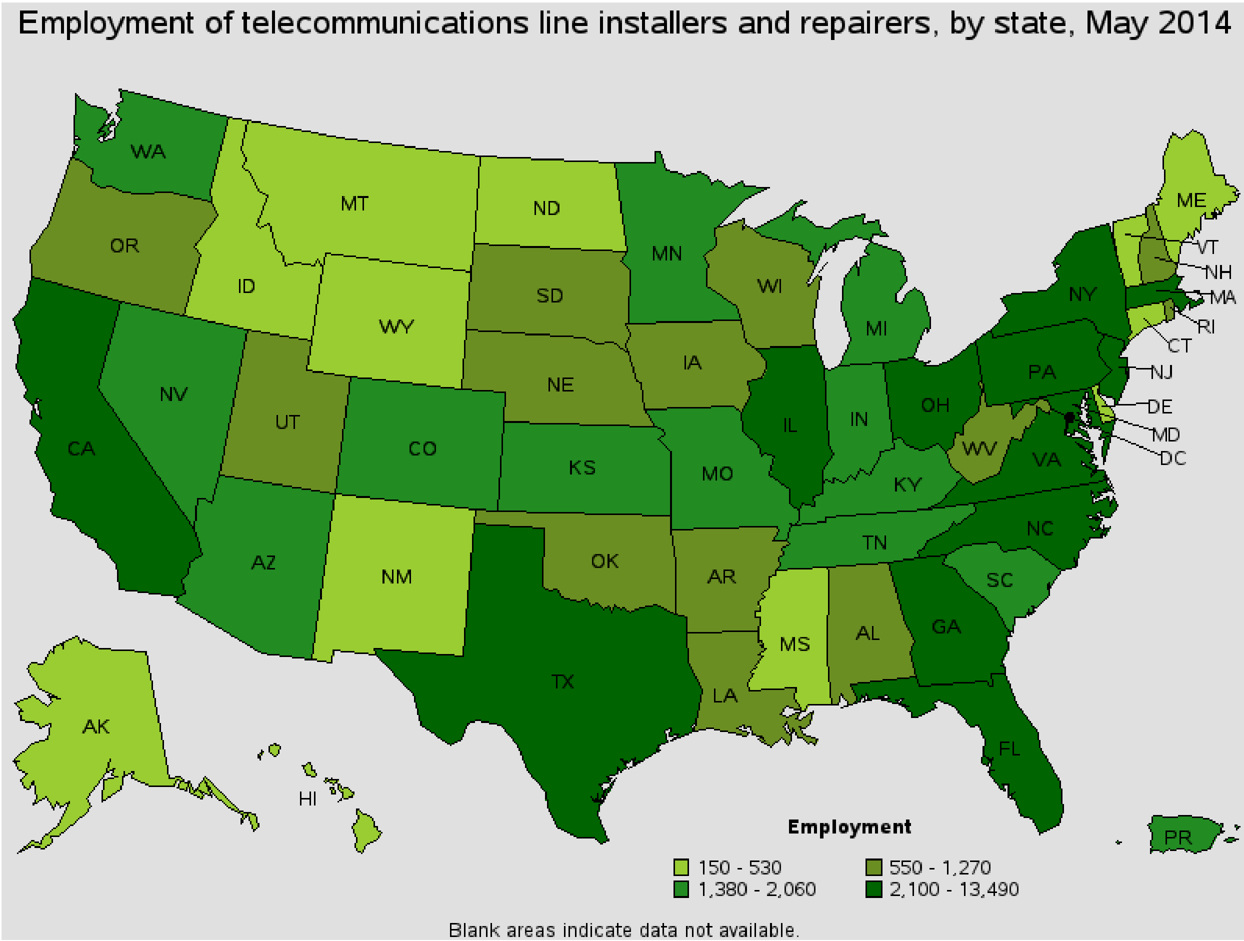


Figure 6.1.15-1: Number of Telecommunication Line Installers and Repairers Employed per State, May 2014

Source: (BLS, 2015e)

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, 2013). This represents 45 percent of the broader information industry fatalities (40 total), and less than 1 percent of total occupational fatalities (4,585 total). Nevada has not had any fatalities in the telecommunications industry or telecommunications occupations since 2003, when data are first available. However, within the broader installation, maintenance, and repair occupations (SOC code 49-0000), Nevada had 55 fatalities since 2003, including 5 fatalities in 2014, with the highest fatality years being 2003, 2007, and 2010, with 9 fatalities each (BLS, 2015f).

Public Health and Safety

The general public is unlikely to encounter occupational hazards at telecommunication sites due to limited access. Environmental and public health data is reported at the federal level through the Centers 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 29 fatalities due to a fall from, out of, or through a building or structure and 13 fatalities due to being caught, crushed, jammed or pinched in or between objects (CDC, 2015). Among the general public, trespassers entering telecommunication sites would be at the greatest risk for exposure to health and safety hazards.

6.1.15.4. 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[129] 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.

As of November 2015, Nevada had 11 RCRA Corrective Action sites,[130] 383 brownfields, and 1 proposed or final Superfund/NPL site (USEPA, 2015h). In Nevada, the NDEP Bureau of Corrective Action administers the investigation and cleanup of hazardous waste sites through its environmental response program, Superfund and Brownfields programs, and voluntary cleanup program (VCP). NDEP has developed cleanup standards for contaminated sites requiring remediation and determines when No Further Action will be necessary. NDEP's VCP accepts sites currently undergoing assessments under any federal, state, or local Brownfields program.

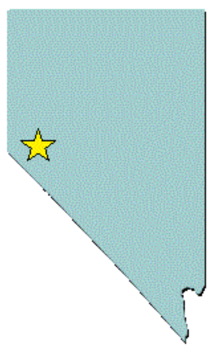
[129] The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) enacted in 1980, commonly referred to as the Superfund Program, governs abandoned hazardous waste sites, and collects a tax on chemical and petroleum industries. CERCLA was amended by the Superfund Amendments and Reauthorization Act (SARA) in 1986; see Appendix C, Environmental Laws and Regulations (USEPA, 2011).

[130] Data gathered using USEPA's Cleanups in My Community (CIMC) search on October 20, 2015, for all sites in Nevada, where cleanup type equals 'RCRA Hazardous Waste – Corrective Action,' and excludes sites where cleanup phase equals 'Construction Complete' (i.e., no longer active). (USEPA, 2015h)

The VCP provides relief from liability to owners who undertake cleanups of contaminated properties under NDEP's oversight. (NDEP, 2011a)

Spotlight on Nevada Superfund Site: Carson River Mercury Site

The Carson River Mercury Site stretches an 80-mile length of the Carson River, from Carson City, NV, downstream to the Lahontan Valley. During the Comstock mining era in the late 1880s, the site was used to process gold and silver ore using mercury. The USEPA has calculated that between 1850 and 1950, approximately 7,500 tons of mercury were discharged into the Carson River, primarily in the form of mercury-contaminated tailings. Today, the site is contaminated with mercury, arsenic, and lead in the soils at former mill sites, adjacent waterways, sediments, fish, and wildlife. (USEPA, 2015i)



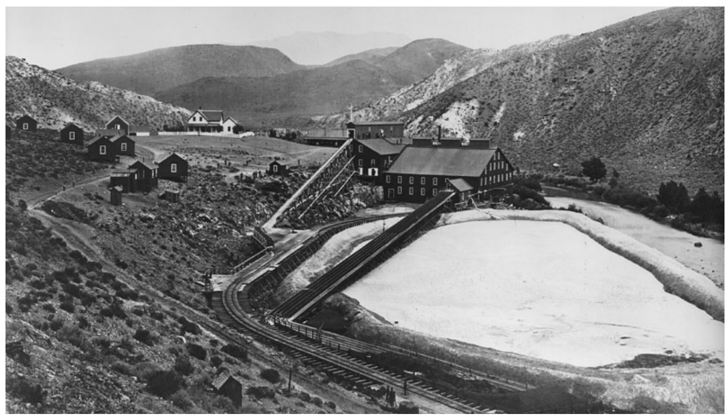


Figure 6.1.15-2: Photo of the Eureka Mill on the Carson River

Source: (NDEP, 2011b)

Excavation and removal of mercury-contaminated tailings and soils from the site have reduced the potential for exposure to contaminated soil. Primary human health risks are present from long-term direct contact with highly contaminated soils found onsite, and through consumption of contaminated fish or wildlife. Mercury can cause permanent damage to the nervous system and serious disabilities for developing fetuses and children. Fish advisories are in effect, issued by the Nevada State Health Division, which recommend limited or no consumption of fish and ducks at the site due to high levels of mercury. (USEPA, 2015i)

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 March 2016 (from the TRI Factsheet reporting data for 2014), Nevada had 134

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 2014, the most recent data available, Nevada released 285.2 million pounds of toxic chemicals through onsite and offsite disposal, transfer, or other releases, largely from the metal mining industry. This accounted for 7.31 percent of total nationwide TRI releases, ranking Nevada 4 of 56 states and territories based on total releases per square mile (USEPA, 2016f).

Another USEPA program is the National Pollutant Discharge Elimination System (NPDES), which regulates the quality of storm water 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, Nevada had 17 major NPDES permitted facilities registered with the USEPA Integrated Compliance Information System (USEPA, 2015j).

The National Institutes of Health, U.S. National Library of Medicine, provides an online mapping tool called TOXMAP, which allows users to “visually explore data from the USEPA’s TRI and Superfund Program” (NIH, 2015a). Figure 6.1.15-3 provides an overview of potentially hazardous sites in Nevada.

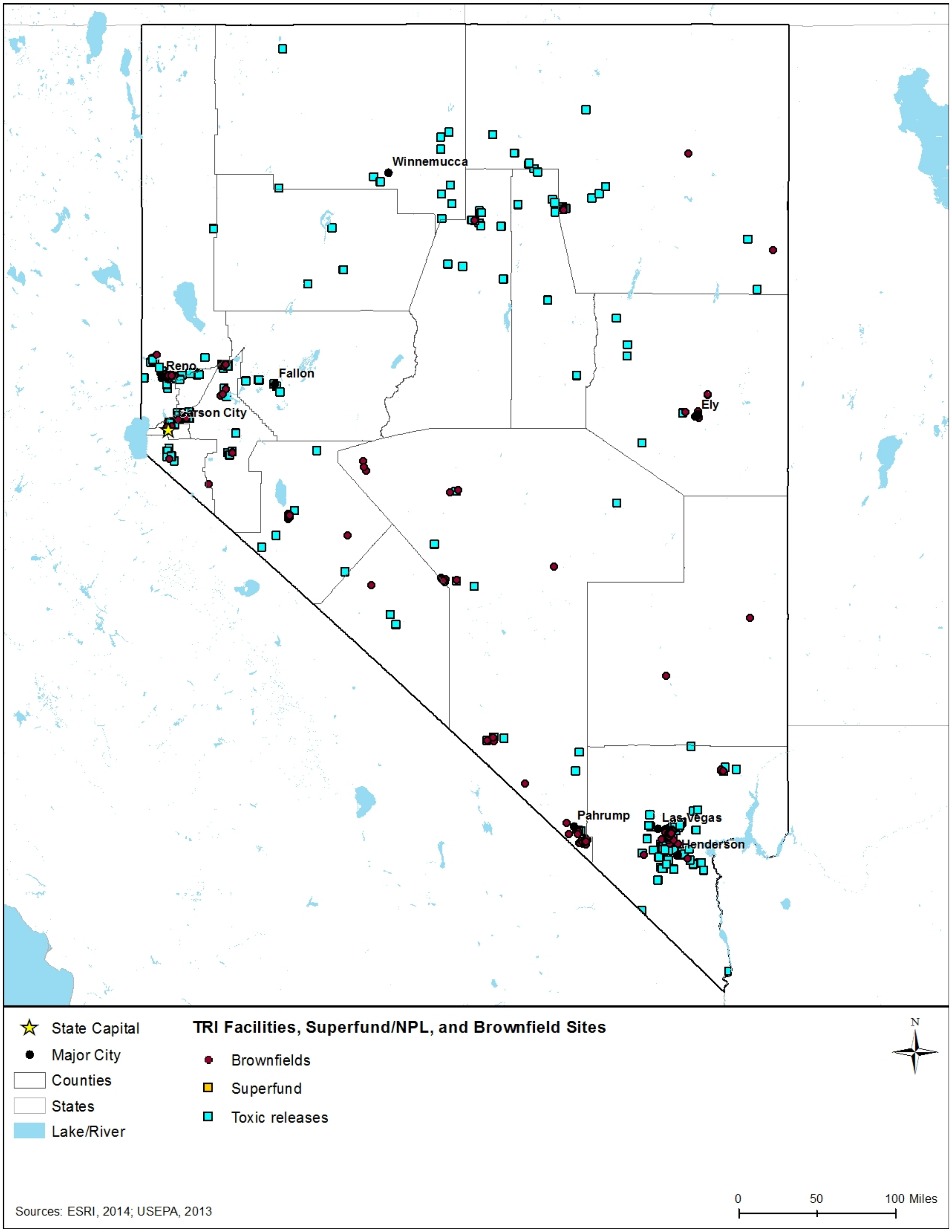


Figure 6.1.15-3: TOXMAP Superfund/NPL and TRI Facilities in Nevada (2013)

Source*:* (NIH, 2015b)

Telecommunication Worker Occupational Health and Safety

Telecommunications sites may be on or near contaminated land, industrial discharge facilities, or sites presenting additional hazards. Occupational exposure to contaminated environmental media can occur during activities like soil excavating, trenching, other earthwork, and working over water bodies. Indoor air quality may also be impacted from vapor intrusion infiltrating indoors from contaminated soil or groundwater that are present beneath a building's foundation. As of October 2015, there are three USEPA-regulated telecommunications sites in Nevada (USEPA, 2015k). These sites are regulated under one or more environmental programs including NPDES compliance, Superfund/NPL status, and TRI releases.

According to BLS data, Nevada has not had any fatalities within the telecommunications industry or telecommunications occupations since 2003, when data are first available. Within the broader installation, maintenance, and repair occupations (SOC code 49-0000), Nevada had three occupational fatalities in 2007 resulting from exposure to "harmful substances or environments." (BLS, 2007). By comparison, the 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, 2014b). 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, 2014b).

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, and the general public could be potentially exposed to contaminants and other hazards in a variety of ways. One example would be if occupational workers disturb contaminated soil while digging, causing hazardous chemicals to mix with an underlying groundwater drinking water sources. If a contaminant enters a drinking water source, the surrounding community could inadvertently ingest or absorb the contaminant when using that source of water for drinking, cooking, bathing, and swimming. By trespassing on a restricted property, a trespasser may come in contact with contaminated soil or surface water, or by inhaling harmful vapors. The NVDHHS DPBH is responsible for collecting public health data resulting from exposure to environmental contamination. No data are published on the DBPH website regarding public illnesses or fatalities associated with exposure to environmental contamination (Nevada Division of Public and Behavioral Health, 2015).

6.1.15.5. Environmental Setting: Abandoned Mine Lands at or near Telecommunications Sites

Another health and safety hazard in Nevada includes surface and subterranean mines. Nevada's mining industry started in 1859 with the discovery of extensive silver and gold deposits known as the Comstock Lode, near Virginia City, NV. Mining activities, including exploration, mill sites, mines, roads and all associated activities, currently occur in nearly every county in the state, with activities affecting approximately 1/10th of 1 percent of land in the state (approximately 109,781 square miles total) (U.S. Census Bureau, 2015f) (Nevada Mining Association, 2010). In 2015, the Nevada mining industry ranked 1st for non-fuel minerals (primarily gold, copper, silver, lime, and diatomite), generating a value of $6.94B (USGS, 2016a).

Health and safety hazards at active mines and abandoned mine lands (AML) include falling into open shafts, cave-ins from unstable rock and decayed support, deadly gases and lack of oxygen inside the mine, unused explosives and toxic chemicals, horizontal and vertical openings, high walls, and open pits (Federal Mining Dialogue, 2015). Acidic water outflow from metal mines, known as acid mine drainage, also presents a risk to health and safety, primarily to recreational visitors ingesting fish caught in impaired waters, and affected residential populations through contaminated drinking water supplies.

As of 2014, Nevada had 113 active metal, industrial mineral and gemstone mines (Nevada Bureau of Mines and Geology, 2014). Figure 6.1.15-4 shows the distribution of active mines in Nevada. In addition to active mines, Nevada has an estimated 200,000 AMLs, 50,000 of which may present safety hazards to the public. As of October 2015, the Nevada Commission on Mineral Resources, Division of Minerals, is conducting a statewide inventory of abandoned mine safety hazards, including the identification and application of a hazard ranking to each hazardous condition. Abandoned mine hazards that are near inhabited places or areas of high public use are ranked higher than mine hazards in more remote areas. From 1987 through January 2015, the Division of Minerals identified and ranked 18,654 hazardous mine openings throughout the state, of which 14,946 (approximately 80 percent) have been secured (Nevada Commission on Mineral Resources, 2015).

Telecommunication Worker Occupational Health and Safety

Telecommunications sites may be on or near AMLs or mine 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 mines present additional health and safety risks to the general public, by generating toxic combustible gases, which can penetrate the surface through ground fractures, potentially seeping into residential structures. Additionally, mine fires can consume enough sub-surface material, that risk of subsidence increases. As a result, AMLs and mine fires in particular, can result in evacuations of entire communities (USDOI Office of Surface Mining Reclamation and Enforcement, 2015).

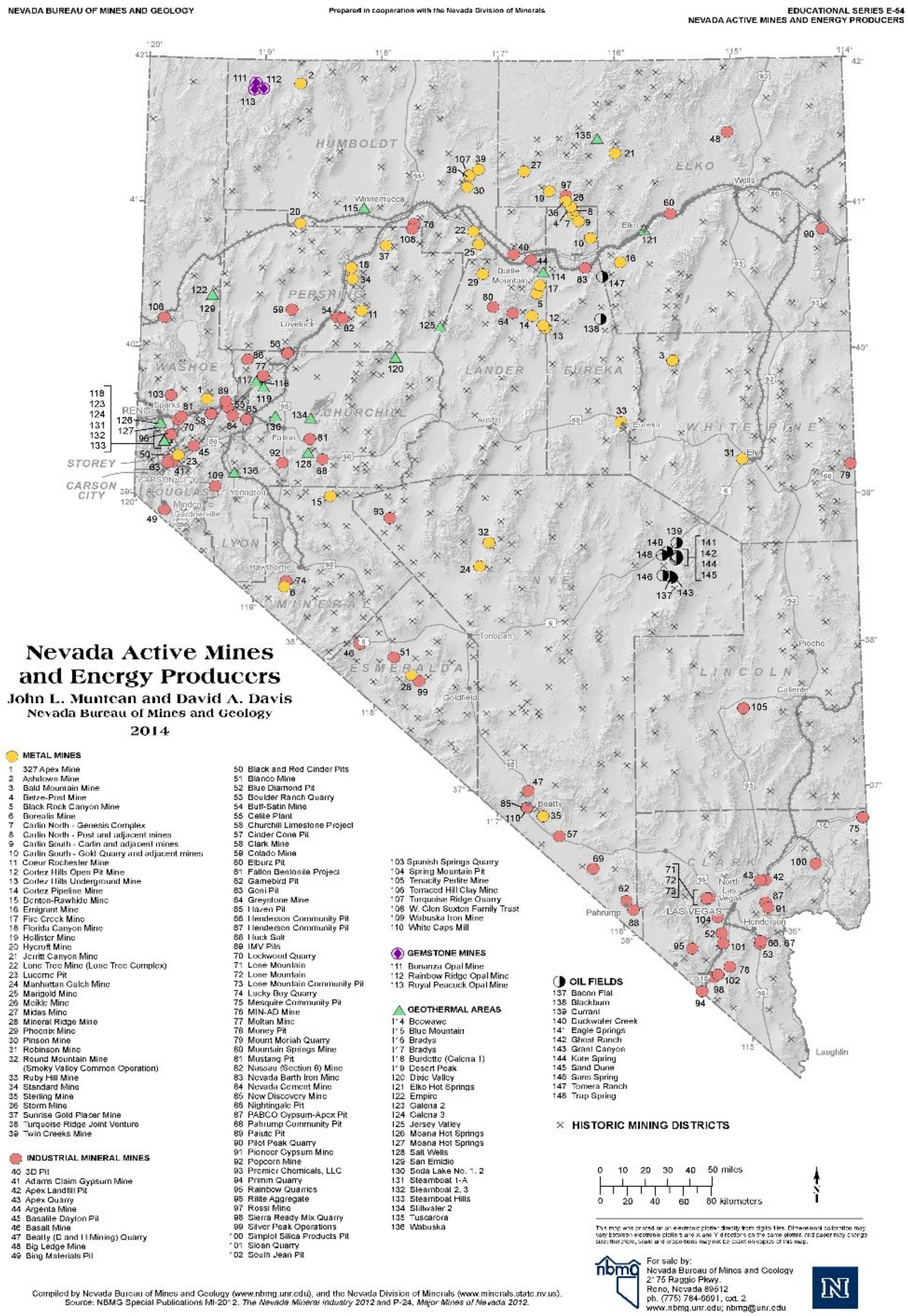


Figure 6.1.15-4: Nevada Active Mines (2014)

Source: (Nevada Bureau of Mines and Geology, 2014)

6.1.15.6. Environmental Setting: Natural and Manmade Disaster Sites

Natural and manmade disaster events can create health and safety risks, as well as present unique hazards, to telecommunication workers and the public. Telecommunications, including public safety communications, can be unavailable (temporarily or permanently) during disaster events. Examples of manmade disasters are train derailments, refinery fires, or other incident involving the release of hazardous constituents. A common example of a natural disaster is flooding. Floodwaters damage transportation infrastructure (roads, railways, etc.) and utility lines (sewer, water, electric power, broadband, natural gas lines, etc.). Hazardous chemicals and sanitary wastes often contaminate floodwaters, which can cause headaches, skin rashes, dizziness, nausea, excitability, weakness, fatigue, and disease to exposed workers (OSHA, 2003).

Physical hazards may also be present at disaster sites, such as downed utility lines, debris blockage or road washout conditions, which increases exposure risks to telecommunication workers. Climbing and working from tower structures damaged by wind increases the risk of slips, trips, or falls. During natural and manmade disasters, access to the telecommunication sites can be obstructed by debris.

Telecommunication Worker Occupational Health and Safety

Natural and manmade disaster events can create health and safety risks, as well as present unique hazards, to telecommunication workers and the public. 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).

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. Currently, NVOSHA 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 37 NRC-reported incidents for Nevada in 2015 with known causes, none were attributed to natural disaster (e.g., earthquake, flood, tornado, or other natural phenomenon), while all 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). In 2014, for example, approximately 100 gallons of gasoline were released onto the ground when a remote fuel line was ruptured by a weather event near Las Vegas, NV (USCG, 2014). 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 general public faces risks during these types of disasters, such as compromised transportation infrastructure and utilities, potential for exposure to unknown chemical and biologic hazards, and inadequate medical support. In 2014, Nevada reported 14 weather-related fatalities and three injuries (NWS, 2015b). By comparison, 384 weather-related fatalities and 2,203 injuries were reported nationwide the same year (NWS, 2015b).

Spotlight on Nevada Manmade Disaster: Pacific Engineering and Production Company Explosion

In the 1980s, Pacific Engineering Company of Nevada (PEPCON) was one of only two American producers of ammonium perchlorate (AP), an oxidizer used in solid fuel rocket boosters, including the space shuttle and military weapons. Following the Challenger space shuttle explosion in 1986, PEPCON's AP shipments were frozen; however, the production of AP continued. Over a period of 15 months, PEPCON had accumulated a stockpile of over 4,000 tons of AP stored in containers wherever space permitted. (NASA, 2012)

On May 4, 1988, a fire broke out at the PEPCON facility and spread to the accumulated stock of AP containers, creating the largest domestic, non-nuclear explosion in recorded history. Smoke from the fire rose several thousand feet and travelled downwind and eastward over residential and commercial zones of Henderson, NV (Figure 6.1.15-5). The explosion damaged structures in a 10-mile radius, resulting in damages estimated at $100M, injured 372 people including 15 firefighters, and killed 2 plant employees. Approximately 1,500 tons of the 4,000 tons of AP stored at the plant were consumed in the subsequent explosion. (NASA, 2012)

Figure 6.1.15-5: Smoke Rising from the PEPCON Explosion

Source: (NASA, 2012)

6.2. ENVIRONMENTAL CONSEQUENCES

This section describes the potential environmental impacts, beneficial, or adverse, resulting from the Proposed Action and Alternatives. As this is a programmatic evaluation, site- and project-specific issues are not assessed. The specific deployment activity and where the deployment will take place will be determined based on location-specific conditions and the results of site-specific environmental reviews.

At the programmatic level, the categories of impacts have been defined as potentially significant, less than significant with mitigation incorporated, less than significant, or no impact. Each resource area identifies the range of possible impacts on resources for the Proposed Action and Alternatives, including the No Action Alternative. The No Action Alternative provides a comparison to describe the effects of environmental resources of the existing conditions to the proposed Alternatives.

NEPA requires agencies to assess the potential direct and indirect impacts each alternative could have on the existing environment (as characterized earlier in this section). Direct impacts are those impacts that are caused by the Proposed Action and occur at the same time and place, such as soil disturbance. Indirect impacts are those impacts related to the Proposed Action but result from an intermediate step or process, such as changes in surface water quality because of soil erosion.

For each resource, the potential impact is assessed in terms of context of the action and the intensity of the potential impact, per CEQ regulations (40 CFR §1508.27). *Context* refers to the timing, duration, and where the impact could potentially occur (i.e., local vs. national; pristine vs. disturbed; common species vs. protected species). In terms of duration of potential impact, context is described as short or long term. *Intensity* refers to the magnitude or severity of the effect as either beneficial or adverse. Resource-specific significance rating criteria are provided at the beginning of each resource area section.

6.2.1. Infrastructure

6.2.1.1. Introduction

This section describes potential impacts to infrastructure in Nevada associated with construction, deployment, and operation of the Proposed Action and alternatives. Chapter 9, Best Management Practices (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.

6.2.1.2. Impact Assessment Methodology and Significance Criteria

The impacts of the Proposed Action on infrastructure were evaluated using the significance criteria presented in Table 6.2.1-1. The categories of impacts are defined as potentially significant, less than significant with mitigation incorporated, less than significant, or no impact. Characteristics of each impact type, including magnitude or intensity, geographic extent, and duration or frequency, were used to determine the impact significance rating associated with each potential impact.

Given the nature of this programmatic evaluation, and because the Proposed Action could potentially cover a wide variety of actions that would take place in various landscapes, the potential impacts to infrastructure addressed in this section are presented as a range of possible impacts.

Table 6.2.1-1: Impact Significance Rating Criteria for Infrastructure

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
Transportation system capacity and safety	Magnitude or Intensity	Creation of substantial traffic congestion/delay and/or a substantial increase in transportation incidents (e.g., crashes, derailments).	Effect that is potentially significant, but with mitigation is less than significant.	Minimal change in traffic congestion/delay and/or transportation incidents (e.g., crashes, derailments).	No effect on traffic congestion or delay, or transportation incidents.
	Geographic Extent	Regional impacts observed throughout the state/territory.		Effects realized at one or multiple isolated locations.	NA
	Duration or Frequency	Permanent: Persisting indefinitely.		Short-term effects will be noticeable for up to the entire construction phase or a portion of the operational phase.	NA
Capacity of local health, public safety, and emergency response services	Magnitude or Intensity	Impacted individuals or communities cannot access health care and/or emergency services, or access is delayed, due to the project activities.	Effect is potentially significant, but with mitigation is less than significant.	Minor delays to access to care and emergency services that do not impact health outcomes.	No impacts on access to care or emergency services.
	Geographic Extent	Regional impacts observed ("regional" assumed to be at least a county or county-equivalent geographical extent, could extend to state).		Impacts only at a local/neighborhood level.	NA
	Duration or Frequency	Duration is constant during construction and deployment phase.		Rare event during construction and deployment phase.	NA

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
Modifies existing public safety response, physical infrastructure, telecommunication practices, or level of service in a manner that directly affects public safety communication capabilities and response times	Magnitude or Intensity	Substantial adverse changes in public safety response times and the ability to communicate effectively with and between public safety entities.	Effect that is potentially significant, but with mitigation is less than significant.	Minimal change in the ability to communicate with and between public safety entities.	No perceptible change in existing response times or the ability to communicate with and between public safety entities.
	Geographic Extent	Local/City, County/Region, or State/Territory.		Local/City, County/Region, or State/Territory.	Local/City, County/Region, or State/Territory.
	Duration or Frequency	Permanent or perpetual change in emergency response times and level of service.		Change in communication and/or the level of service is perceptible but reasonable to maintaining effectiveness and quality of service.	NA
Effects to commercial telecommunication systems, communications, or level of service	Magnitude or Intensity	Substantial adverse changes in level service and communications capabilities.	Effect that is potentially significant, but with mitigation is less than significant.	Minor changes in level of service and communications while transitioning to the new system.	No perceptible effect to level of service or communications while transitioning to the new system.
	Geographic Extent	Local/City, County/Region, or State/Territory.		Local/City, County/Region, or State/Territory.	Local/City, County/Region, or State/Territory.
	Duration or Frequency	Persistent, long-term, or permanent effects to communications and level of service.		Minimal effects to level of service or communications lasting no more than a short period (minutes to hours) during the construction and deployment phase.	NA

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
Effects to utilities, including electric power transmission facilities and water and sewer facilities	Magnitude or Intensity	Substantial disruptions in the delivery of electric power or to physical infrastructure that results in disruptions, including frequent power outages or drops in voltage in the electrical power supply system ("brownouts"). Disruption in water delivery or sewer capacity, or damage to or interference with physical plant facilities that impact delivery of water or sewer systems.	Effect that is potentially significant, but with mitigation is less than significant.	Minor disruptions to the delivery of electric power, water, and sewer services, or minor modifications to physical infrastructure that result in minor disruptions to delivery of power, water, and sewer services.	There would be no perceptible impacts to delivery of other utilities and no service disruptions.
	Geographic Extent	Local/City, County/Region, or State/Territory.		Local/City, County/Region, or State/Territory.	Local/City, County/Region, or State/Territory.
	Duration or Frequency	Effects to other utilities would be seen throughout the entire construction phase.		Effects to other utilities would be of short duration (minutes to hours) and would occur sporadically during the entire construction phase.	NA

NA = Not Applicable

6.2.1.3. 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., NevadaDOT, airport authorities, and railway companies) to ensure proper coordination during deployment. Based on the impact significance criteria presented in Table 6.2.1-1, such impacts would be less than significant due to the temporary nature of the deployment activities, even if impacts would be realized at one or more isolated locations. These impacts would be noticeable during the deployment phase, but would be short-term, with no anticipated impacts continuing into the operational phase, unless any large-scale maintenance would become necessary during operations.

Capacity of Local Health, Public Safety, and Emergency Response Services

The capacity of local health, public safety, and emergency response services would experience less than significant impacts 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, 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 6.2.1-1, 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 6.2.1-1, any potential impacts would be less than significant during deployment. As described above, during deployment and system optimization, existing services would likely remain operational in a redundant manner ensuring continued operations and availability of services to the public. Once operational, state and local public safety organizations would need to evaluate telecommunication practices and standard operating procedures (SOPs). FirstNet's mission is to 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 assets would be using a different spectrum for communications; as such, commercial telecommunication systems, communications, or level of service would experience no impacts. FirstNet has exclusive rights to use of the assigned spectrum, and only designated public safety organizations would be authorized to connect to FirstNet's network. Depending on the use patterns of FirstNet's spectrum, such spectrum use may be over-built or under-utilized.[131] Anticipated impacts would be less than significant due to the limited extent and temporary nature of deployment.

Effects to Utilities, including Electric Power Transmission Facilities, and Water and Sewer Facilities

The activities proposed by FirstNet would have less than significant impacts on utilities, 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.

6.2.1.4. Potential Impacts of the Preferred Alternative

The following section assesses potential impacts associated with implementation of the Preferred Alternative, including deployment and operation activities.

Deployment Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, implementation of the Preferred Alternative could result in the deployment of various types of facilities or infrastructure.

[131] 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.

Depending on the physical nature and location of the facility/infrastructure and the specific deployment requirements, some activities would result in potential impacts to infrastructure and others would not. In addition, and as explained in this section, the same type of Proposed Action Infrastructure could result in a range of no impacts to less than significant impacts depending on the deployment scenario or site-specific conditions.

Activities Likely to Have No Impacts

Of the types of facilities or infrastructure deployment scenarios described in Section 2.1.2, Proposed Action Infrastructure, the following are likely to have no impacts to infrastructure under the conditions described below:

- Wired Projects
  - Use of Existing Conduit – New Buried Fiber Optic Plant: Disturbance associated with the installation of fiber optic cable in existing conduit would be limited to entry and exit points of the existing conduit in previously disturbed areas. It is anticipated that there would be no impacts to infrastructure resources since the activities that would be conducted at these small entry and exit points are not likely to produce perceptible changes or disruption of transportation, telecommunications, or utility services.
  - Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting of dark fiber would have no impacts to infrastructure resources because there would be no ground disturbance and no interference with existing utility, transportation, or communication systems.
- Satellites and Other Technologies
  - Satellite-Enabled Devices and Equipment: It is anticipated that the use of portable devices that use satellite technology would not impact infrastructure resources because there would be no change to the built or natural environment from the use of portable equipment. Installation of satellite-enabled equipment would not be expected to have any impacts to infrastructure resources, given that construction activities would occur on existing structures, would not be expected to interfere with existing equipment, and transportation capacity and safety, and access to emergency services would not be impacted.
  - Deployment of Satellites: FirstNet does not anticipate launching satellites as part of the deployment of the Nationwide Public Safety Broadband Network (NPSBN); however, it may include equipment on satellites that are already being launched for other purposes. As adding equipment to an existing launch vehicle would be very unlikely to impact infrastructure resources, it is anticipated that this activity would have no impact on infrastructure resources.

Activities with the Potential to Have Impacts

Potential deployment-related impacts to infrastructure as a result of implementation of the Preferred Alternative would encompass a range of impacts that could occur as a result of direct interface with existing infrastructure, most notably existing telecommunication infrastructure. The types of infrastructure deployment activities that could be part of the Preferred Alternative and result in potential impacts to infrastructure include the following:

- Wired Projects
  - New Build – Buried Fiber Optic Plant: Plowing (including vibratory plowing), trenching, or directional boring and the construction of points of presence (POPs),[132] 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, other than harbor operations. However, impacts to infrastructure resources could potentially occur as result of the construction of landings and/or facilities on shores or the banks of waterbodies 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 to 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

[132] Points of Presence are connections or access points between two different networks, or different components of one network.

infrastructure, and other telecommunications as the site could potentially be available for subsequent collocation.

- Collocation on Existing Wireless Towers, 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 Cells on Wheels (COWs), Cells on Light Trucks (COLTs), and Systems on Wheels (SOWs) are comprised of cellular base stations, sometimes with expandable antenna masts, and generators that connect to utility power cables. Connecting the generators to utility power cables has the potential to disrupt electric power utility systems or cause power outages; however, this is expected to be temporary and minor. Some staging or landing areas (depending on the type of technology) could require minor construction and maintenance within public road 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. In addition, beneficial impacts could be realized, as deployable technologies are used when other infrastructure is impaired in some way; so deployable technologies could provide continuity of service during emergency events. Where deployable technologies would be implemented on existing paved surfaces and the acceptable load on those paved surfaces is not exceeded, or where aerial deployable technologies may be launched or recovered on existing paved surfaces, it is anticipated that there would be no impacts to infrastructure resources because there would be no disturbance of the natural or built environment.

In general, the abovementioned activities could potentially impact infrastructure resources in different ways, resulting in both potentially negative and potentially positive impacts. Potential negative impacts to infrastructure associated with deployment could include temporary disruption of various types of transportation corridors, temporary impacts on 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 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 9, 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 associated with routine inspections of the Preferred Alternative, assuming that the same access roads used for deployment are also used for inspections. If usage of heavy equipment as part of routine maintenance or inspections occurs off established access roads or corridors, or if further construction related activities are required along public road and utility ROWs, increased traffic congestion, current telecommunication system interruption, and utility interruptions could occur. These potential impacts would be expected to be minor and temporary as explained above.

Numerous beneficial impacts would be associated with operation of the NPSBN. The new system is intended to result in substantial improvements in public safety response times and the ability to communicate effectively with and between public safety entities, and would likely result in substantial improvements in level of service and communications capabilities. Operation of the NPSBN is intended to involve high-speed data capabilities, location information, images, and eventually streaming video, which would likely significantly improve communications and the ability of the public safety community to effectively engage and respond. The NPSBN is also intended to have a higher level of redundancy and resiliency than current commercial networks to support the public safety community effectively, even in events of extreme demand. This improvement in the level of resiliency and redundancy is intended to increase the reliability of systems, communications, and level of service, and also minimize disruptions and misinformation resulting from limited or disrupted service. Chapter 9, BMPs and Mitigation Measures, provides a list of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

6.2.1.5. Alternatives Impact Assessment

The following section assesses potential impacts to infrastructure associated with the Deployable Technologies Alternative and the No Action Alternative.[133]

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

[133] As mentioned above and in Section 2.1.2, Proposed Action Infrastructure, the Preferred Alternative includes implementation of deployable technologies.

construction associated with wired or wireless projects discussed above under the Preferred Alternative. Some limited construction could be associated with implementation such as land clearing or paving for parking or staging areas. The specific infrastructure associated with the Deployable Technologies Alternative would be the same as the deployable technologies implemented as part of the Preferred Alternative but would likely be implemented in greater numbers, over a larger geographic extent, and used with greater frequency and duration. Therefore, potential impacts to infrastructure as a result of implementation of this alternative could be as described below.

Deployment Impacts

As explained above, implementation of deployable technologies could result in less than significant impacts to infrastructure 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 deployables. The site-specific location of deployment would need to be considered, and any local infrastructure assets (transportation, telecommunications, or utilities) would need to be considered, planned for, and managed accordingly to try 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. Chapter 9, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

As explained above, operation activities would consist of implementation/running of the deployable technology and routine maintenance and inspections. As with the Preferred Alternative, it is anticipated that there would be no impacts to infrastructure resources associated with routine inspections of the Preferred Alternative, assuming that the same access roads used for deployment are also used for inspections. If usage of heavy equipment, as part of routine maintenance or inspection occurs off an established access road or utility ROW, or if additional maintenance-related construction activities occur within public road and utility ROWs, less than significant impacts would likely still occur to transportation systems or utility services due to the limited amount of new infrastructure needed to accommodate the deployables. Chapter 9, 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. As a result, there would be no impacts to infrastructure as a result of deployment and operation of the Proposed Action. Environmental conditions would therefore be the same as those described in Section 6.1.1, Infrastructure. The state also would not realize positive, beneficial impacts to infrastructure resources described above.

6.2.2. Soils

6.2.2.1. Introduction

This section describes potential impacts to soil resources in Nevada associated with deployment and operation of the Proposed Action and alternatives. Chapter 9, 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.

6.2.2.2. Impact Assessment Methodology and Significance Criteria

The impacts of the Proposed Action on soil resources were evaluated using the significance criteria presented in Table 6.2.2-1. As described in Section 6.2, Environmental Consequences, the categories of impacts are defined as potentially significant, less than significant with mitigation incorporated, less than significant, or no impact. Characteristics of each impact type, including magnitude or intensity, geographic extent, and duration or frequency, were used to determine the impact significance rating associated with each potential impact.

Given the nature of this programmatic evaluation, and because the Proposed Action could potentially cover a wide variety of actions that would take place in various landscapes, the potential impacts to soil resources addressed in this section are presented as a range of possible impacts.

Table 6.2.2-1: Impact Significance Rating Criteria for Soils

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

6.2.2.3. Description of Environmental Concerns

Soil Erosion

Soil erosion is an environmental concern for nearly every construction activity that involves ground disturbance. Construction erosion typically only occurs in a small area of land with the actual removal of vegetative cover from construction equipment or by wind and water erosion. Of concern in Nevada 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 Nevada that have steep slopes (i.e., greater than 20 percent) or where the erosion potential is medium to high, including locations with Aquents, Aquepts, Aquerts, Aquolls, Argids, Calcids, Cambids, Cryolls, Durids, Fluvents, Orthents, Psamments, Rendolls, Salids, Saprists, Xeralfs, Xererts, and Xerolls (see Section 6.1.2.4, Soil Suborders and Figure 6.1.2-2).

Based on the impact significance criteria presented in Table 6.2.2-1, building of some of FirstNet's network deployment sites could cause potentially significant erosion at locations with highly erodible soil and steep grades. For the majority of projects, impacts to soils would be expected to be less than significant given the short-term and temporary duration of the activities.

To the extent practicable, FirstNet would attempt to minimize ground-disturbing construction in areas with high erosion potential due to steep slopes or soil type. Where construction is required in areas with a high erosion potential, FirstNet could implement BMPs and mitigation measures, where practicable and feasible, to avoid or minimize impacts, and minimize the periods when exposed soil is open to precipitation and wind (see Chapter 9).

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 6.2.2-1, and due to the relatively small-scale (less than 1 acre) of most FirstNet project sites minimal topsoil mixing is anticipated. Chapter 9, 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.

Soil Compaction and Rutting

Soil compaction and rutting at construction sites could involve heavy land clearing equipment such as bulldozers and backhoes, trenchers and directional drill rigs to install buried fiber, and cranes to install towers and aerial infrastructure. Heavy equipment could cause perceptible compaction and rutting of susceptible soils, particularly if BMPs and mitigation measures are not implemented.

Soils with the highest potential for compaction or rutting were identified by using the STATSGO2 database (see Section 6.1.2.4, Soil Suborders). The most compaction susceptible soils in Nevada are Aquerts, Aquolls, Fluvents, Saprists, and Xeralfs, because they are hydric soils with poor drainage conditions. These soils constitute 5.16 percent of Nevada's land area[134] (see Figure 6.1.2-2). The potential for compaction or rutting impact would be generally low at FirstNet network deployment sites where other soil types predominate.

Based on impact significance criteria presented in Table 6.2.2-1, the risk of soil compaction and rutting resulting from FirstNet deployment would be less than significant due to the extent of susceptible soils in the state.

6.2.2.4. 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

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.

[134] 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.

Activities with the Potential to Have Impacts

Implementation of the Preferred Alternatives could include potential deployment-related impacts to soil resources resulting from ground disturbance activities, including soil erosion, topsoil mixing, and soil compaction and rutting. The types of deployment activities that could be part of the Preferred Alternative and result in potential impacts to soil resources include the following:

- Wired Projects
    - New Build – Buried Fiber Optic Plant: New fiber optic cable installation usually requires trenching, plowing (including vibratory plowing), or directional boring, as well as construction of hand holes, pulling vaults, junction boxes, huts, and POP structures that require ground disturbance. Impacts from fiber optic plant installation and structure construction, as well as associated grading and restoration of the disturbed ground when construction is completed, could result in soil erosion, topsoil mixing, or soil compaction and rutting.
    - New Build – Aerial Fiber Optic Plant: Installation of new utility poles, and replacement/upgrading of existing poles and structures could potentially impact soil resources resulting from ground disturbance for pole/structure installation (soil erosion and topsoil mixing), and heavy equipment use from bucket trucks operating on existing gravel or dirt roads (soil compaction and rutting). Potential impacts to soils are anticipated to be small-scale and short-term.
    - Collocation on Existing Aerial Fiber Optic Plant: Topsoil removal, soil excavation, and excavated material placement during the replacement of poles and structural hardening could result in soil erosion and topsoil mixing. Heavy equipment use associated with these activities as well as with installing new fiber on existing poles could result in soil compaction and rutting.
    - New Build – Submarine Fiber Optic Plant: Installation of fiber optic plants in limited nearshore and inland bodies of water could potentially impact soil resources at and near the landings or facilities on shores or the banks of waterbodies 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 required ground disturbance, such as grading, or excavation activities, impacts to soil resources could occur, including soil erosion and topsoil mixing, as well as soil compaction and rutting associated with heavy equipment use.
  - Deployable Technologies: Implementation of deployable technologies could result in potential impacts to soil resources depending on the technology and location for deployment. Potential impacts may result if deployment of vehicles (i.e., SOWs, COWs, COLTs, or UAVs) occurs in unpaved areas, or if the implementation results in paving of previously unpaved surfaces. Some staging or landing areas (depending on the type of technology) may require land/vegetation clearing, excavation, and paving. These activities could result in soil erosion and topsoil mixing. Heavy equipment use associated with these activities may result in soil compaction and rutting. In addition, implementation of deployable technologies themselves could result in soil compaction and rutting if deployed in unpaved areas. Where technologies such as COWs, COLTs, and SOWs are deployed on existing paved surfaces, there would be no impacts to soil resources because there would be no ground disturbance.

In general, the abovementioned activities could potentially involve land/vegetation clearing, topsoil removal, excavation, excavated material placement, trenching or directional boring, construction of access roads and other impervious surfaces, landscape grading, and heavy equipment movement. Potential impacts to soil resources associated with deployment of this infrastructure could include soil erosion, topsoil mixing, or soil compaction and rutting. These impacts are expected to be less than significant as the activity would likely be short term, localized to the deployment locations, and would return to normal conditions as soon as revegetation occurs, often by the next growing season. It is expected that heavy equipment would utilize existing roadways and utility rights-of-way for deployment activities. Chapter 9, 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. It is anticipated that there would be no impacts to soil resources associated with routine inspections of the Preferred Alternative, assuming that the same access roads used for deployment are also used for inspections because there would be no ground disturbance. If usage of heavy equipment as part of routine maintenance or inspections occurs off established access roads or corridors, or if the acceptable load of the surface is exceeded, soil compaction and rutting impacts could result as explained above. These impacts are expected to be less than significant due to the temporary nature and small scale of operations activities with the potential to create impacts. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

6.2.2.5. Alternatives Impact Assessment

The following section assesses potential impacts to soils associated with the Deployable Technologies Alternative and the No Action Alternative.

Deployable Technologies Alternative

Under the Deployable Technologies Alternative option, a nationwide fleet of mobile communications systems would provide temporary coverage in areas not covered by the existing, usable infrastructure. There would be no collocation of equipment and minimal new construction associated with wired or wireless projects discussed above under the Preferred Alternative. Some limited construction could be associated with implementation such as land clearing or paving for parking or staging areas. The specific infrastructure associated with the Deployable Technologies Alternative would be the same as the deployable technologies implemented as part of the Preferred Alternative but would likely be implemented in greater numbers, over a larger geographic extent, and used with greater frequency and duration. Therefore, potential impacts to soil resources as a result of implementation of this alternative could be as described below.

Deployment Impacts

As explained above, implementation of deployable technologies could result in less than significant impacts to soil resources if deployment occurs in unpaved areas, or if the implementation results in paving of previously unpaved surfaces. In addition, impacts to soils could occur on paved surfaces if the acceptable load of the surface is exceeded. Some staging or landing areas (depending on the type of technology) may require land/vegetation clearing, excavation, and paving. These activities could result in soil erosion and topsoil mixing. Heavy equipment use associated with these activities may result in soil compaction and rutting. In addition, implementation of deployable technologies themselves could also result in soil compaction and rutting if deployed in unpaved areas. However, these potential impacts are expected to be less than significant due to the small-scale and short term nature of the deployment. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

As explained above, operation activities would consist of implementation/running of the deployable technology and routine maintenance and inspections. As with the Preferred Alternative, it is anticipated that there would be no impacts to soil resources associated with routine inspections of deployable assets, assuming that the same access roads used for deployment are also used for inspections because there would be no ground disturbance. If usage of heavy equipment as part of routine maintenance or inspections occurs off established access roads or corridors, or if the acceptable load of the surface is exceeded, less than significant soil compaction and rutting impacts could result 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 less than significant impacts as described above. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

No Action Alternative

Under the No Action Alternative, the NPSBN would not be deployed. Therefore, there would be no associated construction or installation of wired, wireless, deployable infrastructure or satellites and other technologies. As a result, there would be no impacts to soil resources as a result of construction and operation of the Proposed Action. Environmental conditions would therefore be the same as those described in Section 6.1.2, Soils.

6.2.3. Geology

6.2.3.1. Introduction

This section describes potential impacts to Nevada geology resources associated with deployment and operation of the Proposed Action and alternatives. Chapter 9, 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.

6.2.3.2. Impact Assessment Methodology and Significance Criteria

The impacts of the Proposed Action on geology resources were evaluated using the significance criteria presented in Table 6.2.3-1. As described in Section 6.2, Environmental Consequences, the categories of impacts are defined as potentially significant, less than significant with mitigation incorporated, less than significant, or no impact. Characteristics of each impact type, including magnitude or intensity, geographic extent, and duration or frequency, were used to determine the impact significance rating associated with each potential impact.

Given the nature of this programmatic evaluation, and because the Proposed Action could potentially cover a wide variety of actions that would take place in various landscapes, the potential impacts to geology addressed in this section are presented as a range of possible impacts.

Table 6.2.3-1: Impact Significance Rating Criteria for Geology

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	Less than Significant with BMPs and Mitigation Measures Incorporated	Less than Significant	No Impact
Seismic Hazard	Magnitude or Intensity	High likelihood that a project activity could be located within a high-risk earthquake hazard zone or active fault.	Effect that is potentially significant, but with mitigation is less than significant.	Low likelihood that a project activity could be located within an earthquake hazard zone or active fault.	No likelihood of a project activity being located in an earthquake hazard zone or active fault.
	Geographic Extent	Hazard zones or active faults are highly prevalent within the state/territory.		Earthquake hazard zones or active faults occur within the state/territory, but may be avoidable.	Earthquake hazard zones or active faults do not occur within the state/territory.
	Duration or Frequency	NA		NA	NA
Volcanic Activity	Magnitude or Intensity	High likelihood that a project activity could be located near a volcano lava or mud flow area of influence.	Effect that is potentially significant, but with mitigation is less than significant.	Low likelihood that a project activity could be located near a volcanic ash area of influence.	No likelihood of a project activity located within a volcano hazard zone.
	Geographic Extent	Volcano lava flow areas of influence are highly prevalent within the state/territory.		Volcano ash areas of influence occur within the state/territory, but may be avoidable.	Volcano hazard zones do not occur within the state/territory.
	Duration or Frequency	NA		NA	NA
Landslide	Magnitude or Intensity	High likelihood that a project activity could be located within a landslide area.	Effect that is potentially significant, but with mitigation is less than significant.	Low likelihood that a project activity could be located within a landslide area.	No likelihood of a project activity located within a landslide hazard area.
	Geographic Extent	Landslide areas are highly prevalent within the state/territory.		Landslide areas occur within the state/territory, but may be avoidable.	Landslide hazard areas do not occur within the state/territory.

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	Less than Significant with BMPs and Mitigation Measures Incorporated	Less than Significant	No Impact
	Duration or Frequency	NA		NA	NA
Land Subsidence	Magnitude or Intensity	High likelihood that a project activity could be located within an area with a hazard for subsidence (e.g., karst terrain).	Effect that is potentially significant, but with mitigation is less than significant.	Low likelihood that a project activity could be located within an area with a hazard for subsidence.	Project activity located outside an area with a hazard for subsidence.
	Geographic Extent	Areas with a high hazard for subsidence (e.g., karst terrain) are highly prevalent within the state/territory.		Areas with a high hazard for subsidence occur within the state/territory, but may be avoidable.	Areas with a high hazard for subsidence do not occur within the state/territory.
	Duration or Frequency	NA		NA	NA
Potential Mineral and Fossil Fuel Resource Impacts	Magnitude or Intensity	Severe, widespread, observable impacts to mineral and/or fossil fuel resources.	Effect that is potentially significant, but with mitigation is less than significant.	Limited impacts to mineral and/or fossil resources.	No perceptible change in mineral and/or fossil fuel resources.
	Geographic Extent	Regions of mineral or fossil fuel extraction areas are highly prevalent within the state/territory.		Mineral or fossil fuel extraction areas occur within the state/territory, but may be avoidable.	Mineral or fossil fuel extraction areas do not occur within the state/territory.
	Duration or Frequency	Long-term or permanent degradation or depletion of mineral and fossil fuel resources.		Temporary degradation or depletion of mineral and fossil fuel resources.	NA
Potential Paleontological	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.

<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="2">Resources Impacts</td><td>Geographic Extent</td><td>Areas with known paleontological resources are highly prevalent within the state/territory.</td><td rowspan="2"></td><td>Areas with known paleontological resources occur within the state/territory, but may be avoidable.</td><td>Areas with known paleontological resources do not occur within the state/territory.</td></tr>
<tr><td>Duration or Frequency</td><td>NA</td><td>NA</td><td>NA</td></tr>
<tr><td rowspan="3">Surface Geology, Bedrock, Topography, Physiography, and Geomorphology</td><td>Magnitude or Intensity</td><td>Substantial and measurable degradation or alteration of surface geology, bedrock, topography, physiographic characteristics, or geomorphological processes.</td><td rowspan="3">Effect that is potentially significant, but with mitigation is less than significant.</td><td>Minor degradation or alteration of surface geology, bedrock, topography that do not result in measurable changes in physiographic characteristics or geomorphological processes.</td><td>No degradation or alteration of surface geology, bedrock, topography, physiographic characteristics, or geomorphologic processes.</td></tr>
<tr><td>Geographic Extent</td><td>State/territory.</td><td>State/territory.</td><td>NA</td></tr>
<tr><td>Duration or Frequency</td><td>Permanent or long-term changes to characteristics and processes.</td><td>Temporary degradation or alteration of resources that is limited to the construction and deployment phase.</td><td>NA</td></tr>
</table>

NA= Not Applicable

6.2.3.3. Description of Environmental Concerns

Environmental concerns regarding geology can be viewed as two distinct types, those that would potentially provide impacts to the project, such as seismic hazards, landslides, and volcanic activity, and those that would be impacts from the project, such as land subsidence and effects on mineral and fossil fuel resources, paleontological resources, surface geology, bedrock, topography, physiography, and geomorphology. These concerns and their impacts on geology are discussed below.

Seismic Hazard

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 discussed in Section 6.1.3.8, the majority of Nevada is susceptible to moderate to high hazard of earthquake events. As shown in Figure 6.1.3-5, areas in western Nevada near the California border are at greatest risk to earthquakes. Based on the impact significance criteria presented in Table 6.2.3-1, 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 moderate to severe earthquakes in parts of Nevada, some amount of infrastructure could be subject to earthquake hazards. Chapter 9, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Volcanic Activity

Within Nevada, two areas that have exhibited volcanic/geothermal activity within the past 10,000 years are Soda Lake and Steamboat Springs. Soda Lake and Little Soda Lake are two maars[135] located near Fallon, NV; both lakes formed within the last 10,000 years following a volcanic eruption in which basalt[136] blasted "through the water table or shallow lakes." In western Nevada, just northeast of Lake Tahoe, Steamboat Springs contains a volcanic rock field that dates to 2.53 to 1.14 MYA. While no volcanic activity has occurred there during the last 10,000 years, it was included in the *Catalog of Active Volcanoes of the World* based on its 50 active hot springs and multiple steam vents. (Smithsonian Institution, 2013) No impacts would occur from these resources due to the length of inactivity exhibited by each.

Landslides

Similar to seismic hazards, another concern would be placement of equipment in areas that are highly susceptible to landslides. Equipment that is exposed to landslides is subject to

[135] Maar: "A broad, short volcanic crater formed by groundwater or permafrost coming into contact with hot lava or magma, which causes an explosion powerful enough to create a large hole in the ground." (NPS, 2016b)
[136] Basalt: "A dark, fine-grained, extrusive (volcanic) igneous rock with a low silica content (40% to 50%), but rich in iron, magnesium and calcium." (USGS, 2015h)

misalignment, alteration, or, in extreme cases, destruction; all of these activities could result in connectivity loss.

As discussed in Section 6.1.3.8, the majority of Nevada is at low to moderate risk of experiencing landslide events. Based on the impact significance criteria presented in Table 6.2.3-1, 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. The potential for landslides is not widespread across Nevada, but exists in localized pockets throughout the State (Figure 6.1.3-6). To the extent practicable, FirstNet would avoid deployment in areas that are susceptible to landslide events. However, given that several of Nevada's cities, including Reno and Carson City, are in areas that experience landslides with moderate frequency, some amount of infrastructure could be subject to landslide hazards. Chapter 9, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Land Subsidence

Equipment that is exposed to land subsidence, such as sinkholes created by karst topography or mine collapse, is subject to misalignment, alteration, or, in extreme cases, destruction. Significant long-term land subsidence, due to factors such as aquifer compaction, in coastal areas could lead to relative sea level rise[137] and inundation of equipment. All of these activities could result in connectivity loss.

As discussed in Section 6.1.3.8 and shown in Figure 6.1.3-7, subsidence due to underground water withdrawal is a significant problem in Nevada, particularly in the Las Vegas Valley, where 20 percent of the water supply comes from groundwater withdrawals. Based on the impact significance criteria presented in Table 6.2.3-1, 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 deployment locations were within areas at high risk to karst topography or mining areas. To the extent practicable, FirstNet would avoid deployment in known areas of high land subsidence events or potential. However, where infrastructure is subject to landslide hazards, BMPs and mitigation measures, could help avoid or minimize the potential impacts. Chapter 9, 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.

[137] Relative Sea Level Rise: "[Sea level rise that] includes the combined movement of both water and land. Even if sea level was constant, there could be changes in relative sea level. For example, a rising land surface would produce a relative fall in sea level, whereas a sinking land surface would produce a relative rise in sea level." (USGS, 2016f)

Potential Mineral and Fossil Fuel Resource Impacts

Equipment deployment near mineral and fossil fuel resources is not likely to affect these resources. Rather the new construction is only likely to limit access to extraction of these resources. Based on the impact significance criteria presented in Table 6.2.3-1, 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 and feasible, FirstNet would likely avoid construction in areas where these resources exist. Chapter 9, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Potential Paleontological Resource Impacts

Equipment installation and construction activities that require ground disturbance could damage existing paleontological resources, which are both fragile and irreplaceable. Based on the impact significance criteria presented in Table 6.2.3-1, impacts to paleontological resources could be potentially significant if FirstNet's buildout/deployment locations uncovered paleontological resources during construction activities. As discussed in Section 6.1.3.7, fossils are abundant throughout parts of Nevada. It is anticipated that potential impacts to specific areas known to contain paleontological resources would be avoided, minimized, or mitigated, and any potential impacts would be limited and localized. Potential impacts to paleontological resources should be considered on a site-by-site basis, and BMPs and mitigation measures could further help avoid or minimize the potential impacts. Chapter 9, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Surface Geology, Bedrock, Topography, Physiography, and Geomorphology

Equipment installation and construction activities that degrade or alter surface geology, bedrock, or topography could cause measurable changes in physiographic characteristics of an area's geology, topography, physiography, or geomorphology. Based on the impact significance criteria presented in Table 6.2.3-1, 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 could be implemented to help avoid or minimize the potential impacts. Chapter 9, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Potential Impacts of the Preferred Alternative

The following section assesses potential impacts associated with implementation of the Preferred Alternative, including construction/deployment and operation activities.

Deployment Impacts

Implementation of the Preferred Alternative could result in the deployment of various types of facilities or infrastructure. Depending on the physical nature and location of the facility/infrastructure and the specific deployment requirements, some activities have the potential to be impacted by geologic hazards, some activities could result in potential impacts to geology, and other activities would have no impacts. In addition, and as explained in this section, the same type of Proposed Action Infrastructure could result in a range of no impacts to less than significant impacts depending on the deployment scenario or site-specific conditions.

Activities Likely to Have No Impacts

Of the types of facilities or infrastructure deployment scenarios described in Section 2.1.2, Proposed Action Infrastructure, the following are likely to have no impacts to geology under the conditions described below:

- Wired Projects
  - Use of Existing Conduit – New Buried Fiber Optic Plant: Disturbance associated with the installation of fiber optic cable in existing conduit would be limited to entry and exit points of the existing conduit in previously disturbed areas. In most cases, there would be no impacts to geologic resources since the activities that would be conducted at these small entry and exit points are not likely to produce perceptible changes.

    Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting up of dark fiber would have no impacts to geologic resources because there would be no ground disturbance.
- Satellites and Other Technologies
  - Deployment of Satellites: FirstNet does not anticipate launching satellites as part of the deployment of the NPSBN; however, it may include equipment on satellites that are already being launched for other purposes. As adding equipment to an existing launch vehicle would be very unlikely to impact geologic resources, it is anticipated that this activity would have no impact on geologic resources.

Activities with the Potential to Have Impacts

Potential deployment-related impacts to geologic resources, or resulting from geologic hazards due to implementation of the Preferred Alternative, would encompass a range of impacts that could occur as a result of ground disturbance activities, including loss of mineral and fuel resources and paleontological resources. The types of infrastructure development scenarios or deployment activities that could be part of the Preferred Alternative and result in potential impacts to geologic resources, or impacts from geologic hazards, include the following:

- Wired Projects
  - New Build – Buried Fiber Optic Plant: Plowing (including vibratory plowing), trenching, or directional boring and the construction of 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 landslides, earthquakes, and other geologic hazards, it is possible that equipment could be affected by that hazard.
  - New Build – Aerial Fiber Optic Plant: Installation of new utility poles, and associated use of heavy equipment during construction, could result in potential impacts to geologic resources due to associated ground disturbance. Where equipment is installed in locations that are susceptible to landslides, earthquakes, and other geologic hazards, it is possible that equipment could be affected by that hazard.
  - Collocation on Existing Aerial Fiber Optic Plant: Replacement of utility poles and structural hardening, and associated use of heavy equipment during construction, could result in potential impacts to geologic resources due to associated ground disturbance. Where equipment is installed in locations that are susceptible to landslides, earthquakes, and other geologic hazards, it is possible that equipment could be affected by that hazard.
  - New Build – Submarine Fiber Optic Plant: The installation of cables in limited nearshore or inland bodies of water is not expected to impact geologic resources. However, where landings and/or facilities for submarine cable are installed at locations that are susceptible to landslides, minor earthquakes, or land subsidence, it is possible that equipment could be affected by that hazard.
  - Installation of Optical Transmission or Centralized Transmission Equipment: If installation of transmission equipment would occur in existing boxes or huts and require ground disturbance in locations that are susceptible to geologic hazards (e.g., land subsidence, landslides, or earthquakes), it is possible that they could be affected by that hazard.
- Wireless Projects
  - New Wireless Communication Towers: Installation of new wireless towers and associated structures (generators, equipment sheds, fencing, security and aviation lighting, electrical feeds, and concrete foundations and pads) or access roads could result in impacts to geologic resources. Land/vegetation clearing, excavation activities, landscape grading, and other ground disturbance activities during the installation of new wireless towers and associated structures or access roads could result in erosion or disturbance of geologic resources. Where equipment is installed in locations that are susceptible to landslides, earthquakes, and other geologic hazards, it is possible that equipment could be affected by that hazard.
  - Collocation on Existing Wireless Tower, Structure, or Building: Collocation would involve mounting or installing equipment (such as antennas or microwave dishes) on an

existing tower, which would not result in ground disturbance. However, if additional power units, structural hardening, and physical security measures required ground disturbance, such as grading, or excavation activities, impacts to geologic resources could occur due to ground disturbance. Where equipment is installed in locations that are susceptible to landslides, earthquakes, and other geologic hazards, it is possible that equipment could be affected by that hazard.

  - Deployable Technologies: Implementation of deployable technologies could result in potential impacts to geologic resources depending on the technology and location proposed for deployment. Potential impacts may result if deployment of vehicles (i.e., SOWs, COWs, COLTs, or UAVs) occurs in unpaved areas, or if the implementation results in paving of previously unpaved surfaces. Some staging or landing areas (depending on the type of technology) may require land/vegetation clearing, excavation, and paving. Where deployable technologies would be implemented on existing paved surfaces, there would be no impacts to/from geologic resources because there would be no ground disturbance and mobile technologies could be moved to avoid geologic hazards.

- Satellites and Other Technologies
  - Satellite-Enabled Devices and Equipment: In most cases, the installation of permanent equipment on existing structures, adding equipment to satellites launched for other purposes, or the use of portable devices that use satellite technology would not impact geologic resources because those activities would not require ground disturbance. However, where equipment is permanently installed in locations that are susceptible to landslides, earthquakes, and other geologic hazards, it is possible that they could be affected by that hazard. The use of portable satellite-enabled devices would not impact geologic resources nor would it be affected by geologic hazards because there would be no ground disturbance nor any impact to the built or natural environment.

In general, the abovementioned activities could potentially involve ground disturbance resulting from land/vegetation clearing, topsoil removal, excavation, excavated material placement, trenching or directional boring, construction of access roads and other impervious surfaces, landscape grading, and heavy equipment movement. Potential impacts to geological resources associated with deployment could result in incidental removal of bedrock or mineral 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. As a result, these potential impacts are expected to be less than significant. For the same reason, impacts to deployment from geologic hazards are likely to be less than significant as well. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, operation activities associated with the Preferred Alternative would consist of routine maintenance and inspection of the facilities. Any major infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the abovementioned deployment impacts. It is anticipated that there would be no impacts to geology associated with routine inspections of the Preferred Alternative, assuming that the same access roads used for deployment are also used for inspections because there would be no ground disturbance.

The operation of the Preferred Alternative could be affected by to geologic hazards including seismic activity, volcanic activity, landslides, and land subsidence. However, potential impacts would be anticipated to be less than significant 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 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

6.2.3.4. 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 new construction associated with wired or wireless projects discussed above under the Preferred Alternative. Some limited construction could be associated with implementation such as land clearing or paving for parking or staging areas. The specific infrastructure associated with the Deployable Technologies Alternative would be the same as the deployable technologies implemented as part of the Preferred Alternative but would likely be implemented in greater numbers, over a larger geographic extent, and used with greater frequency and duration. Therefore, potential impacts to geology as a result of implementation of this alternative could be as described below.

Deployment Impacts

Implementation of deployable technologies on existing paved surfaces would not result in impacts to geologic resources (or from geologic hazards) as there would be no ground disturbance and mobile technologies could be moved to avoid geologic hazards. Potential impacts may result if deployment of vehicles (i.e., SOWs, COWs, COLTs, or UAVs) occurs in unpaved areas, or if the implementation results in paving of previously unpaved surfaces. Some staging or landing areas (depending on the type of technology) may require land/vegetation clearing, excavation, and paving. These impacts are expected to be less than significant due to the minor amount of paving or new infrastructure needed to accommodate the deployables.

Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

As explained above, operation activities would consist of implementation/running of the deployable technology and routine maintenance and inspections. As with the Preferred Alternative, it is anticipated that there would be no impacts to geologic resources (or from geologic hazards) associated with routine inspections of the Preferred Alternative because there would be no ground disturbance.

The operation of the Deployable Technologies Alternative could be affected by to geologic hazards including seismic activity, volcanic activity, landslides, and land subsidence. However, potential impacts would be anticipated to be less than significant as the deployment would be temporary and likely would attempt to avoid locations that were subject to increased seismic activity, landslides, and land subsidence. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

No Action Alternative

Under the No Action Alternative, the NPSBN would not be deployed; therefore, there would be no associated construction or installation of wired, wireless, deployable infrastructure, or satellites and other technologies. As a result, there would be no impacts to geologic resources (or from geologic hazards) from construction and operation of the Proposed Action. Environmental conditions would therefore be the same as those described in Section 6.1.3, Geology.

6.2.4. Water Resources

6.2.4.1. Introduction

This section describes potential impacts to water resources in Nevada associated with construction/deployment and operation of the Proposed Action and alternatives. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

6.2.4.2. Impact Assessment Methodology and Significance Criteria

The impacts of the Proposed Action on water resources were evaluated using the significance criteria presented in Table 6.2.4-1. The categories of impacts are defined as potentially significant, less than significant with mitigation incorporated, less than significant, or no impact. Characteristics of each impact type, including magnitude or intensity, geographic extent, and duration or frequency, were used to determine the impact significance rating associated with each potential impact.

Given the nature of this programmatic evaluation, and because the Proposed Action could potentially cover a wide variety of actions that would take place in various landscapes, the potential impacts to water resources addressed in this section are presented as a range of possible impacts.

Table 6.2.4-1: Impact Significance Rating Criteria for Water Resources

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
Water Quality (groundwater and surface water) - sedimentation, pollutants, nutrients, water temperature	Magnitude or Intensity	Groundwater contamination creating a drinking quality violation, or otherwise substantially degrade groundwater quality or aquifer; local construction sediment water quality violation, or otherwise substantially degrade water quality; water degradation poses a threat to the human environment, biodiversity, or ecological integrity. Violation of various regulations including: CWA, SDWA.	Effect that is potentially significant, but with mitigation is less than significant.	Potential impacts to water quality, but potential effects to water quality would be below regulatory limits and would naturally balance back to baseline conditions.	No changes to water quality; no change in sedimentation or water temperature, or the presence of water pollutants or nutrients.
	Geographic Extent/Context	Watershed level, and/or within multiple watersheds.		Watershed or subwatershed level.	NA
	Duration or Frequency	Chronic and long term changes not likely to be reversed over several years or seasons.		Impact is temporary, lasting no more than six months.	NA
Floodplain degradation[a]	Magnitude or Intensity	The use of floodplain fill, substantial increases in impervious surfaces, or placement of structures within a 500-year flood area that will impede or redirect flood flows or impact floodplain hydrology. High likelihood of encountering a 500-year floodplain within a state or territory.	Effect that is potentially significant, but with mitigation is less than significant.	Activities occur inside the 500-year floodplain, but do not use fill, do not substantially increase impervious surfaces, or place structures that will impede or redirect flood flows or impact floodplain hydrology, and do not occur during flood events. Low likelihood of encountering a 500-year floodplain within a state or territory.	Activities occur outside of floodplains and therefore do not increase fill or impervious surfaces, nor do they impact flood flows or hydrology within a floodplain.

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
	Geographic Extent	Watershed level, and/or within multiple watersheds.		Watershed or subwatershed level.	NA
	Duration or Frequency	Chronic and long term changes not likely to be reversed over several years or seasons.		Impact is temporary, lasting no more than one season or water year[b], or occurring only during an emergency.	NA
Drainage pattern alteration	Magnitude or Intensity	Alteration of the course of a stream of a river, including stream geomorphological conditions, or a substantial and measurable increase in the rate or amount of surface water or changes to the hydrologic regime.	Effect that is potentially significant, but with mitigation is less than significant.	Any alterations to the drainage pattern are minor and mimic natural processes or variations.	Activities do not impact drainage patterns.
	Geographic Extent	Watershed level, and/or within multiple watersheds.		Watershed or subwatershed level.	NA
	Duration or Frequency	Impact occurs in perennial streams, and is ongoing and permanent.		Impact is temporary, lasting no more than six months.	NA
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

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
Changes in groundwater or aquifer characteristics	Magnitude or Intensity	Substantial and measurable changes in groundwater or aquifer characteristics, including volume, timing, duration, and frequency of groundwater flow, and other changes to the groundwater hydrologic regime.	Effect that is potentially significant, but with mitigation is less than significant.	Any potential impacts to groundwater or aquifers are temporary, lasting no more than a few days, with no residual impacts.	Activities do not impact groundwater or aquifers.
	Geographic Extent	Watershed level, and/or within multiple watersheds.		Watershed or subwatershed level.	NA
	Duration or Frequency	Impact is ongoing and permanent.		Impact is temporary, not lasting more than six months.	NA

[a] Since public safety infrastructure is considered a critical facility, project activities should avoid the 500-year floodplain wherever practicable, per the Executive Orders on Floodplain Management (EO 11988 and EO 13690). (See http://www.archives.gov/federal-register/codification/executive-order/11988.html and https://www.federalregister.gov/articles/2015/02/04/2015-02379/establishing-a-federal-flood-risk-management-standard-and-a-process-for-further-soliciting-and).
[b] A water year is defined as "the 12-month period October 1, for any given year through September 30, of the following year. The water year is designated by the calendar year in which it ends and which includes 9 of the 12 months." (USGS, 2014f)
NA = Not Applicable

6.2.4.3. 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 half of Nevada's rivers, streams, lakes, reservoirs, and ponds are impaired; almost all of Nevada's wetlands are impaired (see Table 6.1.4-2 and Figure 6.1.4-3). Agriculture, natural sources, rangeland grazing in riparian or shoreline zones, non-point sources and impacts from abandoned mine lands are all contributing factors. Groundwater quality within the state is generally good. (NDEP, 2014a) (Thomas & Hoffman, 1987)

Deployment activities could contribute pollutants in a number of ways but the primary likely manner is increased sediment in surface waters. Vegetation removal on site exposes soils to rain and wind that could increase erosion. Impacts to water quality may occur from post-construction vegetation management, such as herbicides, that may leach into groundwater or move to surface waters through soil erosion or runoff, spray drift, or inadvertent direct overspray. Fuel, oil, and other lubricants from equipment could contaminate groundwater and surface waters if carried in runoff. Other water quality impacts could include changes in temperature, pH, dissolved oxygen levels, water odor, color, or taste, or addition of suspended solids.

Soil erosion or the introduction of suspended solids into waterways from implementation of the Preferred Alternative could contribute to degradation of water quality. If the Proposed Action and Alternatives would disturb more than 1 acre of soil, a state or USEPA NPDES Construction General Permit (CGP) would be required. As part of the permit application for the CGP, a stormwater pollution prevention plan (SWPPP) would need to be prepared containing BMPs that would be implemented to prevent, or minimize the potential for, sedimentation and erosion. Adherence to the CGP and the BMPs would help prevent sediment and suspended solids from entering the waterways and ensure that effects on water quality during construction would not be adverse.

Deployment activities associated with the Proposed Action have the potential to increase erosion and sedimentation around construction and staging areas. Grading activities associated with construction would potentially result in a temporary increase in the amount of suspended solids running off construction sites. If a storm event were to occur, construction site runoff could result in sheet erosion of exposed soil. If not adequately controlled, water runoff from these areas would have the potential to degrade surface water quality. Implementing BMPs and mitigation measures could help reduce potential impacts to surface water quality.

Expected deployment activities would not violate applicable state, federal (e.g., CWA, Safe Drinking Water Act), or 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 6.2.4-1, 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[138] or tower construction were to occur near or below the existing water table (depth to water), then dewatering would be anticipated at the location. Residual contaminated groundwater could be encountered during dewatering activities. Construction activities would need to comply with Nevada dewatering requirements. Any groundwater extracted during dewatering activities, or subject to the terms of a dewatering permit, may be required to be treated prior to discharge or disposed of at a wastewater treatment facility.

Nevada's principal aquifers consist of carbonate-rock[139] volcanic-rock, basaltic-rock, and basin-fill aquifers. 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. Groundwater supply is scarce throughout the state; thus, based on the impact significance criteria presented in Table 6.2.4-1, there would likely be less than significant impacts on groundwater quality within most of the state. In areas where groundwater is close to the surface, then site-specific analysis, BMPs, and mitigation measures could be implemented to further reduce potential impacts.

Floodplain Degradation

Floodplains are low-lying lands next to rivers and streams. When left in a natural state, floodplain systems store and dissipate floods without adverse impacts on human beings, buildings, roads and other infrastructure. The 500-year floodplain is the area of minimal flood hazard, where there is a 0.2-percent-annual-chance of flooding. 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 6.2.4-1, floodplain degradation impacts would be potentially less than significant since the majority of FirstNet's deployment, on the watershed or subwatershed level, 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

[138] 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).
[139] Carbonate-rock aquifers typically consist of limestone with highly variable water-yielding properties (some yield almost no water and others are highly productive aquifers) (Olcott, 1995).

technologies which may be deployed in response to an emergency. Additionally, any effects would likely be temporary, lasting no more than one season or water year, 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 but is built above base flood elevation pursuant to floodplain management regulations.
- Land uses that include pervious surfaces such as gravel parking lots.
- Land uses that do not change the flow of water or drainage patterns.
- Limited clearing or grading activities.

Implementation of BMPs and mitigation measures could help reduce the risk of additional impacts to floodplain degradation (see Chapter 9).

Drainage Pattern Alteration

Flooding and erosion from land disturbance could change 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 6.2.4-1, 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.

Examples of projects that could have minor changes to the drainage patterns include:

- Land uses with pervious surfaces that create limited stormwater runoff.
- Where stormwater is contained on site and does not flow to or impact surface waterbodies offsite on other properties.
- Activities designed so that the amount of stormwater generated before construction is the same as afterwards.
- 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 and mitigation measures could be implemented to further reduce any potentially significant impacts.

Flow Alteration

Flow alteration refers to the modification of flow characteristics, relative to natural conditions. Human activities may change the amount of water reaching a stream, divert flow through artificial channels, or alter the shape and location of streams. Surface water and groundwater withdrawals could alter flow by reducing water volumes in streams. Withdrawals may return to the surface/groundwater system at a point further downstream, be removed from the watershed through transpiration by crops, lawns or pastures, or be transferred to another watershed altogether (e.g., water transferred to a different watershed for drinking supply). Altered flow could increase flooding and introduce more erosion and potential for pollution. Alternatively, if water is diverted from its normal flow, the opposite may occur; wetlands and streams may not receive as much water as necessary to maintain the ecology and previous functions.

Activities that do not impact discharge or stage of waterbody (stream height) are not anticipated to have an impact on flow, according to Table 6.2.4-1. 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 offsite or into surface water bodies that have not received that volume of stormwater previously.
- Minor clearing or grading activities.

Since the proposed activities would not likely alter flow characteristics or change the hydrologic regime, impacts would be less than significant impacts to flow alteration. BMPs and mitigation measures could be implemented to further reduce any impacts.

Changes in Groundwater or Aquifer Characteristics

As described in Section 6.1.4.7, groundwater supply is scarce throughout the state. Areas with higher concentrations of people, such as Carson City, Reno, Sparks, and Las Vegas, depend heavily on surface water for their public water supply. Agricultural irrigation draws the most groundwater from the aquifers. (USGS, 1995a) Generally, the water quality of Nevada’s aquifers is suitable for drinking and daily water needs. Once a groundwater supply is exhausted or contaminated, it is very expensive, and sometimes impossible, to replace. Water supply demand from the deployment activities is unlikely to exceed safe and sustainable withdrawal capacity rate of the local supply or aquifer.

Storage of generator fuel over groundwater or an aquifer would be unlikely to cause significant impacts to water quality due to the expected small volume of these materials.

Activities that may cause changes is groundwater or aquifer characteristics include:

- Excavation 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 will likely have less than significant impacts since they would not substantially deplete supplies of potable groundwater, as any construction dewatering would be short-term. The siting of deployment activities should be considered to avoid areas that would extract groundwater from potable groundwater sources in the area. According to Table 6.2.4-1, potentially significant impacts to groundwater or aquifer characteristics would only occur if actions resulted in substantial and measurable changes in groundwater or aquifer characteristics, including volume, timing, duration, and frequency of groundwater flow, and other changes to the groundwater hydrologic regime on a watershed or within multiple watersheds that is ongoing and permanent. Chapter 9, 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.

6.2.4.4. Potential Impacts of the Preferred Alternative

The following section assesses potential impacts associated with implementation of the Preferred Alternative, including construction/deployment and operation activities.

Deployment Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, implementation of the Preferred Alternative could result in the deployment of various types of facilities or infrastructure. Depending on the physical nature and location of the facility/infrastructure and the specific deployment requirements, some activities would result in potential impacts to water resources and others would not. In addition, and as explained in this section, the same type of Proposed Action Infrastructure could result in a range of no impacts to potentially significant impacts depending on the deployment scenario or site-specific conditions. The impact on the water resources that could be affected would depend on the watershed, duration (chronic or short-term) and frequency (many years or a few months) the resource would be used, and the water resource’s current use (considered exceptional value for recreation, or provides critical habitat for a species).

Activities Likely to Have No Impacts

Of the types of facilities or infrastructure deployment scenarios described in Section 2.1.2, Proposed Action Infrastructure, the following are likely to have no impacts to water resources under the conditions described below:

- Wired Projects
  - Use of Existing Conduit – New Buried Fiber Optic Plant: Disturbance associated with the installation of fiber optic cable in existing conduit would be limited to entry and exit points of the existing conduit in previously disturbed areas. It is anticipated that there would be no impacts to water resources since the activities that would be conducted at these small entry and exit points are not likely to produce perceptible changes.
  - Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting up of dark fiber would have no impacts to water resources because there would be no ground disturbance.
- Satellites and Other Technologies
  - Satellite-Enabled Devices and Equipment: It is anticipated that the installation of permanent equipment on existing structures and the use of portable devices that use satellite technology would not impact water resources because those activities would not require ground disturbance.
  - Deployment of Satellites: FirstNet does not anticipate launching satellites as part of the deployment of the NPSBN; however, it could include equipment on satellites that are already being launched for other purposes. As adding equipment to an existing launch vehicle would be very unlikely to impact water resources, it is anticipated that this activity would have no impact on water resources.

Activities with the Potential to Have Impacts

Potential deployment-related impacts to water resources because of implementation of the Preferred Alternative would encompass a range of impacts that could occur, including impaired water quality. The types of deployment activities that could be part of the Preferred Alternative and result in potential impacts to water resources include the following:

- Wired Projects
  - New Build – Buried Fiber Optic Plant: Plowing (including vibratory plowing), trenching, or directional boring and the construction of POPs, huts, or other associated facilities or hand-holes to access fiber could result in potential impacts to water resources. Land/vegetation clearing and excavation activities, associated with construction of POPs, huts, or other associated facilities could result in direct and indirect impacts to water quality from a temporary increase in the amount of suspended solids running off construction sites. The amount of impact depends on the land area affected, installation technique, and location. Trenching would not be expected to occur near or below the existing water table (depth to water). Implementing BMPs and mitigation measures could reduce impact intensity.
  - New Build – Submarine Fiber Optic Plant: The installation of cables in limited nearshore and inland bodies of water would impact water resources from a short-term increase in suspended solids in the water. Site-specific impact assessment could be required to

aquatic 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 that could cause impacts to water quality from increased suspended solids.
- Installation of Optical Transmission or Centralized Transmission Equipment: If installation of transmission equipment required grading or other ground disturbance to install small boxes or huts, or access roads, there could potentially be direct and indirect impacts to water quality from a temporary increase in the amount of suspended solids running from construction sites. The amount of impact depends on the land area affected, installation technique, and location. Trenching would not be expected to occur near or below the existing water table (depth to water). If installation of transmission equipment would occur in existing boxes or huts and require no ground disturbance, there would be no impacts to water resources.

- Wireless Projects
  - New Wireless Communication Towers: Installation of new wireless towers and associated structures (generators, equipment sheds, fencing, security lighting, electrical feeds, and concrete foundations and pads) or access roads could result in potential direct and indirect impacts to water quality from a temporary increase in the amount of suspended solids running off construction sites. The amount of impact depends on the land area affected, installation technique, and location. Trenching would not be expected to occur near or below the existing water table (depth to water). Implementing BMPs and mitigation measures could reduce impact intensity. If a new roadway were built, additional impervious surface would not be expected to impact water resources or the overall amount of runoff and nonpoint pollution.
  - Deployable Technologies: Implementation of land-based deployable technologies could result in potential impacts to water resources if deployment involves movement of equipment through streams, occurs in riparian or floodplain areas, occurs in unpaved areas, or if the implementation results in paving of previously unpaved surfaces. Some staging or landing areas (depending on the type of technology) may require land/vegetation clearing, excavation, and paving. These activities could result in direct and indirect impacts to water quality from a temporary increase in the amount of suspended solids running off construction sites or deployment in unpaved areas. The amount of impact depends on the land area affected, installation technique, and location.

Implementing BMPs and mitigation measures could reduce impact intensity. The activities could also result in indirect impacts on water quality if fuels leak into surface or groundwater. Where deployable technologies would be implemented on existing paved surfaces, or where aerial and vehicular deployable technologies may be used on existing paved surfaces, it is anticipated that there would be no impacts to water resources because there would be no ground disturbance.

- Deployment of drones, balloons, blimps, or piloted aircraft could have indirect impacts on water quality if fuels spill or other chemicals seep into ground or surface waters. In general, the abovementioned activities could potentially involve land/vegetation clearing; excavation and trenching; installation of security/safety lighting and fencing; and deployment of aerial platforms. Potential impacts to water resources associated with deployment of this infrastructure could include water quality impacts, but are expected to be less than significant due to the small-scale of individual activities. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

In general, the abovementioned activities could potentially involve land/vegetation clearing; excavation and trenching; construction of access roads; installation or restructuring of towers or poles; installation of security/safety lighting and fencing; and deployment of aerial platforms. Potential impacts to water resources associated with deployment of this infrastructure would likely be less than significant due to the limited geographic scale of individual activities and would likely return to baseline conditions once revegetation of disturbed areas is complete. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its (p)artners 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, and are expected to have no impacts as there would be no ground disturbing activity and it is likely routine maintenance activities would be conducted along exiting roads and utility rights-of way. Any major infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the abovementioned construction impacts. Impacts to surface and groundwater quality from routine operations and maintenance, such as herbicide application to control vegetation, are not expected. Chapter 9, 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.

6.2.4.5. Alternatives Impact Assessment

The following section assesses potential impacts to water resources associated with the Deployable Technologies Alternative and the No Action Alternative.

Deployable Technologies Alternative

Under the Deployable Technologies Alternative option, a nationwide fleet of mobile communications systems would provide temporary coverage in areas not covered by the existing, usable infrastructure. There would be no collocation of equipment and minimal new construction associated with wired or wireless projects discussed above under the Preferred Alternative. Some limited construction could be associated with implementation such as land clearing or paving for parking or staging areas. The specific infrastructure associated with the Deployable Technologies Alternative would be the same as the deployable technologies implemented as part of the Preferred Alternative but would likely be implemented in greater numbers, over a larger geographic extent, and used with greater frequency and duration. Therefore, potential impacts to water resources as a result of implementation of this alternative could be as described below.

Deployment Impacts

As explained above, implementation of deployable technologies could result in less than significant impacts to water resources if those activities occurred on paved surfaces. Some staging or launching/landing areas (depending on the type of technology) may require land/vegetation clearing, excavation, and paving, however, these activities would be isolated and short term, and would likely return to baseline conditions once revegetation was complete. Additionally, project activities could result in direct and indirect impacts to water quality from a temporary increase in the amount of suspended solids running off construction sites and from fuels leaking into surface or groundwater. However, spills from vehicles or machinery used during deployment tend to be associated with re-fueling operations, and as such, would likely be a few gallons or less in volume and would likely be easily contained or cleaned up, and therefore would have less than significant impacts. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to 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 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 (considered exceptional value for recreation, or provides critical habitat for a species).

It is anticipated that there would be no impacts to water resources associated with routine inspections of the Deployable Technologies Alternative, assuming that the same access roads used for deployment are also used for inspections. If usage of heavy equipment as part of routine maintenance or inspections occurs off established access roads or corridors and near waterbodies, the resulting ground disturbance could increase sedimentation in waterbodies, potentially impacting water quality. It is assumed that routine maintenance would not include operation of vehicles or equipment in waterbodies. Finally, if ground-based deployable technologies are parked and operated with air conditioning for extended periods, 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. Site maintenance, including mowing or herbicides, may result in less than significant effects to water quality, due to the small-scale of expected FirstNet activities in any particular location. In addition, the presence of new access roads could increase the overall amount of impervious surface in the area, and increase runoff effects on water resources, as explained above. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

No Action Alternative

Under the No Action Alternative, the NPSBN would not be deployed; therefore, there would be no associated construction or installation of wired, wireless, deployable infrastructure or satellites and other technologies. As a result, there would be no impacts to water resources as a result of construction and operation of the Proposed Action. Environmental conditions would therefore be the same as those described in Section 6.1.4, Water Resources.

6.2.5. Wetlands

6.2.5.1. Introduction

This section describes potential impacts to wetlands in Nevada associated with deployment and operation of the Proposed Action and alternatives. Chapter 9, 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.

6.2.5.2. Impact Assessment Methodology and Significance Criteria

The impacts of the Proposed Action on wetlands were evaluated using the significance criteria presented in Table 6.2.5-1. The categories of impacts are defined as potentially significant, less than significant with mitigation incorporated, less than significant, or no impact. Characteristics of each impact type, including magnitude or intensity, geographic extent, and duration or frequency, were used to determine the impact significance rating associated with each potential impact.

Given the nature of this programmatic evaluation, and because the Proposed Action could potentially cover a wide variety of actions that would take place in various landscapes, the potential impacts to wetlands addressed in this section are presented as a range of possible impacts.

Table 6.2.5-1: Impact Significance Rating Criteria for Wetlands

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
Direct wetland loss (fill or conversion to non-wetland)	Magnitude[a] or Intensity	Substantial loss of high-quality wetlands (e.g., those that provide critical habitat for sensitive or listed species, are rare or a high-quality example of a wetland type, are not fragmented, support a wide variety of species, etc.); violations of Section 404 of the CWA.	Effect that is potentially significant, but with mitigation is less than significant.	Impacts to lower quality wetlands (e.g., not rare or unique, that have low productivity and species diversity, and those that are already impaired or impacted by human activity).	No direct loss of wetlands.
	Geographic Extent/Context	Watershed level, and/or within multiple watersheds.		Watershed or subwatershed level.	NA
	Duration or Frequency	Chronic and long term changes not likely to be reversed over several years or seasons.		Periodic and/or temporary loss reversed over 1-2 growing seasons with or without active restoration.	NA
Other direct effects: vegetation clearing; ground disturbance; direct hydrologic changes (flooding or draining); direct soil changes; water quality degradation (spills or sedimentation)	Magnitude or Intensity	Substantial and measurable changes to hydrological regime of the wetland impacting salinity, pollutants, nutrients, biodiversity, ecological integrity, or water quality; introduction and establishment of invasive species to high quality wetlands.	Effect that is potentially significant, but with mitigation is less than significant.	Impacts to lower quality wetlands affecting the hydrological regime including salinity, pollutants, nutrients, biodiversity, ecological integrity, or water quality; introduction and establishment of invasive species to high quality wetlands.	No direct impacts to wetlands affecting vegetation, hydrology, soils, or water quality.
	Geographic Extent	Watershed level, and/or within multiple watersheds.		Watershed or subwatershed level.	NA

Type of Effect	**Effect Characteristics**	**Impact Level**			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
	Duration or Frequency	Long-term or permanent alteration that is not restored within 2 growing seasons, or ever.		Periodic and/or temporary loss reversed over 1-2 growing seasons with or without active restoration.	NA
Indirect Effects: [b] Change in Function(s)[c] Change in Wetland Type	Magnitude or Intensity	Changes to the functions or type of high quality wetlands (e.g., those that provide critical habitat for sensitive or listed species, are rare or a high-quality example of a wetland type, are not fragmented, support a wide variety of species, etc.).	Effect that is potentially significant, but with mitigation is less than significant.	Impacts to lower quality wetlands (e.g., not rare or unique, that have low productivity and species diversity, and those that are already impaired or impacted by human activity).	No changes in wetland function or type.
	Geographic Extent	Watershed level, and/or within multiple watersheds.		Watershed or subwatershed level.	NA
	Duration or Frequency	Long-term or permanent.		Periodic and/or temporary loss reversed over 1-2 growing seasons with or without active restoration.	NA

[a] "Magnitude" is defined based on the type of wetland impacted, using USACE wetland categories. Category 1 are the highest quality, highest functioning wetlands
[b] Indirect effects are those resulting from direct effects, but they occur elsewhere in space and/or time. Includes indirect hydrologic effects (wetting or drying) that in turn alters wetland function or type
[c] Wetland functions include hydrologic, ecological, geomorphic, and social functions typically assessed for wetlands as part of USACE compensatory mitigation planning. Typical functions assessed may include flood attenuation, bank stabilization, water quality, organic matter input/transport, nutrient processing, wildlife habitat, T/E species habitat, biodiversity, recreational/social value.

NA = Not Applicable

6.2.5.3. Description of Environmental Concerns

Potential Direct Wetland Loss (Fill or Conversion to Non-Wetland)

Construction-related impacts from several of the deployment activities have the potential for direct wetland impacts such as filling, draining, or conversion to a non-wetland. Examples include placement of fill in a wetland to construct a new tower, trenching through a wetland or directly connected waterway to install a cable, and placement of a structure (tower, building) within the wetland.

Wetlands regulate the quality and quantity of surface and groundwater supplies, reduce flood hazards by serving as retention basins for surface runoff, and maintain water supplies after floodwaters subside. If wetlands were filled, the entire area may be at risk for increased flooding. There could be a loss of open space to be enjoyed by the community, and decreased wildlife populations may be observed due to displacement and increased noise, light, and other human disturbance. To the extent practicable or feasible, FirstNet and/or its partners would avoid filling wetlands or altering the hydrologic regime so that wetlands would not be lost or converted to non-wetlands. Loss of high and low-quality wetlands would be less than significant given the amount of land disturbance associated with the project locations (generally less than an acre) and the short time-frame of deployment activities. Additionally, all site-specific locations will be subject to an environmental review to help ensure environmental concerns are addressed. To minimize any potential impacts to wetlands, BMPs and mitigation measures would be implemented in compliance with any issued federal, state, and local permits. Chapter 9, 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.

There are approximately 1.7 million acres of palustrine and lacustrine wetlands throughout Nevada (USFWS, 2016b). Palustrine (freshwater) wetlands are found along channels, rivers and lake floodplains across the state, and lacustrine wetlands are found around lakes (both manmade and natural).

Based on the impact significance criteria presented in Table 6.2.5-1, the deployment activities would most likely have less than significant direct impacts on wetlands. Additionally, the deployment activities would not violate applicable federal, state, and local regulations.

As discussed in Section 6.1.5.4, Wetlands, there are no federally regulated wetlands of special concern (high quality) in Nevada. However, Stillwater Marsh, Nevada's largest wetland is considered a high quality wetland. If any of the proposed deployment activities were to occur in high quality wetlands, potentially significant impacts could occur. To minimize any potential impacts to wetlands, BMPs and mitigation measures would be implemented in compliance with any issued federal, state, and local permits. Chapter 9, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Potential Other Direct Effects

Other direct impacts consist of altering the chemical, physical, or biological components of a wetland to the extent that changes to the wetland functions occur. However, other direct impacts would not result in a loss of total wetland acreage. Changes, for example, could include conversion of a forested wetland system to a non-forested state through chemical, mechanical, or hydrologic manipulation; altered hydrologic conditions (increases or decreases) such as stormwater discharges or water withdrawals that alter the functions of the wetlands.

Based on the impact significance criteria presented in Table 6.2.5-1, construction-related deployment activities that result in long-term or permanent, substantial, and measurable changes to hydrological regime of the wetland (i.e., changes in salinity, pollutants, nutrients, biodiversity, ecological integrity, or water quality) may cause potentially significant impacts. Other direct effects to 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 timeframe of deployment activities and the application of federal, state, and local wetlands regulations. Additionally, all site-specific locations would be subject to an environmental review to help ensure environmental concerns are addressed. To minimize any potential impacts to wetlands, BMPs and mitigation measures would be implemented in compliance with any issued federal, state, and local permits. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Examples of activities that could have other direct effects to wetlands in Nevada include:

- *Vegetation Clearing*: removing existing vegetation by clearing forest and herbaceous vegetation during construction activities, grading, seeding, and mulching. Clearing and grading may include increased soil erosion and a decrease in the available habitat for wildlife.
- *Ground Disturbance*: Increased amounts of stormwater runoff in wetlands could alter water level response times, depths, and duration of water detention. Reduction of watershed infiltration capacity could cause wetland water depths to rise more rapidly following storm events.
- *Direct Hydrologic Changes (flooding or draining)*: Greater frequency and duration of flooding could destroy native plant communities, as could depriving them of their water supply. Hydrologic changes could make a wetland more vulnerable to pollution. Increased water depths or flooding frequency could distribute pollutants more widely through a wetland. Sediment retention in wetlands is directly related to flow characteristics, including degree and pattern of channelization, flow velocities, and storm surges.
- *Direct Soil Changes*: Changes in soil chemistry could lead to degradation of wetlands that have a specific pH range and/or other parameter.
- *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:[140] Change in Function(s)[141] or Change in Wetland Type

Indirect effects to wetlands could include change in wetland function or conversion of a resource to another type (i.e., wetland to an open body of water). The construction of curb and gutter systems diverts surface runoff and could cause flooding or wetlands to dry out, depending on the direction of diversion. Indirect effects to high- and low-quality wetlands would be less than significant given the amount of land disturbance associated with the project locations (generally less than an acre) and the short time-frame of deployment activities and the application of federal, state, and local wetlands regulations. Additionally, all site-specific locations will be subject to an environmental review to help ensure environmental concerns are addressed. To minimize any potential impacts to wetlands, BMPs and mitigation measures would be implemented in compliance with any issued federal, state, and local permits. Potential wetlands impacts could be further reduced by implementing BMPs and mitigation measures, as practicable and feasible (see Chapter 9).

Examples of functions related to wetlands in Nevada 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.
- *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.

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[140] 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.
[141] 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.

- *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 6.2.5-1, 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 wetlands in the state are not considered high quality, deployment activities would likely have less than significant indirect impacts on wetlands in the state. To minimize any potential impacts to wetlands, BMPs and mitigation measures would be implemented in compliance with any issued federal, state, and local permits. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

6.2.5.4. Potential Impacts of the Preferred Alternative

The following section assesses potential impacts associated with implementation of the Preferred Alternative, including deployment and operation activities. To determine the magnitude of potential impacts of site-specific activities, wetland delineations could be required to determine the exact location of all wetlands, including high quality wetlands, as well as a functional assessment by an experienced wetland delineator.

Deployment Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, implementation of the Preferred Alternative could result in the deployment of various types of facilities or infrastructure. Depending on the physical nature and location of the facility/infrastructure and the specific deployment requirements, some activities would result in potential impacts to wetlands and others would not. In addition, and as explained in this section, the same type of Proposed Action Infrastructure could result in a range of no impacts to potentially significant impacts depending on the deployment scenario or site-specific conditions.

Activities Likely to Have No Impacts

Of the types of facilities or infrastructure deployment scenarios described in Section 2.1.2, Proposed Action Infrastructure, the following are likely to have no impacts to wetlands under the conditions described below:

- Wired Projects
  - Use of Existing Conduit – New Buried Fiber Optic Plant: Disturbance associated with the installation of fiber optic cable in existing conduit would be limited to entry and exit points of the existing conduit in previously disturbed areas. It is anticipated that there would be no impacts to wetlands since the activities that would be conducted at these small entry and exit points are not likely to produce perceptible changes.

- Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting up of dark fiber would have no impacts to wetlands because there would be no ground disturbance.

- Satellites and Other Technologies
  - Satellite-Enabled Devices and Equipment: It is anticipated that the installation of permanent equipment on existing structures, adding equipment to satellites being launches for other purposes, and the use of portable devices that use satellite technology is not likely to impact wetlands since there would be no ground disturbance.
  - Deployment of Satellites: FirstNet does not anticipate launching satellites as part of the deployment of the NPSBN; however, it may include equipment on satellites that are already being launched for other purposes. As adding equipment to an existing launch vehicle would be very unlikely to impact wetlands, it is anticipated that this activity would have no impact on wetlands.

Activities with the Potential to Have Impacts

Potential deployment-related impacts to wetlands because of implementation of the Preferred Alternative would encompass a range of impacts that could occur, including direct effects, other direct effects, and indirect effects on wetlands. The types of deployment activities that could be part of the Preferred Alternative and result in potential impacts to wetlands include the following:

- Wired Projects
  - New Build – Buried Fiber Optic Plant: Plowing (including vibratory plowing), trenching, or directional boring and the construction of POPs, huts, or other associated facilities or hand-holes to access fiber could result in potential impacts to wetlands. Land/vegetation clearing and excavation activities, associated with construction of POPs, huts, or other associated facilities could result in direct and indirect impacts to wetlands. The amount of impact depends on the land area affected, installation technique, proximity to wetlands, and type of wetland that could be affected (e.g., high quality). Any ground disturbance could cause direct and indirect impacts wetlands, depending on the proximity to wetlands and type of wetlands that could be affected. Implementing BMPs and mitigation measures could reduce impact intensity.
  - New Build – Submarine Fiber Optic Plant: The installation of cables in limited nearshore and inland bodies of water would potentially impact wetlands found along shorelines. Additional project-specific environmental reviews would be required to assess potential impacts to wetland environments, including coastal 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 to 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 help reduce impact intensity.

- Wireless Projects
  - New Wireless Communication Towers: Installation of new wireless towers and associated structures (generators, equipment sheds, fencing, security and aviation lighting, electrical feeds, and concrete foundations and pads) or access roads could potentially cause direct and indirect impacts to wetlands. The activities could cause a temporary increase in the amount of suspended solids running off construction sites and into wetlands, depending on their proximity. The amount of impact depends on the land area affected, installation technique, and proximity to wetlands, and wetland type. If trenching were to occur near wetlands, it could cause impacts on wetlands. Implementing BMPs and mitigation measures could reduce impact intensity.
  - Collocation on Existing Wireless Tower, Structure, or Building: Collocation would involve mounting or installing equipment (such as antennas or microwave dishes) on an existing tower, which would not result in impacts to wetlands. However, if additional power units, structural hardening, and physical security measures required ground disturbance, such as grading, or excavation activities, impacts to wetlands could occur near wetlands, it could cause impacts on wetlands. Implementing BMPs and mitigation measures could reduce impact intensity.
  - Deployable Technologies: Implementation of deployable technologies could result in potential impacts to wetlands if deployment occurs in unpaved areas, or if the implementation results in paving of previously unpaved surfaces. Some staging or landing areas (depending on the type of technology) may require land/vegetation clearing, excavation, and paving. The amount of impact depends on the land area affected, installation technique, and location. Implementing BMPs and mitigation measures could reduce impact intensity. The activities could also result in other direct impacts on wetlands if fuels leak into nearby waterbodies or wetlands. Deployment of drones, balloons, 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 indirect impacts wetlands, depending on the proximity to wetlands and type of wetlands that could be affected. These impacts are expected to be less than significant due to the small amount of land disturbance (generally less than one acre) and the short timeframe of deployment activities. To minimize any potential impacts to wetlands, BMPs and mitigation measures would be implemented in compliance with any issued federal, state, and local permits. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, operation activities associated with the Preferred Alternative would consist of routine maintenance and inspection of the facilities. Any major infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the abovementioned construction impacts. It is anticipated that there could be ongoing potential other direct impacts to wetlands if heavy equipment is used for routine operations and maintenance application of herbicides occurs to control vegetation along all ROWs and near structures, depending on the proximity of wetlands. The intensity of the impact depends on the amount of herbicides used, frequency, and location of nearby sensitive wetlands. These impacts are expected to be less than significant due to the limited nature of deployment activities. It is also anticipated that routine maintenance activities would be conducted on existing roads and utility ROW. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

6.2.5.5. Alternatives Impact Assessment

The following section assesses potential impacts to water resources associated with the Deployable Technologies Alternative and the No Action Alternative.

Deployable Technologies Alternative

Under the Deployable Technologies Alternative option, a nationwide fleet of mobile communications systems would provide temporary coverage in areas not covered by the existing, usable infrastructure. There would be no collocation of equipment and minimal new construction associated with wired or wireless projects discussed above under the Preferred Alternative. Some limited construction could be associated with implementation such as land clearing or paving for parking or staging areas. The specific infrastructure associated with the Deployable Technologies Alternative would be the same as the deployable technologies implemented as part of the Preferred Alternative but would likely be implemented in greater numbers, over a larger geographic extent, and used with greater frequency and duration.

Therefore, potential impacts to wetlands as a result of implementation of this alternative could be as described below.

Deployment Impacts

As explained above, implementation of deployable technologies could result in less than significant impacts to wetlands. Some staging or launching/landing areas (depending on the type of technology) may require land/vegetation clearing, excavation, and paving. These activities could result in direct and indirect impacts to wetlands from a temporary increase in the amount of suspended solids running off construction sites to nearby surface waters. The amount of impact depends on the land area affected, installation technique, and proximity to wetlands, and wetland type; however, impacts are expected to be less than significant due to the small-scale and temporary duration of expected FirstNet deployment activities in any one location. To minimize any potential impacts to wetlands, BMPs and mitigation measures would be implemented in compliance with any issued federal, state, and local permits. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, operation activities associated with the Deployable Technologies Alternative would consist of routine maintenance and inspection of the deployable technologies. Any major infrastructure replacement as part of ongoing system maintenance could result in impacts similar to the abovementioned deployment impacts. The wetlands impacts would depend on the watershed, duration (chronic or short-term) and frequency (many years or a few months) the resource would be used, and the wetland's quality and function.

It is anticipated that there would be less than significant impacts to wetlands associated with routine inspections of the Deployable Technologies Alternative as it is likely existing roads and utility rights-of-way would be utilized for maintenance and inspection activities. Site maintenance, including mowing or herbicides, is anticipated to result in less than significant effects to wetlands due to the limited nature of site maintenance activities, including mowing and application of herbicides. To minimize any potential impacts to wetlands, BMPs and mitigation measures would be implemented in compliance with any issued federal, state, and local permits. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

No Action Alternative

Under the No Action Alternative, the NPSBN would not be deployed; therefore, there would be no associated construction or installation of wired, wireless, deployable infrastructure or satellites and other technologies. As a result, there would be no impacts to wetlands from construction and operation of the Proposed Action. Environmental conditions would therefore be the same as those described in Section 6.1.5, Wetlands.

6.2.6. Biological Resources

6.2.6.1. Introduction

This section describes potential impacts to terrestrial vegetation, wildlife, fisheries and aquatic habitat, and threatened and endangered species in Nevada associated with deployment and operation of the Proposed Action and its alternatives. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

6.2.6.2. 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 6.2.6-1. The categories of impacts are defined as potentially significant, less than significant with mitigation incorporated, less than significant, or no impact. Characteristics of each impact type, including magnitude or intensity, geographic extent, and duration or frequency, were used to determine the impact significance rating associated with each potential impact.

Given the nature of this programmatic evaluation, and because the Proposed Action could potentially cover a wide variety of actions that would take place in various landscapes, the potential impacts to terrestrial vegetation, wildlife, and fisheries and aquatic habitat addressed in Sections 6.2.6.3, 6.2.6.4, and 6.2.6.5, respectively, are presented as a range of possible impacts.

Refer to Section 6.2.6.6 for impact assessment methodology and significance criterial associated with threatened and endangered species in Nevada.

Table 6.2.6-1: Impact Significance Rating Criteria for Terrestrial Vegetation, Wildlife, Fisheries, and Aquatic Habitats

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 Marine Mammal Protection Act (MMPA), Magnuson Stevens Fishery Conservation And Management Act (MSFCMA), MBTA, and Bald and Golden Eagle Protection Act (BGEPA).	Effect that is potentially significant, but with 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 Nevada 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 MMPA, MSFCMA, MBTA, and BGEPA.	Effect that is potentially significant, but with BMPs and mitigation measures is less than significant.	Habitat alteration in locations not designated as vital or critical for any period. Temporary losses to individual plants within cover types, or small habitat alterations take place in important habitat that is widely distributed and there are no cover type losses or cumulative effects from additional projects.	Sufficient habitat would remain functional to maintain viability of all species. No damage or loss of terrestrial, aquatic, or riparian habitat from project would occur.
	Geographic Extent	Regional effects observed within Nevada 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	Impact Level: Less than Significant with BMPs and Mitigation Measures Incorporated	Impact Level: Less than Significant	Impact Level: No Impact
Indirect Injury/Mortality	Magnitude or Intensity	Population-level or sub-population effects observed for at least one species depending on the distribution and the management of said species. Exclusion from resources necessary for the survival of one or more species and one or more life stages. Anthropogenic disturbances that lead to mortality, disorientation, the avoidance or exclusion from nutritional or habitat resources for endemics or a significant portion of the population or sub-population located in a small area during a specific season. Violation of various regulations including MMPA, MSFCMA, MBTA, and BGEPA.	Effect that is potentially significant, but with BMPs and mitigation measures is less than significant.	Individual injury/mortality observed but not sufficient to affect population or sub-population survival. Partial exclusion from resources in locations not designated as vital or critical for any given species or life stage, or exclusion from resources that takes place in important habitat that is widely distributed. Anthropogenic disturbances are measurable but minimal as determined by individual behavior and propagation, and the potential for habituation or adaptability is high given time.	No stress or avoidance of feeding or important habitat areas. No reduced population resulting from habitat abandonment.
	Geographic Extent	Regional or site-specific effects observed within Nevada 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	Impact Level: Less than Significant with BMPs and Mitigation Measures Incorporated	Impact Level: Less than Significant	Impact Level: No Impact
	Duration or Frequency	Chronic and long-term effects not likely to be reversed over several years for at least one species.		Temporary, isolated, or short-term effects that are reversed within one to three years.	NA
Effects to Migration or Migratory Patterns	Magnitude or Intensity	Population-level or sub-population effects observed for at least one species depending on the distribution and the management of said species. Temporary or long-term loss of migratory pattern/path or rest stops due to anthropogenic activities. Violation of various regulations including: MMPA, MSFCMA, MBTA, and BGEPA.	Effect that is potentially significant, but with 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 Nevada for at least one species. Anthropogenic disturbances that lead to exclusion from nutritional or habitat resources during migration, or lead to changes of migratory routes for endemics or a significant portion of the population or sub-population located in a small area during a specific season.		Effects realized at one location when population is widely distributed, and not concentrated in affected area.	NA
	Duration or Frequency	Chronic and long-term effects not likely to be reversed over several years for at least one species.		Temporary, isolated, or short-term effects that are reversed within one to three years.	NA

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	Less than Significant with BMPs and Mitigation Measures Incorporated	Less than Significant	No Impact
Reproductive Effects	Magnitude or Intensity	Population or sub-population level effects in reproduction and productivity over several breeding/spawning seasons for at least one species depending on the distribution and the management of said species. Violation of various regulations including: MMPA, MSFCMA, MBTA, and BGEPA.	Effect that is potentially significant, but with BMPs and mitigation measures is less than significant.	Effects to productivity are at the individual rather than population level. Effects are within annual variances and not sufficient to affect population or sub-population survival.	No reduced breeding or spawning success.
	Geographic Extent	Regional effects observed within Nevada 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	Impact Level: Less than Significant with BMPs and Mitigation Measures Incorporated	Impact Level: Less than Significant	Impact Level: 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 Nevada.		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, 2016e)
NA = Not Applicable

6.2.6.3. Terrestrial Vegetation

Impacts to terrestrial vegetation occurring in Nevada 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 6.2.6-1, direct injury or mortality impacts could be significant if population-level or sub-population effects were observed for at least one species depending on the distribution and the management of the subject species. 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 and therefore would have less than significant impacts. The implementation of BMPs and mitigation measures and avoidance measures could help to minimize or altogether avoid potential impacts to plant population survival. Chapter 9, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Vegetation and Habitat Loss, Alteration, or Fragmentation

Habitat impacts are primarily physical disturbances that result in alterations in the amount or quality of a habitat. As with all of the effects categories, the magnitude of the potential impact depends on the duration, location, and spatial scale of the system and associated activities. Habitat fragmentation is the loss or breaking down of continuous and connected habitat. Areas near Las Vegas and Reno have experienced extensive land use changes from urbanization and agriculture. However, a large portion of the state is arid and semi-desert and remains relatively unfragmented.

Construction of new infrastructure and long-term facility maintenance would result in the alteration of the type of vegetative communities in these localized areas, and in some instances the permanent loss of vegetation. In general, these impacts are expected to be less than significant due to the short-term, localized nature of the deployment activities. Further, some limited amount of infrastructure may be built in sensitive or rare regional vegetative communities, in which case BMPs and mitigation measures would be recommended and consultation with the appropriate resource agencies, if required, would be undertaken to minimize or avoid potential impacts.

Indirect Injury/Mortality

Indirect effects are effects that are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable (40 CFR 1508.8[b]). Indirect injury/mortality could include stress related to disturbance. The alteration of soils or hydrology within a localized area could result in stress or mortality of plants. Construction activities that remove large quantities of soil in the immediate vicinity of trees could cause undue stress to trees from root exposure, although this is unlikely to occur due to the small size of expected FirstNet activities. Indirect injury/mortality impacts vary depending on the species, time of year and duration of construction or deployment. Overall, these impacts are expected to be less than significant due to the short-term and small-scale nature of deployment activities. Chapter 9, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Effects to Migration or Migratory Patterns

No effects to the long-term migration or migratory patterns for terrestrial vegetation (e.g., forest migration) are expected as a result of the Proposed Action, given the small-scale of deployment activities.

Reproductive Effects

No reproductive effects to terrestrial vegetation are expected as a result of the Proposed Action given the small-scale of deployment activities.

Invasive Species Effects

When human activity results in a species entering an ecosystem new to it, the species is classified as introduced or, depending on its ability to spread rapidly and outcompete native species, invasive. The introduction of invasive species could have a dramatic effect on natural resources and biodiversity. Nevada uses NRS 555 to control insects, pests, and noxious weeds through weed control districts, requiring each district to prepare regulations for their district species management and control. These efforts help control invasive species with the greatest potential to impact the state's biodiversity.

As described in Section 6.1.6.4, when non-native species are introduced into an ecosystem in which they did not evolve, their populations sometimes increase rapidly.

The potential to introduce invasive plants within construction zones and during long-term site maintenance could occur from vehicles and equipment being transported from one region to another, or when conducting revegetation of a site after deployment activities are complete. Overall, these impacts are expected to be less than significant due to the small-scale, localized nature of deployment activities. BMPs and mitigation measures could help to minimize or avoid the potential for introducing invasive plant species during implementation of the Proposed Action. Chapter 9, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Potential Impacts of the Preferred Alternative

The following section assesses potential impacts associated with implementation of the Preferred Alternative, including 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[142], and the nature as well as the extent of the habitats affected. Chapter 9, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Activities Likely to Have No Impacts

Of the types of facilities or infrastructure deployment scenarios described in Section 2.1.2, Proposed Action Infrastructure, the following are expected to have no impacts to terrestrial vegetation under the conditions described below:

- Wired Projects
  - Use of Existing Conduit – New Buried Fiber Optic Plant: Disturbance associated with the installation of fiber optic cable in existing conduit would be limited to entry and exit points of the existing conduit in previously disturbed areas. Although terrestrial vegetation could be impacted, it is anticipated that effects to vegetation would be minimal since the activities that would be conducted at these small entry and exit points are not likely to produce perceptible changes.
  - Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting up of dark fiber would have no impacts to terrestrial vegetation because there would be no ground disturbance.
- Satellites and Other Technologies
  - Satellite-Enabled Devices and Equipment: It is anticipated that the installation of permanent equipment on existing structures, attaching equipment to satellite launches for other purposes, and the use of portable devices that use satellite technology would not impact terrestrial vegetation because those activities would not require ground disturbance.

[142] Phenology is the seasonal changes in plant and animal lifecycles, such as emergence of insects or migration of birds.

- Deployment of Satellites: FirstNet does not anticipate launching satellites as part of the deployment of the NPSBN; however, it could include equipment on satellites that are already being launched for other purposes. As adding equipment to an existing launch vehicle would be very unlikely to impact biological resources, it is anticipated that this activity would have no impact on terrestrial vegetation.

Activities with the Potential to Have Impacts

Potential deployment-related impacts to terrestrial vegetation as a result of implementation of the Preferred Alternative would encompass a range of impacts that could occur, including direct injury/mortality; vegetation and habitat loss, alteration, or fragmentation; indirect injury/mortality; and invasive species effects. The types of infrastructure deployment activities that could be part of the Preferred Alternative and result in potential impacts to terrestrial vegetation include the following:

- Wired Projects
  - New Build – Buried Fiber Optic Plant: Plowing, trenching, or directional boring and the construction of POPs, huts, or other associated facilities or hand-holes to access fiber could result in potential impacts to terrestrial vegetation. Land/vegetation clearing and excavation activities, associated with construction of POPs, huts, or other associated facilities could result in direct or indirect injury to plants; the loss, alteration, or fragmentation of vegetative communities; and invasive species. Implementation of BMPs and mitigation measures could help to avoid or minimize potential impacts.
  - New Build – Aerial Fiber Optic Plant: The installation of new poles and hanging cable and associated security, safety, or public lighting components on public ROWs or private easements as well as the construction of access roads, POPs, huts, or facilities to house outside plant equipment could result in potential impacts to terrestrial vegetation. Impacts may vary depending on the number or individual poles installed, but could include direct or indirect injury to plants; the loss, alteration, or fragmentation of vegetative communities; and invasive species effects. BMPs and mitigation measures could help avoid or minimize potential impacts.
  - Collocation on Existing Aerial Fiber Optic Plant: Land clearing and excavation during replacement of poles and structural hardening could result in direct or indirect injury to plants; the loss, alteration, or fragmentation of vegetative communities; and invasive species effects.
  - New Build – Submarine Fiber Optic Plant: The installation of cables in or near bodies of water would not impact terrestrial vegetation. However, impacts to terrestrial vegetation could potentially occur as a result of the construction of landings and/or facilities on shores or the banks of waterbodies that accept the submarine cables could potentially occur as a result of land clearing, excavation activities, and heavy equipment use. Effects could include direct or indirect injury to plants; the loss, alteration, or fragmentation of vegetative communities; and invasive species effects if BMPs and mitigation measures are not implemented.

  - Installation of Optical Transmission or Centralized Transmission Equipment: If installation of transmission equipment required construction of access roads, trenching, and/or land clearing, such disturbance could result in direct or indirect injury to plants, vegetation loss, and invasive species effects.
- Wireless Projects
  - New Wireless Communication Towers: Installation of new wireless towers and associated structures (generators, equipment sheds, fencing, security and aviation lighting, electrical feeds, and concrete foundations and pads), microwave facilities, or access roads could result in impacts to terrestrial vegetation. Land/vegetation clearing, excavation activities, landscape grading, and other disturbance activities during the installation of new wireless towers and associated structures or access roads could result in direct or indirect injury to plants; the loss, alteration, or fragmentation of vegetative communities; and invasive species effects.
  - Collocation on Existing Wireless Tower, Structure, or Building: Collocation would involve mounting or installing equipment (such as antennas or microwave dishes) on an existing tower, which would not result in impacts to terrestrial vegetation. However, if additional power units, replacement towers, structural hardening, and physical security measures require land clearing or excavation activities, impacts would be similar to new wireless construction.
  - Deployable Technologies: Implementation of deployable technologies including COWs, COLTs, or SOWs could result in direct impacts to terrestrial vegetation if deployment occurs on vegetated areas, or the implementation results in paving of previously unpaved surfaces. Some staging or landing areas (depending on the type of technology) may require land/vegetation clearing, excavation, and paving. These activities could result in direct or indirect injury to plants; the loss, alteration, or fragmentation of vegetative communities; and invasive species effects.

    Deployment of drones, balloons, blimps, or piloted aircraft could potentially impact terrestrial vegetation if launching or recovery occurs on vegetated areas. Impacts would be similar to deployment of COWs, COLTs, and SOWs.

In general, the abovementioned activities could potentially involve land/vegetation clearing; topsoil removal; excavation and trenching; construction of access roads; installation or restructuring of towers, poles, or cables; heavy equipment movement; installation of security/safety lighting and fencing; and deployment of aerial platforms. Potential impacts to terrestrial vegetation associated with deployment of this infrastructure, depending on their scale, could include direct or indirect injury/mortality to plants; the loss, alteration, or fragmentation of vegetative communities; and invasive species depending on the ecoregion, the species' phenology, and the nature and extent of the vegetation affected. These potential impacts are expected to be less than significant due to the small-scale of expected deployment activities. Chapter 9, BMPs and Mitigation Measures, provide a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, operational activities associated with the Preferred Alternative would consist of routine maintenance and inspection of the facilities. Any major infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the abovementioned deployment impacts. The terrestrial vegetation that would be affected would depend on the ecoregion, the species' phenology, and the nature and extent of the habitats affected.

It is anticipated that there would be no impacts to terrestrial vegetation associated with routine inspections of the Preferred Alternative, assuming that the same access roads used for deployment are also used for inspections. Site maintenance, including mowing or herbicides, may result in less than significant effects due to the small-scale of expected activities. These potential impacts could result from accidental spills from maintenance equipment or release of herbicides and because these areas would not be allowed to revert to a more natural state. If usage of heavy equipment or land clearing activities occurs off established roads or corridors as part of routine maintenance or inspections, direct or indirect injury/mortality to plants; the loss, alteration, or fragmentation of vegetative communities; and invasive species could occur to terrestrial vegetation, however impacts are expected to be less than significant due to the small-scale of expected activities. Chapter 9, BMPs and Mitigation Measures, provide 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.

Alternatives Impact Assessment

The following section assesses potential impacts to terrestrial vegetation associated with the Deployable Technologies Alternative and the No Action Alternative.

Deployable Technologies Alternative

Under the Deployable Technologies Alternative option, a nationwide fleet of mobile communications systems would provide temporary coverage in areas not covered by the existing, usable infrastructure. There would be no collocation of equipment and minimal new construction associated with wired or wireless projects discussed above under the Preferred Alternative. Some limited construction could be associated with implementation such as land clearing or paving for parking or staging areas. The specific infrastructure associated with the Deployable Technologies Alternative would be the same as the deployable technologies implemented as part of the Preferred Alternative but would likely be implemented in greater numbers, over a larger geographic extent, and used with greater frequency and duration. Therefore, potential impacts to terrestrial vegetation as a result of implementation of this alternative could be as described below.

Deployment Impacts

As described above, implementation of deployable technologies could result in less than significant impacts from land/vegetation clearing, excavation, and paving activities. These activities could result in direct or indirect injury to plants; the loss, alteration, or fragmentation of vegetative communities; and invasive species effects. Greater frequency and duration of deployments could change the magnitude of impacts. However, impacts are expected to remain less than significant due to the relatively small-scale of FirstNet activities at individual locations. Chapter 9, BMPs and Mitigation Measures, provide 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. The impacts could vary greatly among species, vegetative community, and geographic region, but are expected to remain less than significant. As with the Preferred Alternative, it is anticipated that there would be less than significant impacts to terrestrial vegetation associated with routine operations and maintenance due to the relatively small-scale of likely FirstNet project sites. The impacts could vary greatly among species, vegetative community, and geographic region, but are expected to remain less than significant. Chapter 9, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

No Action Alternative

Under the No Action Alternative, the NPSBN would not be deployed; therefore, there would be no associated construction or installation of wired, wireless, deployable infrastructure or satellites and other technologies. There would be no impacts to terrestrial vegetation as a result of construction and operation of the Proposed Action. Environmental conditions would therefore be the same as those described in Section 6.1.6.3, Terrestrial Vegetation.

6.2.6.4. Wildlife

Impacts to amphibians and reptiles, terrestrial mammals, birds, and terrestrial invertebrates 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 6.2.6-1, less than significant impacts would be anticipated given the size and nature of the majority of the proposed deployment activities. Although anthropogenic disturbances may be measurable (although minimal) for some FirstNet projects, impacts on individual behavior of animals would be short-term and direct injury or mortality impacts at the population-level or sub-population effects would not likely be observed; therefore, impacts are generally expected to be less than significant, as discussed further below. Chapter 9, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Terrestrial Mammals

Vehicle strikes are common sources of direct mortality or injury to both small and large mammals in Nevada. Mammals are attracted to roads for a variety of reasons including use as a source of minerals, foraging, and migration (FHWA, 2009). Individual injury or mortality as a result of vehicle strikes associated with the Proposed Action could occur.

Entanglement in fences or other barriers could be a source of mortality or injury to terrestrial mammals, though entanglements would likely be isolated, individual events.

For example, if bats, and particularly maternity colonies, are present at a site location, removal of trees during land clearing activities could result in direct injury/mortality if bats are utilizing them as roost trees or for rearing young. The scale of this impact would be expected to be small-scale and would be dependent on the location and type of deployment activity, and the amount of tree removal. Site avoidance measures could be implemented to avoid disturbance to bats.

Birds

Mortalities from collisions or electrocutions with manmade cables and wires are environmental concerns for avian species and violate MBTA and BGEPA. Generally, collision events occur to “poor” fliers (e.g., ducks), 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, & and Manville, 2011)

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

Direct injury and mortality of birds could occur to ground-nesting birds when nests are either disturbed or destroyed during land clearing, excavation and trenching, and other ground disturbing activities. Removal of trees during land clearing activities could also result in direct injury/mortality to forest dwelling birds if they are utilizing them as roost trees for resting or shelter from predators and inclement weather, or as nest trees for rearing young. The scale of this impact would be associated with the amount of tree removal and the abundance of forest-dwelling birds roosting/nesting in the area. These impacts could be particularly pronounced in IBAs within the state as these areas provide them with essential habitat that supports various life stages (Hill, et al., 1997).

Direct mortality and injury to birds of Nevada 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. Direct injury/mortality are not anticipated to be widespread or affect bird populations due to the small scale of likely FirstNet actions. If siting considerations, BMPs, and mitigation measures are implemented (Chapter 9), potential impacts could potentially be minimized. Additionally, potential impacts under MBTA and BGEPA could be addressed through BMPs and mitigation measures developed in consultation with USFWS.

Reptiles and Amphibians

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

Terrestrial Invertebrates

The terrestrial invertebrate populations of Nevada 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. As previously mentioned, areas near Las Vegas and Reno have experienced extensive land use changes from urbanization and agriculture. However, a large portion of the state is arid and semi-desert and remains relatively unfragmented.

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.

In general, potential effects of vegetation and habitat loss, alteration, or fragmentation are expected to be less than significant because of the small-scale nature of expected deployment activities. These potential impacts are described for Nevada's wildlife species below. Chapter 9, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Terrestrial Mammals

Mammals occupy a wide range of habitats throughout Nevada and may experience localized effects of habitat loss or fragmentation. Removal or loss of vegetation may impact large mammals by decreasing the availability of forest or shrubs 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 or shrub habitat would also impact some small mammals that utilize these areas for roosting, foraging, sheltering, and for rearing their young. Loss of habitat or exclusions from these areas could be avoided or minimized by BMPs and mitigation measures (see Chapter 9, BMPs and Mitigation Measures).

Birds

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

Noise disturbance and human activity, as discussed previously, could directly restrict birds from using their preferred resources. Greater human activity of longer duration will increase the likelihood that birds will 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[143] species from disturbance or displacement from construction activities is likely to be short-term with minor effects from exclusion. Exclusion from resources concentrated in a small migratory stop area during peak migration could have major impacts to species that migrate in large flocks and concentrate at stopovers (e.g., shorebirds). BMPs and mitigation measures, including nest avoidance during construction-related activities, could help to avoid or minimize the potential impacts to birds from exclusion of resources, as appropriate.

Reptiles and Amphibians

Important habitats for Nevada's amphibians and reptiles typically consist of wetlands and the surrounding upland forest or shrub areas. Impacts are expected to be less than significant given the short-term nature and limited geographic scope of individual activities. If proposed project sites were unable to avoid sensitive areas, BMPs and mitigation measures (see Chapter 9) would be implemented to avoid or minimize the potential impacts.

Filling or draining of wetland breeding habitat (see Section 6.2.4, Water Resources) and alterations to ground or surface water flow from development associated with the Proposed

[143] 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.

Action may also have effects to Nevada's amphibian and reptile populations, though BMPs and mitigation measures would help to avoid or minimize the potential impacts.[144]

Terrestrial Invertebrates

Habitat loss and degradation are the most common causes of invertebrate species' declines; however, habitat for many common terrestrial invertebrates is generally assumed to be abundant and widely distributed across the state, therefore no significant effects to terrestrial invertebrates are expected. Impacts to sensitive invertebrate species are discussed below in Section 6.2.6.6, Threatened and Endangered Species and Species of Concern.

Indirect Injury/Mortality

Indirect injury/mortality impacts vary depending on the species, time of year and duration of deployment. Overall, impacts are expected to remain less than significant due to the short-term nature and limited geographic scope of expected activities, though BMPs and mitigation measures could further help to avoid or minimize the potential impacts. Chapter 9, 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 periods (e.g., roosting and mating) could reduce the overall fitness and productivity of young and adult terrestrial mammals. Indirect effects could occur to roosting bats from noise, light, or human disturbance causing them to leave their roosting locations or excluding them from their summer roosting/maternity colony roosts. For example, some bat species establish summer roosting or maternity colonies in the same general area that they return to year and after year. The majority of FirstNet deployment activities would be short-term in nature, and repeated disturbances would not occur. Depending on the project type and location, individual species may be disturbed resulting in less than significant 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. The majority of FirstNet deployment activities would be short-term in nature, and repeated disturbances would not occur.

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 not occur. Depending on the project type and location, individual species may be disturbed resulting in less than significant impacts.

[144] See Chapter 9, Wetlands, for a discussion of BMPs for wetlands.

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. Overall, potential impacts are anticipated to be less than significant due to the small-scale and localized nature of expected activities. Potential effects to migration patterns of Nevada's amphibians and reptiles, terrestrial mammals, birds, and terrestrial invertebrates are described below. Chapter 9, 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

Large game animals have well-defined migratory routes. Route knowledge is passed on from one generation to the next and includes important feeding and calving areas. Small mammals also have migratory routes that include spring and fall roosting areas between their summer maternity roosts and hibernacula.[145]

Any clearance, drilling, and construction activities needed for network deployment, including noise associated with these activities, has the potential to divert mammals from these migratory routes. Impacts could vary depending on the species, time of year of construction/operation, and duration, but are generally expected to be less than significant because they would be unlikely to result in long-term avoidance. Implementation of BMPs and mitigation measures could help to further avoid or minimize the potential impacts.

Birds

Because many birds have extremely long migrations, protection efforts for critical sites along migratory routes must be coordinated over distances often involving many different countries. Many migratory routes are passed from one generation to the next. Impacts could vary (e.g., mortality of individuals or abandonment of stopover sites by whole flocks) depending on the species, time of year of construction/operation, and duration, and impacts are expected to be less than significant given the short-term nature and limited geographic scope for individual activities. BMPs and mitigation measures could help to further avoid or minimize effects to migratory pathways.

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

Reptiles and Amphibians

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 given the short-team nature and limited geographic scope for individual activities. BMPs could help to further avoid or minimize the potential impacts.

Terrestrial Invertebrates

The proposed deployment activities would be expected to be short-term or temporary in nature. No effects to migratory patterns of Nevada's terrestrial invertebrates are expected as a result of the Proposed Action.

Reproductive Effects

Reproductive effects are considered those that either directly or indirectly reduce an animal's ability to produce offspring or reduce the rates of growth, maturation, and survival of offspring, which could affect the overall population of individuals. Overall, potential impacts are anticipated to be less than significant due to the short-term and limited nature of expected activities. Chapter 9, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Terrestrial Mammals

Restricted access to important winter hibernacula or summer maternity roosts for bats and calving grounds for large mammals, such as the mule deer, has the potential to negatively affect body condition and reproductive success of mammals in Nevada. Disturbance from deployment and operations could also result in the abandonment of offspring leading to reduced survival, although these activities are expected to be small scale and impacts are expected to be less than significant. Reproductive effects as a result of displacement and disturbance could be minimized through the use of BMPs and mitigation measures.

Birds

Impacts due to Proposed Action deployment and operations could include abandonment of the area and nests due to disturbance. Disturbance (visual and noise) may displace birds into less suitable habitat and thus reduce survival and reproduction. These impacts could be particularly pronounced in IBAs within the state if birds temporarily avoid those areas, since they provide essential habitat for various life stages (Hill, et al., 1997). The majority of FirstNet deployment or operation activities are likely to be small-scale in nature. Applicable BMPs and mitigation measures, as defined through consultation with USFWS for MBTA or BGEPA, if required, could help to avoid or minimize any potential impacts. Environmental consequences pertaining to federally listed species will be discussed in Section 6.2.6.6, Threatened and Endangered Species and Species of Conservation Concern.

Reptiles and Amphibians

Reproductive effects to reptile nests may occur through direct loss or disturbance of nests. For example, the spotted turtle, a resident in Nevada's wetlands, leaves its breeding pool in May and travels to its nesting site.

Reproductive effects to sub-populations of amphibians and reptiles may occur through the direct loss of vernal pools as breeding habitat if deployment activities occur near breeding pools, or alter water quality through sediment infiltration, or obstruction of natural water flow to pools, though BMPs would help to avoid or minimize the potential impacts.

Terrestrial Invertebrates

The majority of FirstNet deployment or operation activities are likely to be short-term in nature; therefore, no reproductive effects to terrestrial invertebrates are expected as a result of the Proposed Action.

Invasive Species Effects

When human activity results in a species entering an ecosystem new to it, the species is classified as introduced or invasive. The introduction of invasive species could have a dramatic effect on natural resources. Nevada uses NRS 555 to control insects, pests, and noxious weeds through weed control districts, requiring each district to prepare regulations for their district species management and control. These efforts help control invasive species with the greatest potential to impact the state's biodiversity.

FirstNet deployment or operation 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 species are not expected to be introduced to project sites as part of the deployment activities from machinery or construction workers. Therefore, potential impacts are expected to be less than significant.

Potential invasive species effects to Nevada's wildlife are described below.

Terrestrial Mammals

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.

Birds

FirstNet deployment activities could result in short-term or temporary changes to specific project sites, although these sites are expected to return to their natural state in a year or two. Invasive bird species are not expected to be introduced at project sites as part of the deployment activities from machinery or construction workers.

Reptiles and Amphibians

Although FirstNet deployment activities could result in short-term or temporary changes to specific project sites, these sites are expected to return to their natural state in a year or two. Invasive reptile or amphibian species are not expected to be introduced at project sites as part of the deployment activities. Invasive terrestrial reptile or amphibian species are not expected to be introduced at project sites from machinery or laborers.

Terrestrial Invertebrates

Terrestrial invertebrate populations are susceptible to invasive plant species that may change or alter the community composition of specific plants on which they depend. Effects from invasive plant species to terrestrial invertebrates would be similar to those described for habitat loss and degradation.

Invasive insects pose a large threat to Nevada's forest and agricultural resources. The potential to introduce invasive invertebrates within construction zones and during long-term site maintenance could occur from vehicles and equipment being transported from one region to another, or when conducting revegetation of a site after deployment activities are complete. BMPs and mitigation measures could help to avoid or minimize the potential for introducing invasive terrestrial invertebrate species during implementation of the Proposed Action. Invasive species effects related to terrestrial invertebrates could be minimized with the implementation of BMPs and mitigation measures. Chapter 9, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Potential Impacts of the Preferred Alternative

The following section assesses potential impacts associated with implementation of the Preferred Alternative, including deployment and operational activities.

Deployment Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, implementation of the Preferred Alternative could result in the deployment of various types of facilities or infrastructure. Depending on the physical nature and location of the facility/infrastructure and the specific deployment requirements, some activities would result in potential impacts to wildlife resources and others would not. In addition, and as described in this section, infrastructure developed under the Preferred Alternative could result in a range of impacts, from no impacts to less than significant impacts, depending on the deployment scenario or site-specific conditions. The wildlife that would be affected would depend on the ecoregion, the species' phenology, and the nature and extent of the habitats affected. Chapter 9, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Activities Likely to Have No Impacts

Of the types of facilities or infrastructure deployment scenarios described in Section 2.1.2, Proposed Action Infrastructure, the following are expected to have no impacts to wildlife resources under the conditions described below.

- Wired Projects
  - Use of Existing Conduit – New Buried Fiber Optic Plant: Disturbance associated with the installation of fiber optic cable in existing conduit would be limited to entry and exit points of the existing conduit in previously disturbed areas. Noise generated by equipment required to install fiber would be infrequent and of short duration, and unlikely to produce measurable changes in wildlife behavior. It is anticipated that effects to wildlife would be temporary and would not result in any perceptible change.
  - Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting up of dark fiber would have no impacts 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, attaching equipment to satellites launched for other purposes, and the use of portable devices that use satellite technology would not impact wildlife because those activities would not require ground disturbance.
  - Deployment of Satellites: FirstNet does not anticipate launching satellites as part of the deployment of the NPSBN; however, it may include equipment on satellites that are already being launched for other purposes. As adding equipment to an existing launch vehicle would be very unlikely to impact wildlife resources, it is anticipated that this activity would have no impact on wildlife resources.

Activities with the Potential to Have Impacts

Potential deployment-related impacts to wildlife resources as a result of implementation of the Preferred Alternative would encompass a range of impacts that could occur, including direct injury/mortality; vegetation and habitat loss, alteration, or fragmentation; effects to migratory patterns; indirect injury/mortality; reproductive effects; and invasive species effects. The types of infrastructure development scenarios or deployment activities that could be part of the Preferred Alternative and result in potential impacts to wildlife resources include the following:

- Wired Projects
  - New Build – Buried Fiber Optic Plant: Plowing, trenching, or directional boring and the construction of POPs, huts, or other associated facilities or hand-holes to access fiber could result in potential impacts to wildlife resources. Land/vegetation clearing and excavation activities, associated with construction of POPs, huts, or other associated facilities could result in direct injury/mortalities of wildlife that are not mobile enough to avoid construction activities (e.g., reptiles, small mammals, and young individuals), that utilize burrows (e.g., ground squirrels), or that are defending nest sites (such as ground-

nesting birds). Disturbance, including noise, associated with the above activities involving heavy equipment or land clearing could result in habitat loss, effects to migration patterns, indirect injury/mortality, reproductive effects, and invasive species effects. Implementation of BMPs and mitigation measures could help avoid or minimize potential impacts.

- New Build – Aerial Fiber Optic Plant: The installation of new poles and hanging cable and associated security, safety, or public lighting components on public ROWs or private easements as well as the construction of access roads, POPs, huts, or facilitates to house outside plant equipment could result in potential impacts to wildlife resources. Impacts may vary depending on the number or individual poles installed and the extent of ground disturbance, but could include direct injury/mortality of individuals as described above; habitat loss, alteration, or fragmentation; effects to migratory patterns; indirect injury/mortality; and invasive species effects.
- Collocation on Existing Aerial Fiber Optic Plant: Land clearing and excavation during replacement of poles and structural hardening could result in direct injury/mortality, habitat loss or alteration, effects to migratory patterns, indirect injury/mortality, and invasive species effects. Noise disturbance from heavy equipment use associated with these activities as well as with installing new fiber on existing poles could result in migratory effects and indirect injury/mortality.
- New Build – Submarine Fiber Optic Plant: The installation of cables in or near bodies of water and construction of landings and/or facilities on the shores or the banks of waterbodies that accept the submarine cables could potentially impact wildlife (see Section 6.2.4, 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 periods, effects to migratory patterns as well as reproductive effects and indirect injury/mortality could occur.
- Installation of Optical Transmission or Centralized Transmission Equipment: If installation of transmission equipment required construction of access roads, trenching, and/or land clearing, such disturbance could result in direct injury/mortality of wildlife as described for other New Build activities. Habitat loss, alteration and fragmentation; effects to migration or migratory patterns, indirect injury/mortality, and invasive species effects could occur as a result of construction and resulting disturbance.

- Wireless Projects
  - New Wireless Communication Towers: Installation of new wireless towers and associated structures (e.g., generators, equipment sheds, fencing, security and aviation lighting, electrical feeds, and concrete foundations and pads) or access roads could result in impacts to wildlife resources. Land/vegetation clearing, excavation activities, landscape grading, and other disturbance activities during the installation of new wireless towers and associated structures or access roads could result in direct injury/mortality,

habitat loss, alteration or fragmentation, and effects to migratory patterns. Security lighting and fencing could result in direct and indirect injury or mortality, effects to migratory patterns, as well as reproductive effects. For a discussion of RF emissions, refer to Section 2.4, Radio Frequency Emissions.

- Collocation on Existing Wireless Tower, Structure, or Building: Collocation would involve mounting or installing equipment (such as antennas or microwave dishes) on an existing tower, which would not result in impacts to wildlife. However, if additional power units, replacement towers, or structural hardening are required, impacts would be similar to new wireless construction. For a discussion of RF emissions, refer to Section 2.4, Radio Frequency Emissions.
- Deployable Technologies: Implementation of deployable technologies including COWs, COLTs, and SOWs could result in direct injury/mortalities to wildlife on roadways. If external generators are used, noise disturbance could potentially impact migratory patterns of wildlife. For a discussion of RF emissions, refer to Section 2.4, Radio Frequency Emissions.
- Deployment of drones, balloons, or blimps, and piloted aircraft could potentially impact wildlife by direct or indirect injury/mortality from collision, entanglement, or ingestion and effects to migratory patterns and reproductive effects from disturbance and/or displacement due to noise. The magnitude of these effects depends on the timing and frequency of deployments. However, deployment activities are expected to be temporary and isolated, and likely affecting only a small number of wildlife.

In general, the abovementioned activities could potentially involve land/vegetation clearing; excavation and trenching; construction of access roads; installation or restructuring of towers or poles; installation of security/safety lighting and fencing; and deployment of aerial platforms. Potential impacts to wildlife resources associated with deployment of this infrastructure are anticipated to be less than significant given the small-scale of likely individual FirstNet projects; however, some deployment activities could include direct injury/mortality, habitat loss, indirect injury/mortality, effects to migration, reproductive effects, and effects of invasive species depending on the project type, location, ecoregion, the species' phenology, and the nature and extent of the habitats affected. As stated above, these impacts would likely be limited to individual wildlife species and unlikely to cause population-level impacts. The specific deployment activity and where the deployment will take place will be determined based on location-specific conditions and the results of site-specific environmental reviews. Chapter 9, BMPs and Mitigation Measures, provide a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts

Operation Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, operational activities associated with the Preferred Alternative would consist of routine maintenance and inspection of the facilities. Any major infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the abovementioned deployment impacts. The wildlife that would be affected would depend on the ecoregion, the species' phenology, and the nature and extent of the habitats affected.

It is anticipated that there would be less than significant impacts to wildlife resources associated with routine inspections of the Preferred Alternative. Site maintenance would be infrequent, including mowing or limited application of herbicides, may result in less than significant effects to wildlife including direct injury/mortality to less mobile wildlife, or exposure to contaminants from accidental spills from maintenance equipment or release of pesticides. Potential spills of these materials would be expected to be in small quantities.

During operations, direct injury/mortality of wildlife could occur from collisions and/or entanglements with transmission lines, towers, and aerial platforms.

Wildlife resources could still be affected by the reduction in habitat quality associated with habitat fragmentation from the presence of access roads, transmission corridors, and support facilities. These features could also continue to disrupt movements of terrestrial wildlife, particularly during migrations between winter and summer ranges or in calving areas.

In addition, the presence of new access roads and transmission line ROWs may increase human use of the surrounding areas, which could increase disturbance to wildlife resulting in effects to migratory pathways, indirect injury/mortalities, reproductive effects, as well as the potential introduction and spread of invasive species as explained above. As stated above, these impacts would likely be limited to individual wildlife species and unlikely to cause population-level impacts, and therefore would likely be less than significant given the short-term nature and limited geographic scope for individual activities. Chapter 9, BMPs and Mitigation Measures, provide 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

Alternatives Impact Assessment

The following section assesses potential impacts to wildlife resources associated with the Deployable Technologies Alternative and the No Action Alternative.

Deployable Technologies Alternative

Under the Deployable Technologies Alternative option, a nationwide fleet of mobile communications systems would provide temporary coverage in areas not covered by the existing, usable infrastructure. There would be no collocation of equipment and minimal new construction associated with wired or wireless projects discussed above under the Preferred Alternative. Some limited construction could be associated with implementation such as land clearing or paving for parking or staging areas. The specific infrastructure associated with the Deployable Technologies Alternative would be the same as the deployable technologies implemented as part of the Preferred Alternative but would likely be implemented in greater numbers, over a larger geographic extent, and used with greater frequency and duration. Therefore, potential impacts to wildlife resources as a result of implementation of this alternative could be as described below.

Deployment Impacts

As described above, implementation of deployable technologies could result in less than significant impacts from direct and indirect injury or mortality events, changes in migratory patterns, disturbance, or displacement. Greater frequency and duration of deployments could change the magnitude of impacts depending on species, life history, and region of the state. However, impacts are expected to remain less than significant because deployment activities are expected to be temporary, likely affecting only a small number of wildlife. Chapter 9, BMPs and Mitigation Measures, provide a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts

Operational Impacts

As described above, operational activities would consist of implementation/running of the deployable technology and routine maintenance and inspections. As with the Preferred Alternative, it is anticipated that there would be less than significant impacts because deployable activities are expected to be temporary and likely affecting only a small number of wildlife. The impacts could vary greatly among species and geographic region. Chapter 9, BMPs and Mitigation Measures, provide a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

No Action Alternative

Under the No Action Alternative, the nationwide, interoperable, public safety broadband network would not be deployed; therefore, there would be no associated construction or installation of wired, wireless, deployable infrastructure or satellites and other technologies. As a result, there would be no impacts to wildlife resources as a result of construction and operation of the Proposed Action. Environmental conditions would therefore be the same as those described in Section 6.1.6.4, Terrestrial Wildlife.

6.2.6.5. Fisheries and Aquatic Habitats

Impacts to fisheries and aquatic habitats occurring in Nevada are discussed in this section. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Description of Environmental Concerns

Direct Injury/Mortality

Direct injury/mortality effects are physical injuries, extreme physiological stress, or death of an individual organism from interactions associated with the Proposed Action. The most common direct injuries are entanglement, vessel strike, problems associated with accidental ingestion, and injuries incurred by sensitive animals from disturbance events. (USEPA, 2012d)

Based on the impact significance criteria presented in Table 6.2.6-1, less than significant impacts would be anticipated given the size and nature of the majority of proposed deployment activities.

Although anthropogenic disturbances may be measurable but minimal for some FirstNet projects, direct injury or mortality impacts at the population-level or sub-population effects would not likely be observed. BMPs and mitigation measures could help to avoid or minimize potential impacts to fisheries and aquatic invertebrate population survival.

Vegetation and Habitat Loss, Alteration, or Fragmentation

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, 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 to sensitive aquatic habitats could be addressed through BMPs and mitigation measures as defined through consultation with the appropriate resource agency.

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 due the short-term nature and limited geographic scope of deployment activities. BMPs and mitigation measures to protect water resources (see Section 6.2.4, Water Resources) could help to minimize or avoid potential impacts.

Effects to Migration or Migratory Patterns

Migration is the regular movement of animals from one region to another and back again. Migratory patterns vary by species and sometimes within the same species. For example, restrictions or alterations to waterways could alter migration patterns, limit fish passage, or affect foraging and spawning site access. Impacts would vary depending on the species, time of year, and duration of deployment, but would be localized and small-scale, and therefore are expected to be less than significant. BMPs and mitigation measures could help to further avoid or minimize the potential impacts.

Reproductive Effects

Reproductive effects are considered those that either directly or indirectly reduce an animal's ability to produce offspring or reduce the rates of growth, maturation, and survival of offspring, which could affect the overall population of individuals. Restrictions to spawning/breeding areas for fish and aquatic invertebrates and the alteration of water quality through sediment infiltration, obstruction of natural water flow, or loss of submerged vegetation resulting from the deployment of various types of infrastructure, are not anticipated, and therefore impacts are expected to be less than significant. BMPs and mitigation measures could help to further avoid or minimize the potential impacts.

Invasive Species Effects

The potential to introduce invasive plants within construction zones could occur from vessels and equipment being transported from one region to another, or when conducting revegetation of a site after deployment activities are complete. FirstNet deployment activities could result in short-term or temporary changes to specific project sites, 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. BMPs and mitigation measures could help to avoid or minimize the potential for introducing invasive aquatic plant and animal species during implementation of the Proposed Action.

Potential Impacts of the Preferred Alternative

The following section assesses potential impacts associated with implementation of the Preferred Alternative, including 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. Chapter 9, BMPs and Mitigation Measures, provides a listing of the BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Activities Likely to Have No Impacts

Of the types of facilities or infrastructure deployment scenarios described in Section 2.1.2, Proposed Action Infrastructure, the following are expected to have no impacts to fisheries and aquatic habitats under the conditions described below:

- Wired Projects
    - Use of Existing Conduit – New Buried Fiber Optic Plant: Disturbance, including noise, associated with the installation of fiber optic cable in existing conduit would be limited to entry and exit points of the existing conduit in previously disturbed areas. It is anticipated that effects to wildlife would be temporary and would not result in any perceptible change.
    - Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting up of dark fiber would have no impacts to fisheries and aquatic habitats because there would be no ground disturbance.
- Satellites and Other Technologies
    - Satellite-Enabled Devices and Equipment: It is anticipated that the installation of permanent equipment on existing structures and the use of portable devices that use satellite technology would not impact fisheries and aquatic habitats because those activities would not require ground disturbance.
    - Deployment of Satellites: FirstNet does not anticipate launching satellites as part of the deployment of the NPSBN; however, it could include equipment on satellites that are already being launched for other purposes. As adding equipment to an existing launch vehicle would be very unlikely to impact fisheries, it is anticipated that this activity would have no impact on the aquatic environment.

Activities with the Potential to Have Impacts

Potential deployment-related impacts to fisheries and aquatic habitats as a result of implementation of the Preferred Alternative would encompass a range of impacts that could occur, including direct injury/mortality; vegetation and habitat loss, alteration, or fragmentation; effects to migratory patterns; indirect injury/mortality; reproductive effects; and invasive species effects. The types of infrastructure deployment activities that could be part of the Preferred Alternative and result in potential impacts to fisheries and aquatic habitats include the following:

- Wired Projects
    - New Build – Buried Fiber Optic Plant: Plowing, trenching, or directional boring and the construction of POPs, huts, or other associated facilities or hand-holes to access fiber could result in potential impacts to fisheries and aquatic habitats. Land/vegetation clearing and excavation activities, associated with construction of POPs, huts, or other associated facilities, particularly if they occur adjacent to water resources that support fish, could result in habitat loss, alteration and fragmentation; indirect injury/mortality; and invasive species effects. Implementation of BMPs and mitigation measures could help to avoid or minimize potential impacts.
    - New Build – Aerial Fiber Optic Plant: The installation of new poles and hanging cable and associated security, safety, or public lighting components on public ROWs or private easements as well as the construction of access roads, POPs, huts, or facilitates to house outside plant equipment could result in potential impacts to 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 shores or the banks of waterbodies that accept the submarine cables could result in direct injury/mortalities of fisheries and aquatic invertebrates that are not mobile enough to avoid construction activities (e.g., mussels), that utilize burrows (e.g., crayfish), or that are defending nest sites (some fish). Disturbance, including noise, associated with the above activities could result in habitat loss, effects to migration patterns, indirect injury/mortality, reproductive effects, and invasive species effects.
- Installation of Optical Transmission or Centralized Transmission Equipment: If installation of transmission equipment required construction of access roads, trenching, and/or land clearing, particularly near water resources that support fish, such disturbance could result in habitat loss, alteration and fragmentation; indirect injury/mortality, and invasive species effects.

- Wireless Projects
  - New Wireless Communication Towers: Installation of new wireless towers and associated structures (generators, equipment sheds, fencing, security and aviation lighting, electrical feeds, and concrete foundations and pads) or access roads could result in impacts to fisheries and aquatic habitats, if such actions were deployed near water resources. Land/vegetation clearing, excavation activities, landscape grading, and other disturbance activities during the installation of new wireless towers and associated structures or access roads, particularly if they occur near waterbodies, could result in habitat loss or indirect injury/mortality, and invasive species effects, although highly unlikely. Refer to Section 2.4, Radio Frequency Emissions, for more information on RF emissions.
  - Collocation on Existing Wireless Tower, Structure, or Building: Collocation would involve mounting or installing equipment (such as antennas or microwave dishes) on an existing tower, which would not result in impacts to fisheries and aquatic habitats. However, if new power units, replacement towers, structural hardening, or physical security measures require ground disturbance, impacts would be similar to new wireless construction. For a discussion of RF 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 RF emissions, refer to Section 2.4, Radio Frequency Emissions.
- Deployment of drones, balloons, blimps, or piloted aircraft could potentially impact fisheries and aquatic habitat if deployment occurs within or adjacent to water resources. The magnitude of these effects depends on the timing and frequency of deployments, and could result in result in habitat loss, alteration and fragmentation, indirect injury/mortality, and invasive species effects.

In general, the abovementioned activities could potentially involve land/vegetation clearing; excavation and trenching; construction of access roads; installation or restructuring of towers, poles, or underwater cables; installation of security/safety lighting and fencing; and deployment of aerial platforms. Potential impacts to fisheries and aquatic habitats associated with deployment of this infrastructure could include direct injury/mortality, habitat loss, indirect injury/mortality, effects to migration, reproductive effects, and effects of invasive species depending on the ecoregion, the species' phenology, and the nature and extent of the habitats affected. These impacts are anticipated to be less than significant due to the small scale and localized nature of deployment activities that have the potential to impact aquatic habitats. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, operational activities associated with the Preferred Alternative would consist of routine maintenance and inspection of the facilities. Any major infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the abovementioned deployment impacts. The fisheries and aquatic habitats that would be affected would depend on the ecoregion, the species' phenology, and the nature and extent of the habitats affected.

It is anticipated that there would be less than significant impacts to fisheries and aquatic habitats associated with routine inspections of the Preferred Alternative. Site maintenance activities that may result in accidental spills from maintenance equipment or pesticide runoff near fish habitat are expected to have less than significant effects to fisheries and aquatic habitats. Potential spills of these materials would be expected to be in small quantities.

Fisheries and aquatic habitat could still be affected by the reduction in habitat quality associated with habitat fragmentation from the presence of access roads, transmission corridors, and support facilities. These features could also continue to disrupt movements of fish passage. In addition, the presence of new access roads and transmission line ROWs near water resources that support fish may increase human use of the surrounding areas, which could increase disturbance to fisheries and aquatic habitats resulting in effects to migratory pathways, indirect injury/mortalities, reproductive effects, as well as the potential introduction and spread of invasive species as explained above. Fisheries and aquatic habitat may also be impacted if increased access leads to an increase in the legal or illegal take of biota. However, impacts are expected to be less than significant due to the small scale of expected activities with the potential to affect fisheries and aquatic habitat. As a result of the small scale, only a limited number of individuals are anticipated to be impacted, furthermore, habitat impacts would also be minimal in scale. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Alternatives Impact Assessment

The following section assesses potential impacts to fisheries and aquatic habitats associated with the Deployable Technologies Alternative and the No Action Alternative.

Deployable Technologies Alternative

Under the Deployable Technologies Alternative option, a nationwide fleet of mobile communications systems would provide temporary coverage in areas not covered by the existing, usable infrastructure. There would be no collocation of equipment and minimal new construction associated with wired or wireless projects discussed above under the Preferred Alternative. Some limited construction could be associated with implementation such as land clearing or paving for parking or staging areas. The specific infrastructure associated with the Deployable Technologies Alternative would be the same as the deployable technologies implemented as part of the Preferred Alternative but would likely be implemented in greater numbers, over a larger geographic extent, and used with greater frequency and duration. Therefore, potential impacts to fisheries and aquatic habitats as a result of implementation of this alternative could be as described below.

Deployment Impacts

As explained above, implementation of deployable technologies could result in less than significant impacts from habitat loss, alteration and fragmentation, indirect injury/mortality, and invasive species effects. Greater frequency and duration of deployments could change the magnitude of impacts depending on species, life history, and region of the state. However, impacts are expected to remain less than significant due to the limited nature of expected deployment activities. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Operational Impacts

Operational activities would consist of implementation/running of the deployable technology and routine maintenance and inspections. As with the Preferred Alternative, it is anticipated that there would be less than significant impacts to fisheries and aquatic habitats associated with routine operations and maintenance due to the limited nature of expected deployment activities. The impacts could vary greatly among species and geographic region. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

No Action Alternative

Under the No Action Alternative, the nationwide, interoperable, public safety broadband network would not be deployed; therefore, there would be no associated construction or installation of wired, wireless, deployable infrastructure or satellites and other technologies. As a result, there would be no impacts to fisheries and aquatic habitats as a result of construction and operation of the Proposed Action. Environmental conditions would therefore be the same as those described in Section 6.1.6.5, Fisheries and Aquatic Habitats.

6.2.6.6. Threatened and Endangered Species and Species of Conservation Concern

This section describes potential impacts to threatened and endangered species in Nevada 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 9, may be implemented as appropriate to further minimize potential impacts.

Impact Assessment Methodology and Significance Criteria

The impacts of the Proposed Action on threatened and endangered species and their habitat were evaluated using the significance criteria presented in Table 6.2.6-2. The categories of impacts for threatened and endangered species and their habitats are defined as may affect, likely to adversely affect; may affect, not likely to adversely affect; and no effect. Characteristics of each effect type, including magnitude or intensity, geographic extent, and duration or frequency, were used to determine the impact significance rating associated with each potential impact.

Given the nature of this programmatic evaluation, and because the Proposed Action could potentially cover a wide variety of actions that would take place in various landscapes across the state, the potential impacts to threatened and endangered species addressed below are presented as a range of possible impacts.

Table 6.2.6-2: Impact Significance Rating Criteria for Threatened and Endangered Species

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.	
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.

Type of Effect	Effect Characteristics	Impact Level		
		May Affect, Likely to Adversely Affect	**May Affect, Not Likely to Adversely Affect**	**No Effect**
	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 6.2.6-2, any direct injury or mortality of a listed species at the individual-level, as well as any impact that has the potential to result in unpermitted take of an individual species at any geographic extent, duration, or frequency, may affect and likely adversely affect a listed species. Direct injury/mortality environmental concerns pertaining to federally listed birds, reptiles and amphibians, fish, invertebrates, and plants with known occurrence in Nevada are described below. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 9, may be implemented as appropriate to further minimize potential impacts.

<u>Terrestrial Mammals</u>

There are no federally listed terrestrial mammals in Nevada.

<u>Birds</u>

Two federally listed birds are known to occur within Nevada, the southwestern willow flycatcher and yellow-billed cuckoo. Depending on the project types and location, direct mortality or injury to these birds could occur from collisions or electrocutions with manmade cables and wires, vehicle strikes, or by disturbance or destruction of nests during ground disturbing activities. However, these potential impacts may affect, but are not likely to adversely affect, listed species as FirstNet would attempt to avoid deployment activities in these areas. If proposed project sites were unable to avoid sensitive areas, BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 9, may be implemented as appropriate to further minimize potential impacts.

<u>Fish</u>

There are 23 federally listed fish are known to occur within Nevada: Ash Meadows Amargosa Pupfish, Ash Meadows Speckled Dace, Big Spring Spinedace, Bonytail Chub, Bull Trout, Clover Valley Speckled Dace, Cui-ui, Desert Dace, Devils Hole Pupfish, Hiko White River Springfish, Independence Valley Speckled Dace, Lahontan Cutthroat Trout, Moapa Dace, Pahranagat Roundtail Chub, Pahrump Poolfish, Railroad Valley Springfish, Razorback Sucker, Virgin River Chub, Warm Springs Pupfish, Warner Sucker, White River Spinedace, White River Springfish, and Woundfin. Direct mortality or injury could occur 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. Therefore, potential impacts may affect, but are not likely to adversely affect, listed species. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 9, may be implemented as appropriate to further minimize potential impacts.

Reptiles and Amphibians

One federally listed reptile, the Mojave desert tortoise, is known to occur within Nevada. Direct mortality to the species could occur in construction zones either by excavation activities or by vehicle strikes. Potential effects would likely be isolated, individual events, and FirstNet would attempt to avoid areas where the species may occur. Therefore potential impacts may affect, but would not likely adversely affect, the listed species. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 9, may be implemented as appropriate to further minimize potential impacts.

Invertebrates

Federally listed Ash Meadows Naucorid, Carson Wandering Skipper, and Mount Charleston Blue Butterfly occur in Nevada. Direct mortality or injury could occur to these species if land clearing or excavation activities associated with the Proposed Action occur in an area inhabited by one of these species. Distribution of these species is limited to in or near the Point of Rocks and Kings Springs in the Ash Meadows NWR, less than 5,000 feet in elevation, in the northeastern Sierra Nevada Mountains, over 8,200 feet in elevation, and in the Spring Mountains in the southeastern part of the state. FirstNet would attempt to avoid areas where these species may occur. Potential impacts may affect, but are not likely to adversely affect, the listed species. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 9, may be implemented as appropriate to further minimize potential impacts.

Plants

Nevada has 10 federally listed plants: Amargosa Niterwort, Ash Meadows Blazingstar, Ash Meadows Gumplant, Ash Meadows Ivesia, Ash Meadows Milk-vetch, Ash Meadows Sunray, Spring-loving Centaury, Steamboat Buckwheat, Ute Ladies'-tresses, and Webber Ivesia. Direct mortality to federally listed plants could occur if land clearing or excavation activities associated with the Proposed Action occur in an area inhabited by one of these species. FirstNet would attempt to avoid areas where these species may occur; therefore, potential impacts may affect, but are not likely to adversely affect, listed species. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 9, 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 birds, reptiles and amphibians, fish, invertebrates, and plants with known occurrence in Nevada are described below.

Terrestrial Mammals

There are no federally listed terrestrial mammals in Nevada.

Birds

Impacts to birds and bird habitat due to land clearing or excavation activities could directly affect nesting if deployment activities occur during the breeding/nesting season. In addition, habitat loss or degradation could lead to indirect affects to nesting due to birds having to find new nesting sites. Further, noise, light, or human disturbance within nesting areas could cause birds to abandon their nests, relocate to less desirable locations, or cause stress to individuals reducing survival and reproduction. FirstNet would attempt to avoid these areas. Therefore, potential impacts may affect, but are not likely to adversely affect, listed species. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 9, may be implemented as appropriate to further minimize potential impacts.

Reptiles and Amphibians

Nevada has one federally listed terrestrial reptile, the desert tortoise. Changes in water quality, especially during the breeding seasons, resulting from ground disturbing activities could cause stress resulting in lower productivity. Land clearing activities, noise, and human disturbance during the critical periods (e.g., mating, nesting) could lower fitness and productivity. FirstNet would attempt to avoid these areas. Therefore, potential impacts may affect, but are not likely to adversely affect, listed species. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 9, may be implemented as appropriate to further minimize potential impacts.

Fish

Deployment activities in the upstream portions watersheds resulting in increased disturbance (e.g., humans, noise), especially during spawning activity, and changes in water quality and quantity could cause stress resulting in lower productivity (see Section 6.2.4, Water Resources, for a discussion of potential impacts to water resources). Effects to reproduction of the federally listed fish species in Nevada are unlikely as the majority of FirstNet deployment projects would not occur in an aquatic environment and FirstNet would attempt to avoid these areas. Therefore, potential impacts may affect, but are not likely to adversely affect, listed species. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 9, may be implemented as appropriate to further minimize potential impacts.

Invertebrates

Introduction of invasive aquatic species could potentially affect these species (USFWS, 2012a). Potential impacts to federally listed invertebrate species may affect, but are not likely to adversely affect, those species, as FirstNet would attempt to avoid these areas. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 9, may be implemented as appropriate to further minimize potential impacts.

Plants

Potential impacts could occur from ground-disturbing activities to listed plant species as a result of the Proposed Action. However, FirstNet would attempt to avoid these areas. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 9, may be implemented as appropriate to further minimize potential impacts.

Behavioral Changes

Effects to normal behavior patterns that could lead to disruptions in breeding, feeding, or sheltering, resulting in take of a listed species would be considered potentially significant. Potential effects to federally listed birds, reptiles and amphibians, fish, invertebrates, and plants with known occurrence in Nevada are described below.

Terrestrial Mammals

There are no federally listed terrestrial mammals in Nevada.

Birds

Because many birds have extremely long migrations, protection efforts for critical sites along migratory routes must be coordinated over distances often involving many different countries. Disturbance in stopover, foraging, or breeding areas (visual or noise) or habitat loss/fragmentation could cause stress to individuals causing them to abandon areas for less desirable habitat and potentially reduce over fitness and productivity. Activities related to the Proposed Action, such as aerial deployment or construction activities, could result in effects to federally listed birds. FirstNet would attempt to avoid areas where these species are known to occur; therefore, potential impacts may affect, but would likely not adversely affect, these species. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 9, may be implemented as appropriate to further minimize potential impacts.

Reptiles and Amphibians

Habitat loss or alteration, particularly from fragmentation or invasive species, could affect nesting and foraging sites, resulting in reduced survival and productivity; however, the localized nature of disturbances during deployment activities are not anticipated to stress federally listed reptiles or amphibians. FirstNet would attempt to avoid areas where these species are known to occur; therefore, potential impacts may affect, but would likely not adversely affect, these species. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 9, 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 some species. Further, increased human disturbance, noise, and vessel traffic could cause stress to some species causing them to abandon spawning locations or altering migration patterns. Behavioral changes to these listed species are unlikely as the majority of FirstNet deployment projects would not occur in 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 9, may be implemented as appropriate to further minimize potential impacts.

Invertebrates

Changes in water quality, habitat loss or alternation, and introduction of aquatic invasive species could impact food sources for federally listed invertebrates resulting in lower productivity. Disturbances to food sources utilized by the federally listed terrestrial species, especially during the breeding season, could impact foraging behavior. FirstNet would attempt to avoid areas where these species are known to occur; therefore, potential impacts may affect, but would likely not adversely affect, these species. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 9, 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. In some cases, large-scale impacts could occur that would not diminish the functions and values of the habitat, while in other cases, small-scale changes could lead to potentially significant adverse effects, such as designated critical habitat for a listed species that is only known to occur in one specific location geographically. In Nevada, 27 listed species that occur in Nevada have designated critical habitat in the state. Potential effects to federally listed birds, reptiles and amphibians, fish, invertebrates, and plants with designated critical habitat in Nevada are described below.

Terrestrial Mammals

There are no federally listed terrestrial mammals in Nevada. Therefore, no effect to threatened and endangered species from the loss or degradation of designated critical habitat is expected as a result of the Proposed Action.

Birds

Critical habitat for the Southwestern Willow Flycatcher and Yellow-billed Cuckoo populations are found in riparian areas in the state. Land clearing, excavation activities, and other ground disturbing activities in these areas of Nevada could lead to habitat loss or degradation, which affect these species depending on the duration, location, and spatial scale of the associated activities. FirstNet would attempt to avoid areas where these species are known to occur; therefore, potential impacts may affect, but would likely not adversely affect, designated critical habitat. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 9, may be implemented as appropriate to further minimize potential impacts.

Reptiles and Amphibians

Critical habitat has been designated for the Mojave desert tortoise in southern Nevada. Land clearing, excavation activities, and other ground disturbing activities in these areas of Nevada could lead to habitat loss or degradation, which affect these species depending on the duration, location, and spatial scale of the associated activities. FirstNet would attempt to avoid areas where these species are known to occur; therefore, potential impacts may affect, but would likely not adversely affect, designated critical habitat. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 9, may be implemented as appropriate to further minimize potential impacts.

Fish

Critical habitat has been designated for 14 federally listed fish species. Land clearing, excavation activities, and other ground disturbing activities resulting in run-off in these areas of Nevada could lead to habitat loss or degradation, which affect these species depending on the duration, location, and spatial scale of the associated activities. FirstNet would attempt to avoid areas where these species are known to occur; therefore, potential impacts may affect, but would likely not adversely affect, designated critical habitat. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 9, may be implemented as appropriate to further minimize potential impacts.

Plants

Critical habitat has been designated for 8 of 10 federally listed plant species. Land clearing, excavation activities, and other ground disturbing activities resulting in run-off in these areas of Nevada could lead to habitat loss or degradation, which affect these species depending on the duration, location, and spatial scale of the associated activities. FirstNet would attempt to avoid areas where these species are known to occur; therefore, potential impacts may affect, but would likely not adversely affect, designated critical habitat. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 9, may be implemented as appropriate to further 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 threatened and endangered species and others would not. In addition, and as explained in this section, the same type of Proposed Action Infrastructure could result in a range of no impacts to less than significant impacts depending on the deployment scenario or site-specific conditions. The threatened and endangered species that would be affected would depend on the ecoregion, the species' phenology, and the nature and extent of the habitats affected. 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 9, may be implemented as appropriate to further minimize potential impacts.

Activities Likely to Have No Impacts

Of the types of facilities or infrastructure deployment scenarios described in Section 2.1.2, Proposed Action Infrastructure, the following are expected to have no effect to threatened and endangered species or their habitat under the conditions described below:

- Wired Projects
    - Use of Existing Conduit – New Buried Fiber Optic Plant: Disturbance, including noise, associated with the installation of fiber optic cable in existing conduit would be limited to entry and exit points of the existing conduit in previously disturbed areas. Although threatened and endangered species and their habitat could be impacted, it is anticipated that effects to threatened and endangered species would be temporary, infrequent, and likely not conducted in locations designated as vital or critical for any period.

- Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting up of dark fiber would have no effect on threatened and endangered species or their habitat because there would be no ground disturbance and very limited human activity.

- Satellites and Other Technologies
  - Satellite-Enabled Devices and Equipment: It is anticipated that the installation of permanent equipment on existing structures and the use of portable devices that use satellite technology would not impact threatened and endangered 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 effect on protected species.

Activities with the Potential to Affect Listed Species

Potential deployment-related effects to threatened and endangered species and their habitats as a result of implementation of the Preferred Alternative would encompass a range of impacts that could occur, including direct injury/mortality, reproductive effects, behavioral changes, and loss/degradation of designated critical habitat. The types of infrastructure deployment activities that could be part of the Preferred Alternative and result in potential effects to threatened and endangered species include the following:

- Wired Projects
  - New Build – Buried Fiber Optic Plant: Plowing, trenching, or directional boring and the construction of POPs, huts, or other associated facilities or hand-holes to access fiber could result in potential impacts to threatened and endangered species. Land/vegetation clearing and excavation activities, associated with construction of POPs, huts, or other associated facilities could result in direct injury/mortalities of threatened and endangered species that are not mobile enough to avoid construction activities (e.g., reptiles, mollusks, small mammals, and young), that utilize burrows (e.g., ground squirrels), or that are defending nest sites (e.g., ground-nesting birds). Disturbance, including noise, associated with the above activities could result in direct injury/mortality, reproductive effects, behavioral changes, and loss/degradation of designated critical habitat if BMPs and mitigation measures are not implemented.
  - New Build – Aerial Fiber Optic Plant: The installation of new poles and hanging cable and associated security, safety, or public lighting components on public ROWs or private easements as well as the construction of access roads, POPs, huts, or facilitates to house outside plant equipment could result in potential impacts to threatened and endangered species and their habitat. Impacts may vary depending on the number or individual poles installed, but could include direct injury/mortality, reproductive effects, behavioral changes, and loss/degradation of designated critical habitat.

- Collocation on Existing Aerial Fiber Optic Plant: Land clearing and excavation during replacement of poles and structural hardening could result in direct injury/mortality, reproductive effects, behavioral changes, and loss/degradation of designated critical habitat to threatened and endangered species. Noise disturbance from heavy equipment use associated with these activities as well as with installing new fiber on existing poles could result in reproductive effects or behavior changes.
- New Build – Submarine Fiber Optic Plant: The installation of cables in or near bodies of water and construction of landings and/or facilities on the shores or the banks of waterbodies that accept the submarine cables could potentially impact threatened and endangered species and their habitat, particularly aquatic species (see Section 6.2.4, Water Resources, for a discussion of potential impacts to water resources). Effects could include direct injury/mortality, and if activities occurred during critical 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 RF 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 RF 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 RF emissions, refer to Section 2.4, Radio Frequency Emissions.
- Deployment of drones, balloons, piloted aircraft, or blimps could potentially impact threatened and endangered species by direct injury/mortality, reproductive effects, behavioral changes, and loss/degradation of designated critical habitat. The magnitude of these effects depends on the timing and frequency of deployments.

In general, the abovementioned activities could potentially involve land/vegetation clearing; excavation and trenching; construction of access roads; installation or restructuring of towers, poles, or underwater cables; installation of security/safety lighting and fencing; and deployment of aerial platforms. Potential impacts to threatened and endangered species associated with deployment of this infrastructure could include direct injury/mortality, reproductive effects, behavioral changes, and loss/degradation of designated critical habitat depending on the species' phenology and the nature and extent of the habitats affected. FirstNet would attempt to avoid areas where these species are known to occur; therefore, potential impacts may affect, but are not likely adversely affect protected species. Additional BMPs and mitigation measures, as defined in Chapter 9, may be implemented as appropriate to further minimize potential impacts.

Operation Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, operational impacts associated with the Preferred Alternative would consist of routine maintenance and inspection of the facilities. Any major infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the abovementioned deployment impacts.

It is anticipated that operational impacts may affect, but are not likely to adversely affect threatened and endangered species due to routine inspections of the Preferred Alternative, assuming that the same access roads used for deployment are also used for inspections. Site maintenance, including mowing or application of herbicides, may affect, but are not likely to adversely affect threatened and endangered species, as they would be conducted infrequently, and 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 9, may be implemented as appropriate to further minimize potential impacts.

During operations, direct injury/mortality of threatened and endangered species could occur from collisions and/or entanglements with transmission lines, towers, and aerial platforms. FirstNet would attempt to avoid areas where these species are known to occur. Therefore, listed species may be affected, but are not likely to be adversely affected. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented.

Additional BMPs and mitigation measures, as defined in Chapter 9, 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, by the reduction in habitat quality associated with habitat fragmentation from the presence of access roads, transmission corridors, and support facilities. These features could also continue to disrupt movements of some species, particularly during migrations between winter and summer ranges. FirstNet would attempt to avoid areas where these species are known to occur. 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 9, 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 new construction associated with wired or wireless projects discussed above under the Preferred Alternative. Some limited construction could be associated with implementation such as land clearing or paving for parking or staging areas. The specific infrastructure associated with the Deployable Technologies Alternative would be the same as the deployable technologies implemented as part of the Preferred Alternative but would likely be implemented in greater numbers, over a larger geographic extent, and used with greater frequency and duration. Therefore, potential impacts to threatened and endangered species as a result of implementation of this alternative could be as described below.

<u>Deployment Impacts</u>

As explained above, implementation of deployable technologies may affect, but is not likely to adversely affect, threatened and endangered species through direct injury/mortality, reproductive effects, behavioral changes, and loss/degradation of designated critical habitat. Greater frequency and duration of deployments could change the magnitude of impacts depending on species, life history, and region of the state. FirstNet would attempt to avoid areas where these species are known to occur. 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 9, may be implemented as appropriate to further minimize potential impacts.

<u>Operational Impacts</u>

As explained above, operational activities would consist of implementation/running of the deployable technology and routine maintenance and inspections. As with the Preferred

Alternative, it is anticipated that activities may affect, but are not likely to adversely affect threatened and endangered species and their habitats as a result of routine operations, management, and monitoring. FirstNet would attempt to avoid areas where these species are known to occur. 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 9, may be implemented as appropriate to further 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 threatened and endangered species as a result of construction and operation of the Proposed Action. Environmental conditions would therefore be the same as those described in Section 6.1.6.6, Threatened and Endangered Species and Species of Conservation Concern.

6.2.7. Land Use, Recreation, and Airspace

6.2.7.1. Introduction

This section describes potential impacts to land use, recreation, and airspace resources in Nevada associated with deployment and operation of the Proposed Action and Alternatives. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

6.2.7.2. 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 6.2.7-1. The categories of impacts are defined as potentially significant, less than significant with mitigation incorporated, less than significant, or no impact. Characteristics of each impact type, including magnitude or intensity, geographic extent, and duration or frequency, were used to determine the impact significance rating associated with each potential impact.

Given the nature of this programmatic evaluation, and because the Proposed Action could potentially cover a wide variety of actions that would take place in various landscapes, the potential impacts to land use, recreation, and airspace resources addressed in this section are presented as a range of possible impacts.

Table 6.2.7-1: Impact Significance Rating Criteria for Land Use, Recreation, and Airspace

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
Direct land use change	Magnitude or Intensity	Change in designated/permitted land use that conflicts with existing permitted uses, and/or would require a change in zoning. Conversion of prime or unique agricultural lands.	Effect that is potentially significant, but with mitigation is less than significant.	Minimal changes in existing land use, or change that is permitted by-right, through variance, or through special exception.	No changes to existing development, land use, land use plans, or policies. No conversion of prime or unique agricultural lands.
	Geographic Extent	Regional impacts observed throughout the state or territory.		Effects realized at one or multiple isolated locations.	NA
	Duration or Frequency	Permanent: Land use altered indefinitely.		Short-Term: Land use altered for as long as the entire construction phase or a portion of the operations phase.	NA
Indirect land use change	Magnitude or Intensity	New land use directly conflicts with surrounding land use pattern, and/or causes substantial restriction of land use options for surrounding land uses.	Effect that is potentially significant, but with mitigation is less than significant.	New land use differs from, but is not inconsistent with, surrounding land use pattern; minimal restriction of land use options for surrounding land uses.	No conflicts with adjacent existing or planned land uses.
	Geographic Extent	Regional impacts observed throughout the state or territory.		Effects realized at one or multiple isolated locations.	NA
	Duration or Frequency	Permanent: Land use altered indefinitely.		Short-Term: Land use altered for as long as the entire construction phase or a portion of the operations phase.	NA

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
Loss of access to public or private recreation land or activities	Magnitude or Intensity	Total loss of access to recreation land or activities.	Effect that is potentially significant, but with mitigation is less than significant.	Restricted access to recreation land or activities.	No disruption or loss of access to recreational lands or activities.
	Geographic Extent	Most or all recreational land/sites in a state or territory; recreational lands/sites that are of national significance.		Effects realized at one or multiple isolated locations; recreational lands that are not nationally significant, but that are significant within the state/territory.	NA
	Duration or Frequency	Persists during the life of the project.		Persists for as long as the entire construction phase or a portion of the operations phase.	NA
Loss of enjoyment of public or private recreation land (due to visual, noise, or other impacts that make recreational activity less desirable)	Magnitude or Intensity	Total loss of enjoyment of recreational activities; substantial reduction in the factors that contribute to the value of the recreational resource, resulting in avoidance of activity at one or more sites.	Effect that is potentially significant, but with mitigation is less than significant.	Small reductions in visitation or duration of recreational activity.	No loss of enjoyment of recreational activities or areas; no change to factors that contribute to the value of the resource.
	Geographic Extent	Most or all recreational land/sites in a state or territory; recreational lands/sites that are of national significance.		Effects realized at one or multiple isolated locations; recreational lands that are not nationally significant, but that are significant within the state/territory.	NA
	Duration or Frequency	Persists during or beyond the life of the project.		Persists for as long as the entire construction phase or a portion of the operations phase.	NA

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	Less than Significant with BMPs and Mitigation Measures Incorporated	Less than Significant	No Impact
Use of airspace	Magnitude or Intensity	Measurable, substantial change in flight patterns and/or use of airspace.	Effect that is potentially significant, but with mitigation is less than significant.	Alteration to airspace usage is minimal.	No alterations in airspace usage or flight patterns.
	Geographic Extent	Regional impacts observed throughout the state or territory.		Effects realized at one or multiple isolated locations.	NA
	Duration or Frequency	Permanent: Airspace altered indefinitely.		Short-Term: Airspace altered for as long as the entire construction phase or a portion of the operations phase.	NA

NA = Not Applicable

6.2.7.3. Description of Environmental Concerns

Direct Land Use Change

Changes in land use could be influenced by the deployment, operation, and maintenance of facilities or other infrastructure, and the acquisition of rights-of-way or easement. The deployment, operation, and maintenance of structures, towers, roads, and other permanent features could conflict with exiting development or land use. The installation of poles, towers, structures, or other aboveground facilities or assets could have short- or long-term effects to existing development or land use based on the characteristics of the structures or facilities, such as the location, type, or height. In addition, the acquisition of rights-of-way or easements and the construction of roads to access facilities and locations could influence changes in land use. The effects from these actions would depend on the geographic location; compatibility with existing land uses; and characteristics of the ROW, 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 6.2.7-1, 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 6.2.7-1, less than significant impacts would be anticipated as any new land use would be small-scale; 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 rights-of-way 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 6.2.7-1, 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. 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 6.2.7-1, less than significant impacts would be anticipated as only small reductions, if any, in recreational visits or durations would occur due to the relatively small-scale nature of likely FirstNet activities. Only short-term impacts during the construction phase would be expected.

Use of Airspace

Primary concerns to airspace include the following: if aspects of the Proposed Action would result in violation of FAA regulations; undermine the safety of civilian, military, or commercial aviation; or infringe on flight activity and flight corridors. Potential impacts could include air routes or flight paths, available flight altitudes, disruption of normal flight patterns, and restrictions to flight activities. Construction of new towers or alternations to existing towers could obstruct navigable airspace depending on the tower location. Use of aerial technologies could result in SUA considerations.

Based on impact significance criteria presented in Table 6.2.7-1, airspace impacts are not likely to change or alter flight patterns or airspace usage as drones, balloons, and piloted aircraft would likely only be deployed in an emergency and for a short period, FirstNet would not have a significant impact on airspace resources.

6.2.7.4. 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. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Activities Likely to Have No Impacts

Of the types of facilities or infrastructure deployment scenarios described in Section 2.1.2, Proposed Action Infrastructure, the following are likely to have no impacts to land use, recreation, and airspace resources under the conditions described below:

- Wired Projects
  - New Build – Buried Fiber Optic Plant: Plowing (including vibratory plowing), trenching, or directional boring alongside the road in utility corridors or within public road rights-of-way.
    - Land Use: See *Activities with the Potential to Have Impacts* below.
    - Recreation: See *Activities with the Potential to Have Impacts* below.
    - Airspace: No impacts to airspace would be anticipated since the activities would not affect flight patterns or cause obstructions that would require FAA and/or state review based on FAR 14 CFR, Part 77, *Safe, Efficient Use, and Preservation of the Navigable Airspace* (See Section 5.1.7.5 Obstructions to Airspace Considerations).
  - Use of Existing Conduit – New Buried Fiber Optic Plant: Disturbance associated with the installation of fiber optic cable in existing conduit would be limited to entry and exit points of the existing conduit in previously disturbed areas.
    - Land Use: It is anticipated that there would be no impacts to land use since the activities that would be conducted would not directly or indirectly result in changes to existing and surrounding land uses.
    - Recreation: See *Activities with the Potential to Have Impacts* below.
    - Airspace: It is anticipated that there would be no impacts to airspace since the activities would not affect flight patterns or cause obstructions that would require FAA and/or state review based on FAR 14 CFR, Part 77, *Safe, Efficient Use, and Preservation of the Navigable Airspace*.

- New Build – Aerial Fiber Optic Plant: Installing new poles and hanging cables on previously disturbed or new (undisturbed) ROWs or easements and the potential construction of access roads.
  - Land Use: See *Activities with the Potential to Have Impacts* below.
  - Recreation: See *Activities with the Potential to Have Impacts* below.
  - Airspace: Installation of new poles would not have an effect on airspace because utility poles are an average of 40 feet in height and do not intrude into useable airspace.
- Collocation on Existing Aerial Fiber Optic Plant: Installation of new fiber on existing poles would be limited to previously disturbed areas.
  - Land Use: It is anticipated that there would be no impacts to land use since the activities that would be conducted would not directly or indirectly result in changes to existing and surrounding land uses.
  - Recreation: No impacts to recreation would be anticipated since the activities that would be conducted would not cause disruption or loss of access to recreational lands or activities or the enjoyment of those lands or activities.
  - Airspace: No impacts are anticipated to airspace from collocations.
- Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting of dark fiber and installation of new equipment in existing huts.
  - Land Use: It is anticipated that there would be no impacts to land use since the activities would not directly or indirectly result in changes to existing and surrounding land uses.
  - Recreation: Use of existing dark fiber would not impact recreation because it would not impede access to recreational resources.
  - Airspace: Lighting of dark fiber would have no impacts to airspace.
- New Build – Submarine Fiber Optic Plant: Installing cables in limited nearshore and inland bodies of water and the constructing landings and/or facilities on shores or the banks of waterbodies that accept the submarine cable.
  - Land Use: See *Activities with the Potential to Have Impacts* below.
  - Recreation: See *Activities with the Potential to Have Impacts* below.
  - Airspace: The installation of cables in or near bodies of water and construction of landings and/or facilities on shores or the banks of water bodies that accept the submarine cable 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 6.1.7.5 Obstructions to Airspace Considerations).

  - Installation of Optical Transmission or Centralized Transmission Equipment: Installation of transmission equipment would occur in existing boxes or huts. The section below addresses potential impacts to land use, recreation resources, and airspace if deployment of new boxes, huts, or access roads is required.
    - Land Use: See *Activities with the Potential to Have Impacts* below.
    - Recreation: See *Activities with the Potential to Have Impacts* below.
    - Airspace: No impacts to airspace would be anticipated since the activities would not affect flight patterns or cause obstructions that would require FAA and/or state review based on FAR 14 CFR, Part 77, *Safe, Efficient Use, and Preservation of the Navigable Airspace* (see Section 6.1.7.5 Obstructions to Airspace Considerations)
- Wireless Projects
  - Collocation on Existing Wireless Tower, Structure, or Building: Collocation would involve mounting or installing equipment (such as antennas or microwave dishes) on an existing tower, structure, or building.
    - Land Use: There would be no impacts to existing and surrounding land uses. The potential addition of power units, structural hardening, and physical security measures would not impact existing or surrounding land uses.
    - Recreation: See *Activities with the Potential to Have Impacts* below.
    - Airspace: See *Activities with the Potential to Have Impacts* below.
- Deployable Technologies
  - Deployable Technologies: These technologies would be used where permanent, fixed infrastructure cannot be deployed due to a variety of factors such as the need to supplement coverage or to avoid or mitigate permanent impacts to sensitive resources or receptors.
    - Land Use: It is anticipated that there would be no impacts to existing or surrounding land uses because these technologies would be temporarily located in areas compatible with other land uses.
    - Recreation: No impacts to recreation are anticipated, as deployable technologies would not affect the use or enjoyment of recreational lands.
    - Airspace: Use of land-based deployable technologies (COW, COLT, and SOW) is not expected to result in impacts to airspace, provided antenna masts do not exceed 200 feet AGL or do not trigger any of the other FAA obstruction to airspace criteria listed in Section 6.1.7.5 Obstructions to Airspace Considerations.
- Satellites and Other Technologies
  - Satellite-Enabled Devices and Equipment: Installation of permanent equipment on existing structures and the use of portable devices that use satellite technology.

    - Land Use: It is anticipated that there would be no impacts to existing or surrounding land uses because these technologies would be temporarily located in areas compatible with other land uses.
    - Recreation: It is anticipated that there would be no impacts to recreational uses because these technologies would be temporarily deployed but would not restrict access to, or enjoyment of, recreational lands.
    - Airspace: It is anticipated that the installation of permanent equipment on existing structures and the use of portable devices that use satellite technology would not impact airspace because those activities would not result in changes to flight patterns and airspace usage or result in obstructions to airspace.
  - Deployment of Satellites: FirstNet does not anticipate launching satellites as part of the deployment of the NPSBN; however, it could include equipment on satellites that are already being launched for other purposes. As adding equipment to an existing launch vehicle would be very unlikely to impact to land use, recreation, or airspace, it is anticipated that this activity would have no impact on land use, recreation, or airspace.

Activities with the Potential to Have Impacts

Potential deployment-related impacts to land use, recreation resources, or airspace as a result of implementation of the Preferred Alternative would encompass a range of impacts that could occur, including changes to existing and surrounding land uses. The types of infrastructure deployment activities that could be part of the Preferred Alternative and result in potential impacts to land use resources include the following:

- Wired Projects
  - New Build – Buried Fiber Optic Plant: Plowing (including vibratory plowing), trenching, or directional boring alongside the road in utility corridors or within public road rights-of-way.
    - Land Use: Construction activities could temporarily restrict existing and surrounding land uses at isolated locations.
    - Recreation: It is anticipated that plowing, trenching, or directional boring may cause temporary, localized restrictions to recreational land or activities, which may persist during the deployment phase. It is reasonable to anticipate that small reductions in visitation to localized areas may occur during the deployment phase.
    - Airspace: No impacts are anticipated – see previous section.
  - New Build – Aerial Fiber Optic Plant: Installing new poles and hanging cables on previously disturbed or new (undisturbed) ROWs or easements and the potential construction of access roads.
    - Land Use: These activities could result in term potential impacts to land uses. Construction activities could temporarily restrict existing and surrounding land uses at isolated locations. New structures, poles, or access roads on previously

undisturbed ROWs or easements could have long-term impacts to existing and surrounding land uses. The magnitude of the impact would depend on the specific location and the compatibility of the new structures with existing and surrounding land uses. The magnitude of the impact would depend on the specific location and the compatibility of the new structures with existing and surrounding land uses.

- Recreation: Deployment activities may cause temporary, localized restricted access to recreation land or activities, which may persist for the duration of the deployment phase. Small reductions to visitation during the deployment phase may be anticipated.
- Airspace: No impacts are anticipated – see previous section.

- New Build – Submarine Fiber Optic Plant: Installing cables in limited nearshore and inland bodies of water and the constructing landings and/or facilities on shores or the banks of waterbodies that accept the submarine cable.
    - Land Use: Construction activities could temporarily restrict existing and surrounding land uses at isolated locations. New landings and/or facilities on shore could have long-term impacts to existing and surrounding land uses. The magnitude of the impact would depend on the specific location and the compatibility of the new facilities with existing and surrounding land uses.
    - Recreation: Deployment may temporarily restrict recreation on or within limited nearshore and inland bodies of water and the surrounding area during the deployment phase. Reductions in visitation may result during deployment.
    - Airspace: No impacts are anticipated – see previous section.
- Installation of Optical Transmission or Centralized Transmission Equipment: Installation of equipment including construction of new boxes, huts, or access roads.
    - Land Use: Construction activities could temporarily restrict existing and surrounding land uses at isolated locations. New boxes, huts, or access roads could have long-term impacts to existing and surrounding land uses. The magnitude of the impact would depend on the specific location and the compatibility of the new facilities with existing and surrounding land uses.
    - Recreation: Deployment of installation equipment and the construction of boxes, huts, or access roads may restrict access to recreation land or activities. Reductions in visitation during deployment may occur.
    - Airspace: No impacts are anticipated – see previous section.

- Wireless Projects
    - New Wireless Communication Towers: Installing new wireless towers, associated structures (generators, equipment sheds, fencing, security and aviation lighting, electrical feeds, and concrete foundations and pads) or access roads.

        - Land Use: Construction activities could temporarily restrict existing and surrounding land uses at isolated locations. New wireless towers, associated structures, or access roads could have long-term impacts to existing and surrounding land uses. The magnitude of the impact would depend on the specific location and the compatibility of the new facilities with existing and surrounding land uses.
        - Recreation: Deployment of new towers and associated structures could result in temporary, localized restricted access for recreation land or activities for the duration of the deployment phase. Reductions in visitation or duration of recreational activity may result from restricted access.
        - Airspace: Installation of new wireless towers could result in impacts to airspace if towers exceed 200 feet above ground level or meets other criteria listed in Section 6.1.7.5 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 built near one of Nevada'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 Nevada airports (See obstruction criteria in Section 6.1.7.5 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, and untethered balloons, and blimps (e.g., frequency of deployment, altitudes, proximity to airports and airspaces classes/types, length of deployment, etc.). Coordination with the FAA would be required to determine the actual impact and the required certifications. It is expected that FirstNet would attempt to avoid changes to airspace and the flight profiles (boundaries, flight altitudes, operating hours, etc.).

- Satellites and Other Technologies
  - Satellite-Enabled Devices and Equipment: The installation of permanent equipment on existing structures and the use of portable devices that use satellite technology.
    - Land Use: No impacts are anticipated – see previous section.
    - Recreation: It is anticipated the installation of equipment on existing structures may cause temporary, localized restricted access to recreation lands or activities during installation, which may cause small reductions in visitation for the duration of installation.
    - Airspace: It is anticipated that the installation of permanent equipment on existing structures and the use of portable devices that use satellite technology may impact airspace if equipment creates an obstruction.

In general, the abovementioned activities could potentially involve construction activities. Potential impacts to land uses associated with deployment could include temporary restrictions to existing and surrounding land uses in isolated locations. Potential impacts to recreation land and activities could include temporary, localized restricted access and reductions in visitation or duration of recreational activities. Potential impacts to airspace could include obstructions. These potential impacts are expected to be less than significant 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 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, operation activities associated with the Preferred Alternative would consist of routine maintenance and inspection of the facilities. Any major infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the abovementioned deployment impacts. It is anticipated that there would be no impacts to land use, recreation resources, or airspace associated with routine inspections of the Preferred Alternative, assuming that the same access roads used for deployment are also used for temporary, short-term inspections because there would be no ground disturbance, no airspace activity, and no access restrictions to recreational lands. If routine maintenance or inspection activities would conflict with existing or surrounding land uses, impact recreation resources, or conflict with airspace, impacts could result as explained above.

Operation of Deployable Technologies options of the Preferred Alternative could result in the temporary presence of deployable vehicles and equipment (including airborne equipment), potentially for up to two years in some cases. Operation activities would consist of implementation/running of the deployable technology and routine maintenance and inspections. It is anticipated that there would be no impacts to land use, recreation resources, or airspace associated with routine inspections, assuming that the same access roads used for deployment are also used for inspections.

The degree of change in the visual environment (see Section 6.2.8, Visual Resources)—and therefore the potential indirect impact on a landowner's ability to use or sell of their land as desired—would be highly dependent on the specific deployment location and length of deployment. Once deployment locations are known, the location would be subject to an environmental review to help ensure environmental concerns are identified. The use of deployable aerial communications architecture could temporarily add new air traffic or aerial navigation hazards. The magnitude of these effects would depend on the specific location of airborne resources along with the duration of their use. FirstNet would coordinate with the FAA to review required certifications. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

6.2.7.5. 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 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 land use, recreation, and airspace resources as a result of implementation of this alternative could be as described below.

Deployment Impacts

As explained above, implementation of deployable technologies could result in less than significant impacts to land use. While a single deployable technology may have imperceptible impact, multiple technologies operating in close proximity for longer periods could impact existing and surrounding land uses. There could be impacts to recreation activities during the deployment of technologies if such deployment were to occur within or near designated recreation areas. Enjoyment of activities dependent upon the visibility of wildlife or scenic vistas may be affected, however, impacts would be less than significant due to the temporary nature of likely deployment activities. If deployment triggers any obstruction criterion or result in changes to flight patterns and airspace restrictions, FirstNet (or its partners) would consult with the FAA to determine how to proceed. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

As explained above, operation activities would consist of implementation/running of the deployable technology and routine maintenance and inspections. As with the Preferred Alternative, it is anticipated that there would be no impacts to land use, recreation resources, or airspace associated with routine inspections of the Deployable Technologies Alternative, assuming that the same access roads used for deployment are also used for inspections. Operation of deployable technologies would result in land use, land ownership, airspace, and recreation (access and enjoyment) similar in type to those described for the Preferred Alternative. The frequency and extent of 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 due to the temporary nature of deployment activities. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

No Action Alternative

Under the No Action Alternative, the NPSBN would not be deployed; therefore, there would be no associated construction or installation of wired, wireless, deployable infrastructure, or satellites and other technologies. As a result, there would be no impacts to land use, recreation resources, or airspace. Environmental conditions would therefore be the same as those described in Section 6.1.7, Land Use, Recreation, and Airspace.

6.2.8. Visual Resources

6.2.8.1. Introduction

This section describes potential impacts to visual resources in Nevada associated with deployment and operation of the Proposed Action and alternatives. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

6.2.8.2. Impact Assessment Methodology and Significance Criteria

The impacts of the Proposed Action on visual resources were evaluated using the significance criteria presented in Table 6.2.8-1. The categories of impacts are defined as potentially significant, less than significant with mitigation incorporated, less than significant, or no impact. Characteristics of each impact type, including magnitude or intensity, geographic extent, and duration or frequency, were used to determine the impact significance rating associated with each potential impact.

Given the nature of this programmatic evaluation, and because the Proposed Action could potentially cover a wide variety of actions that would take place in various landscapes, the potential impacts to visual resources addressed in this section are presented as a range of possible impacts.

Table 6.2.8-1: Impact Significance Rating Criteria for Visual Resources

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
Adverse change in aesthetic character of scenic resources or viewsheds	Magnitude or Intensity	Fundamental and irreversibly negative change in aesthetic character.	Effect that is potentially significant, but with mitigation is less than significant.	Intermittently noticeable change in aesthetic character that is marginally negative.	No visible effects.
	Geographic Extent	Regional impacts observed throughout the state/territory.		Effects realized at one or multiple isolated locations.	No visible effects.
	Duration or Frequency	Permanent or persistent changes to aesthetic character lasting throughout or beyond the construction or deployment phase.		Persisting through the construction and deployment phase, but aesthetics of the area would be returned to original state following the construction and deployment phase.	Transient or no visible effects.
Nighttime lighting	Magnitude or Intensity	Lighting dramatically alters night-sky conditions.	Effect that is potentially significant, but with mitigation is less than significant.	Lighting alters night-sky conditions to a degree that is only intermittently noticeable.	Lighting does not noticeably alter night-sky conditions.
	Geographic Extent	Regional impacts observed throughout the state/territory.		Effects realized at one or multiple isolated locations.	No visible effects.
	Duration or Frequency	Permanent or persistent changes to night-sky conditions lasting throughout or beyond the construction or deployment phase.		Persisting through the construction and deployment phase, but lighting would be removed and night-sky conditions would be returned to original state following the construction and deployment phase.	Transient or no visible effects.

6.2.8.3. 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 Nevada, residents and visitors travel to many national monuments, historic sites, and state parks, to view its scenic viewsheds and recreation areas. 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 6.2.8-1, impacts to the aesthetic character of scenic resources or viewsheds would be considered potentially significant if landscapes were permanently removed or fragmented, or if damage to historic or cultural resources occurred. Given the small-scale of likely FirstNet activities, impacts are expected to be less than significant

Nighttime Lighting

If new towers or facilities were constructed to a height that required lighting, nighttime vistas could be affected in areas where the night skies do not have light disruptions or are within unpopulated areas. If nighttime lighting were necessary for the operation or function of a facility that caused regional impacts or permanent changes to night sky conditions, those effects could be considered potentially significant.

Based on the impact significance criteria presented in Table 6.2.8 1, lighting that illuminates the night sky, diminishes night sky viewing over long distances, and persists over the long-term could be considered potentially significant. Although likely FirstNet actions are expected to be small-scale, certain discrete locations may experience potentially significant impacts to night skies, although potentially minimized to less than significant with implementation of BMPs and mitigation measures, as defined in Chapter 9, BMPs and Mitigation Measures. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented.

6.2.8.4. 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. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Activities Likely to Have No Impacts

Of the types of facilities or infrastructure deployment scenarios described in Section 2.1.2, Proposed Action Infrastructure, the following are likely to have no impacts to visual resources under the conditions described below:

- Wired Projects
    - Collocation on Existing Aerial Fiber Optic Plant: While the addition of new aerial fiber optic plant to an existing aerial fiber optic transmission system would likely be visible, the change associated with this option is so small as to be essentially imperceptible. This option would involve no new nighttime lighting and pole replacement would be limited.
    - Use of Existing Conduit – New Buried Fiber Optic Plant: Disturbance associated with the installation of fiber optic cable in existing conduit would be limited to entry and exit points of the existing conduit in previously disturbed areas. It is anticipated that there would be no impacts to visual resources since the activities would be conducted at small entry and exit points and are not likely to produce perceptible changes, and would not require nighttime lighting.
    - Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting up of dark fiber would have no impacts to visual resources because there would be no ground disturbance, it would not require nighttime lighting, and it would not produce any perceptible changes to the visual landscape.
- Satellites and Other Technologies
    - Satellite-Enabled Devices and Equipment: It is anticipated that the installation of permanent equipment on existing structures and the use of portable devices that use satellite technology would not impact visual resources since those activities would not require ground disturbance or vegetation removal.
    - Deployment of Satellites: FirstNet does not anticipate launching satellites as part of the deployment of the NPSBN; however, it may include equipment on satellites that are already being launched for other purposes. As adding equipment to an existing launch vehicle would be very unlikely to impact visual resources, it is anticipated that this activity would have no impact on visual resources.

Activities with the Potential to Have Impacts

Potential deployment-related impacts to visual resources as a result of implementation of the Preferred Alternative would encompass a range of impacts that could occur as a result of ground disturbance, vegetation removal, or installation of permanent structures if development occurs in scenic areas. The types of deployment activities that could be part of the Preferred Alternative and result in potential impacts to visual resources include the following:

- Wired Projects
    - New Build – Buried Fiber Optic Plant: Plowing (including vibratory plowing), trenching, or directional boring and the construction of POPs, huts, or other associated facilities or hand-holes to access fiber could result in potential impacts to visual resources. The degree of impact would depend on the timing, location, and type 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 shores or the banks of waterbodies 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.

- Collocation on Existing Wireless Tower, Structure, or Building: Collocation would involve mounting or installing equipment (such as antennas or microwave dishes) on an existing tower and would not likely result in additional impacts to visual resources. However, if additional power units, structural hardening, or physical security measures required ground disturbance or removal of vegetation, impacts to the aesthetic character of scenic resources or viewsheds could occur.
- Deployable Technologies: Implementation of deployable technologies could result in potential impacts to visual resources if long-term deployment occurs in scenic areas, or if the implementation requires minor construction of staging or landing areas, results in vegetation removal, areas of surface disturbance, or additional nighttime lighting.

In general, the abovementioned activities could potentially involve land/vegetation clearing, and potential scenic intrusion of lighting, towers, poles, roads, infrastructure, and other structures. Potential impacts to visual resources associated with deployment could include interruptions of landscapes, degradation of the aesthetic character of scenic resources or viewsheds, and overall changes in valued scenic resources, particularly for permanent fixtures such as towers or facilities. These impacts are expected to be less than significant due to the temporary and small-scale nature of deployment activities. As discussed above, potential impacts to night skies from lighting are expected to be less than significant with BMPs and mitigation measures incorporated. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, operation activities associated with the Preferred Alternative would consist of routine maintenance and inspection of the facilities. Any major infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the abovementioned construction impacts. It is anticipated that there would be no impacts to visual resources associated with routine inspections of the Preferred Alternative, assuming that the same access roads used for deployment are also used for inspections. Nighttime lighting in isolated rural areas or if sited near a national park would be less than significant with BMPs and mitigation measures incorporated during operations. Additionally, FirstNet would work closely with the NPS to address any concerns they might have if a tower needed to be placed in an area that might affect the nighttime sky at a NPS unit. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

6.2.8.5. Alternatives Impact Assessment

The following section assesses potential impacts to visual resources associated with the Deployable Technologies Alternative and the No Action Alternative.

Deployable Technologies Alternative

Under the Deployable Technologies Alternative option, a nationwide fleet of mobile communications systems would provide temporary coverage in areas not covered by the existing, usable infrastructure. There would be no collocation of equipment and minimal new construction associated with wired or wireless projects discussed above under the Preferred Alternative. Some limited construction could be associated with implementation such as land clearing or paving for parking or staging areas. The specific infrastructure associated with the Deployable Technologies Alternative would be the same as the deployable technologies implemented as part of the Preferred Alternative but would likely be implemented in greater numbers, over a larger geographic extent, and used with greater frequency and duration. Therefore, potential impacts to infrastructure as a result of implementation of this alternative could be as described below.

Deployment Impacts

As explained above, implementation of deployable technologies could result in potential impacts to visual resources if long-term deployment occurs in scenic areas. If staging or landing areas (depending on the type of technology) require surface disturbance or vegetation clearing, or if these areas were within scenic landscapes or required new nighttime lighting, impacts could occur to the aesthetic character of scenic resources or viewsheds. These impacts are expected to be less than significant as generally they would be limited to the deployment location and could often be screened or otherwise blocked from view. Chapter 9, BMPs and Mitigation Measures, provide a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

As explained above, operation activities would consist of implementation/running of the deployable technology and routine maintenance and inspections. As with the Preferred Alternative, it is anticipated that there would be no impacts to visual resources associated with routine inspections of the Preferred Alternative, assuming that the same access roads used for deployment are also used for inspections. The potential visual impacts—including aesthetic conditions and nighttime lighting—of the operation of deployable technologies would be less than significant given the limited geographic scope for individual activities. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

No Action Alternative

Under the No Action Alternative, the NPSBN would not be deployed; therefore, there would be no associated construction or installation of wired, wireless, deployable infrastructure or satellites and other technologies. As a result, there would be no impacts to visual resources as a result of construction and operation of the Proposed Action. Environmental conditions would therefore be the same as those described in Section 6.1.8, Visual Resources.

6.2.9. Socioeconomics

6.2.9.1. Introduction

This section describes potential impacts to socioeconomics in Nevada associated with deployment and operation of the Proposed Action and alternatives. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

6.2.9.2. Impact Assessment Methodology and Significance Criteria

The impacts of the Proposed Action on socioeconomics were evaluated using the significance criteria presented in Table 6.2.9-1. The categories of impacts are defined as potentially significant, less than significant with mitigation incorporated, less than significant, or no impact. Characteristics of each impact type, including magnitude or intensity, geographic extent, and duration or frequency, were used to determine the impact significance rating associated with each potential impact.

Given the nature of this programmatic evaluation, and because the Proposed Action could potentially cover a wide variety of actions that would take place in various landscapes, the potential impacts to socioeconomics addressed in this section are presented as a range of possible impacts.

Table 6.2.9-1: Impact Significance Rating Criteria for Socioeconomics

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	Less than Significant with BMPs and Mitigation Measures Incorporated	Less than Significant	No Impact
Impacts to real estate (could be positive or negative)	Magnitude or Intensity	Changes in property values and/or rental fees, constituting a significant market shift.	Effect that is potentially significant, but with mitigation is less than significant.	Indiscernible impact to property values and/or rental fees.	No impacts to real estate in the form of changes to property values or rental fees.
	Geographic Extent	Regional impacts observed throughout the state/territory.		Effects realized at one or multiple isolated locations.	NA
	Duration or Frequency	Persists during the life of the project.		Persists for as long as the entire construction phase or a portion of the operations phase.	NA
Changes to spending, income, industries, and public revenues	Magnitude or Intensity	Economic change that constitutes a market shift.	Effect that is potentially significant, but with mitigation is less than significant.	Indiscernible economic change.	No change to spending, income, industries, and public revenues.
	Geographic Extent	Regional impacts observed throughout the state/territory.		Effects realized at one or multiple isolated cities/towns.	NA
	Duration or Frequency	Persists during or beyond the life of the project.		Persists for as long as the entire construction phase or a portion of the operations phase.	NA
Impacts to employment	Magnitude or Intensity	High level of job creation at the state or territory level.	Effect that is potentially significant, but with mitigation is less than significant.	Low level of job creation at the state/territory level.	No job creation due to project activities at the state/territory level.
	Geographic Extent	Regional impacts observed throughout the state/territory.		Effects realized at one or multiple isolated cities/towns.	NA

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
	Duration or Frequency	Persists during the life of the project.		Persists for as long as the entire construction phase or a portion of the operations phase.	NA
Changes in population number or composition	Magnitude or Intensity	Substantial increases in population, or changes in population composition (age, race, gender).	Effect that is potentially significant, but with mitigation is less than significant.	Minor increases in population or population composition.	No changes in population or population composition.
	Geographic Extent	Regional impacts observed throughout the state or territory.		Effects realized at one or multiple isolated locations.	NA
	Duration or Frequency	Persists during the life of the project.		Persists for as long as the entire construction phase or a portion of the operations phase.	NA

NA = Not Applicable

6.2.9.3. 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 (provide a better fit of the response to the need). These effects would reduce the potential for economic losses and thus support investments in property and greater market value for property. Any increases in property values are most likely in areas that have low property values and below average public safety communication services. Increases are less likely in areas that already have higher property value. As discussed in Affected Environment, property values vary considerably across Nevada. Median values of owner-occupied housing units in the 2009–2013 period ranged from over $225,000 in the Gardnerville Ranchos area, to just over $120,000 in the Pahrump area. These figures are general indicators only. Individual property values are probably both higher and lower in specific localities. Any property value effects of deployment of the NPSBN would occur at a localized level.

Some telecommunications infrastructure, such as wireless communications towers, may adversely affect property values, depending on infrastructure location and other characteristics. Researchers believe these negative impacts relate to perceptions of the aesthetics of towers, or fears over electromagnetic radiation. Economists and appraisers have studied this issue and use a statistical analysis methodology known as hedonic pricing, or hedonic modelling, to assess how different attributes of properties such as distance from a tower affect property value (Bond, Sims, & Dent, 2013). Essentially, analysts compare the value of multiple properties while statistically controlling for differences in property attributes, in order to isolate the effect of a specific attribute such as proximity of a communications tower.

A recent literature review examined such studies in the United States, Germany, and New Zealand (Bond, Sims, & Dent, 2013). These studies all focused on residential properties. One study identified a positive effect on price in one neighborhood due to the presence of a wireless communications tower. Most studies identified negative effects on price. Generally, these negative effects were small: an approximately two percent decrease in property price. In one case, the average reduction in price was 15 percent. In all cases, the effects declined rapidly with distance, with some cases showing no effect beyond 100 meters (328 feet) and one case showing effects up to about 300 meters (984 feet).

Based on review of the particulars of each study, the literature review authors hypothesize that many additional factors regarding communications towers, besides distance, may affect property value. These include the type, height, size, and appearance of communication towers; grouping of towers; the level of activity in the property market at the time properties are listed or sold; and the level of negative local media focus on potential health effects of communication towers at the time properties are listed or sold.

Economic Benefits or Adverse Impacts related to Changes in Spending, Income, Industries, and Public Revenues

Developing the NPSBN may increase economic activity as governments and partners make expenditures to deploy, operate, and maintain telecommunications and broadband infrastructure. Funds for such expenditures would come primarily from federal, state, and local government sources or through private entities under a written agreement with such governmental entities. FirstNet has three primary sources of funding to carry out its mission: (1) up to $7 billion in cash funded by proceeds of incentive auctions authorized by the Act; (2) network user or subscriber fees; and (3) fees from covered leasing agreements that allow FirstNet to permit a secondary 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 could be a minor, direct, beneficial impact of expenditures on FirstNet. Additional, indirect employment increases would occur as additional businesses hire workers to provide supporting goods and services. For instance, FirstNet partner(s) and their subcontractors and vendors would need engineers and information technology professionals, project managers, construction workers, manufacturing workers, maintenance workers, and other technical and administrative staff. Further employment gains would occur as businesses throughout the economy benefit from consumer spending by wage earners in direct and indirectly affected businesses.

For the most part, employment gains in any particular state or community would generally be measurable, but small relative to the overall state or community economy. This is because FirstNet infrastructure investments would be dispersed across the nation. Based on the significance criteria above, the employment gains would be considered positive and less than significant. 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 Nevada. The average unemployment rate in 2014 was 7.8 percent, somewhat higher than the national rate. Counties in the northeastern region of Nevada had unemployment rates below the national average (that is, better employment performance). Most of the remainder of the state, including the counties around populated areas such as Reno and Las Vegas/Henderson, had unemployment rates above the national average, with the exception of one county (i.e., Esmeralda County) located in west-central Nevada.

Large companies that win major contracts for deploying and operating the NPSBN may have concentrations of employees in some specific locations; for instance, engineers and other system designers may be located in one or a few specific offices. While such employment concentrations could be important to specific communities, these and other employment impacts would still not be significant based on the criteria in Table 6.2.9-1 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.

6.2.9.4. Potential Impacts of the Preferred Alternative

The following section assesses potential impacts associated with implementation of the Preferred Alternative, including deployment and operation activities.

Deployment Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, implementation of the Preferred Alternative could deploy various types of facilities or infrastructure. Almost all deployment activities would have socioeconomic impacts, because all represent economic activity that would result, for instance, in expenditures and generation of income. These effects are measurable by economists, even if very small, but their significance is determined by application of the criteria in Table 6.2.9-1. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Activities Likely to Have No Impacts

- Satellites and Other Technologies
  - Deployment of Satellites: FirstNet does not anticipate launching satellites as part of the deployment of the NPSBN; however, it could include equipment on satellites that are already being launched for other purposes. As adding equipment to an existing launch vehicle would be very unlikely to impact socioeconomics, it is anticipated that this activity would have no impact on socioeconomic resources.

Activities with the Potential to Have Impacts

Potential impacts to socioeconomics for the Preferred Alternative would encompass a range of impacts that could result from deployment activities. The discussion below indicates which of the four types of socioeconomic impacts discussed above and listed again here apply to each type of deployment activity. For greater detail on the nature of these impacts, see the Description of Environmental Concerns section above.

- Impacts to Real Estate;
- Changes to Spending, Income, Industries, and Public Revenues;
- Impacts to Employment; 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 limited nearshore and inland bodies of water, and associated onshore activities at existing or new facilities would have the following types of socioeconomic impacts:
  - Changes to Spending, Income, Industries, and Public Revenues – Materials and labor for these projects would represent new expenditures that would generate income, help support industries, and may generate public revenues. All such effects would be small in scale relative to the regional and state economy and of limited duration; their impacts would be less than significant.
  - Impacts to Employment – Similarly, expenditures for these projects would generate temporarily a less than significant number of jobs regionally and statewide.
- Installation of Optical Transmission or Centralized Transmission Equipment: Installation of transmission equipment through existing or new boxes or huts would have the following types of socioeconomic impacts:
  - Changes to Spending, Income, Industries, and Public Revenues – Materials and labor for these projects would represent new expenditures that would generate income, help support industries, and may generate public revenues. All such effects would be small in scale relative to the regional and state economy and of limited duration; their impacts would be less than significant.
  - Impacts to Employment – Similarly, expenditures for these projects would generate temporarily a less than significant number of jobs regionally and statewide.
- New Build – Buried Fiber Optic Plant: New fiber optic cable installation usually requires construction activities and would have the following types of socioeconomic impacts:

        - Changes to Spending, Income, Industries, and Public Revenues – Materials and labor for these projects would represent new expenditures that would generate income, help support industries, and may generate public revenues. All such effects would be small in scale relative to the regional and state economy and of limited duration; their impacts would be less than significant.
        - Impacts to Employment – Similarly, expenditures for these projects would generate temporarily a less than significant number of jobs regionally and statewide.
    - New Build – Aerial Fiber Optic Plant: Pole/structure installation would have the following types of socioeconomic impacts:
        - Changes to Spending, Income, Industries, and Public Revenues – Materials and labor for these projects would represent new expenditures that would generate income, help support industries, and may generate public revenues. All such effects would be small in scale relative to the regional and state economy and of limited duration; their impacts would be less than significant.
        - Impacts to Employment – Similarly, expenditures for these projects would generate temporarily a less than significant number of jobs regionally and statewide.
- Wireless Projects
    - New Wireless Communication Towers: Installation of new wireless towers and associated structures, such as generators, equipment sheds, fencing, security and aviation lighting, electrical feeds, and concrete foundations and pads, or access roads would have the following types of socioeconomic impacts:
        - Impacts to Real Estate – As discussed above, communication towers sometimes have adverse impacts on nearby property values (Bond, Sims, & Dent, 2013). Such impacts, if they occur, would be limited to a small area around each project and would generally be a small percentage reduction in property value; thus, the impacts would be less than significant.
        - Changes to Spending, Income, Industries, and Public Revenues – Materials and labor for these projects would represent new expenditures that would generate income, help support industries, and may generate public revenues. All such effects would be small in scale relative to the regional and state economy and of limited duration; their impacts would be less than significant.
        - Impacts to Employment – Similarly, expenditures for these projects would generate temporarily a less than significant number of jobs regionally and statewide.
    - Collocation on Existing Wireless Tower, Structure, or Building: Collocation would include mounting or installing equipment (such as antennas) on an existing facility would have the following types of socioeconomic impacts. While communication towers sometimes have adverse impacts on nearby property values (Bond, Sims, & Dent, 2013), the impacts of existing wireless towers are presumably already factored into property values and would not be affected by the addition of new equipment.

    - Changes to Spending, Income, Industries, and Public Revenues – Materials and labor for these projects would represent new expenditures that would generate income, help support industries, and may generate public revenues. All such effects would be small in scale relative to the regional and state economy and of limited duration; their impacts would be less than significant.
    - Impacts to Employment – Similarly, expenditures for these projects would generate temporarily a less than significant number of jobs regionally and statewide.
  - Deployable Technologies: COWs, COLTs, and SOWs and aerial deployable technologies require storage, staging, and (for aerial deployables) launch/landing areas. Development of such areas, or enlargement of existing areas to accommodate FirstNet equipment, would have the following types of socioeconomic impacts:
    - Impacts to Real Estate – It is possible that development or enlargement of storage, staging, and launch/landing areas could have adverse impacts on nearby property values. This is because such facilities may have adverse aesthetic aspects (e.g., large areas of pavement and large numbers of parked vehicles), equipment maintenance activities at such facilities may generate noise, and operational activities may generate traffic. Such factors could affect nearby property values. These impacts, if they occur, would occur within a limited distance of each site, and would be limited to a relatively small number of sites within the region and state. Therefore, these impacts would be less than significant.
    - Changes to Spending, Income, Industries, and Public Revenues – Materials and labor for these projects would represent new expenditures that would generate income, help support industries, and may generate public revenues. All such effects would be small in scale relative to the regional and state economy and of limited duration; their impacts would be less than significant.
    - Impacts to Employment – Similarly, expenditures for these projects would generate temporarily a less than significant number of jobs regionally and statewide.
- Satellites and Other Technologies
  - Satellite-Enabled Devices and Equipment: It is anticipated that the deployment of such devices and equipment would be similar to collocation of wireless equipment on existing wireless towers, structures, or buildings, and would have the following types of socioeconomic impacts:
    - Changes to Spending, Income, Industries, and Public Revenues – Materials and labor for these projects would represent new expenditures that would generate income, help support industries, and may generate public revenues. All such effects would be small in scale relative to the regional and state economy and of limited duration; their impacts would be less than significant.
    - Impacts to Employment – Similarly, expenditures for these projects would generate temporarily a less than significant number of jobs regionally and statewide.

In general, the abovementioned activities would have less than significant beneficial socioeconomic impacts. The discussion above characterized the impacts of each type of activity. The socioeconomic impacts of all activities considered together would also be less than significant. Even when considered together, the impacts would be very small relative to the total economic activity and property value of any region or the state. In addition, with the possible exception of property values, all deployment impacts would be limited to the construction phase. To the extent that certain activities could have adverse impacts to property values, those impacts are also expected to be less than significant, as described above. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, operation activities associated with the Preferred Alternative would consist of primarily of routine maintenance and inspection of fixed infrastructure. As with deployment activities, all operational activities would have socioeconomic impacts, because all represent economic activity. Public or private sector employees would conduct all operational activities, and therefore support employment and involve payment of wages. Even if these economic effects are a very small for each operational activity and not significant across the entire state, they are measurable socioeconomic impacts.

Potential socioeconomic impacts would primarily be beneficial, and generally of these types:

- Changes to Spending, Income, Industries, and Public Revenues – Operational activities would require expenditures, which then generate business income and employee wages, and may result in new public sector revenues such as taxes on sales and income. All such effects would be small in scale relative to the regional and state economy; their impacts would be less than significant.
- Impacts to Employment – Public and private sector organizations responsible for operating the NPSBN would sustain existing employees and/or hire new employees to carry out operational activities. They would generate a less than significant number of jobs regionally and statewide.

The potential negative impacts on property values mentioned above for deployment of new wireless communication towers and deployable technology storage, staging, and launch/landing areas may also apply in the operations phase. The ongoing presence of such facilities has aesthetic and other effects that may reduce nearby property values, relative to values in the absence of such facilities. These impacts, if they occur, would be less than significant as they would occur within a limited distance of each site, and would be limited to a relatively small number of sites within the region and state. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

6.2.9.5. Alternatives Impact Assessment

The following section assesses potential impacts to socioeconomics associated with the Deployable Technologies Alternative and the No Action Alternative.

Deployable Technologies Alternative

Under the Deployable Technologies Alternative, a nationwide fleet of mobile communications systems would provide temporary coverage in areas not covered by the existing, usable infrastructure. There would be no collocation of equipment and minimal new construction associated with wired or wireless projects discussed above under the Preferred Alternative. Some limited construction could be associated with implementation such as land clearing or paving for parking or staging areas. The specific infrastructure associated with the Deployable Technologies Alternative would be the same as the deployable technologies implemented as part of the Preferred Alternative but would likely be implemented in greater numbers, over a larger geographic extent, and used with greater frequency and duration. Therefore, potential impacts to socioeconomics resulting from implementation of this alternative could be as described below.

Deployment Impacts

As explained above, all deployment activities represent economic activity and thus have socioeconomic impacts. These impacts would primarily be beneficial, such as generation of business income and employee wages, and creation or sustainment of jobs. The impacts would be small for each activity and, therefore, less than significant.

Deployable technologies such as COWs, COLTs, and SOWs, along with aerial deployable technologies, would require storage, staging, and launch/landing areas. Development or enlargement of these facilities could have adverse impacts on nearby property values. The potential for such impacts is higher under this alternative than the Preferred Alternative because it is likely that these facilities would be implemented in greater numbers and over a larger geographic extent. These potential impacts are anticipated to be less than significant as described above. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

All operational activities represent economic activity and thus have socioeconomic impacts. These impacts would primarily be beneficial, and because they are small individually, overall impacts would be less than significant at the programmatic level.

The ongoing presence of facilities for housing and maintaining deployable technologies may have adverse aesthetic aspects (e.g., large areas of pavement and large numbers of parked vehicles) or other aspects (e.g., noise and traffic) that could negatively affect the value of surrounding properties. The potential for such impacts is higher under this alternative than the Preferred Alternative because it is likely that these facilities would be more numerous, present over a larger geographic extent, and used with greater frequency and duration. These impacts, if they occur, would be less than significant as they would be limited to a relatively small number of sites within the region and Nevada. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

No Action Alternative

Under the No Action Alternative, the NPSBN would not be deployed. Therefore, there would be no associated deployment or installation activities to deploy wired, wireless, deployable infrastructure or satellites and other technologies. As a result, there would be no impacts to socioeconomics from deployment and operation of the No Action Alternative. Socioeconomic conditions would therefore be the same as those described in Section 6.1.9, Socioeconomics.

6.2.10. Environmental Justice

6.2.10.1. Introduction

This section describes potential impacts to environmental justice in Nevada associated with deployment and operation of the Proposed Action and alternatives. Chapter 9 BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

6.2.10.2. Impact Assessment Methodology and Significance Criteria

The impacts of the Proposed Action on environmental justice were evaluated using the significance criteria presented in Table 6.2.10-1. The categories of impacts are defined as potentially significant, less than significant with mitigation incorporated, less than significant, or no impact. Characteristics of each impact type, including magnitude or intensity, geographic extent, and duration or frequency, were used to determine the impact significance rating associated with each potential impact.

Given the nature of this programmatic evaluation, and because the Proposed Action could potentially cover a wide variety of actions that would take place in various landscapes, the potential impacts to environmental justice addressed in this section are presented as a range of possible impacts.

Table 6.2.10-1: Impact Significance Rating Criteria for Environmental Justice

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
Effects associated with other resource areas (e. g., human health and safety, cultural resources, socioeconomics) that have a disproportionately high and adverse impact on low-income populations and minority populations	Magnitude or Intensity	Direct and disproportionately high and adverse effects on environmental justice communities (as defined by EO 12898) that cannot be fully mitigated.	Effect that is potentially significant, but with mitigation is less than significant.	Direct effects on environmental justice communities (as defined by EO 12898) that are not disproportionately high and adverse, and therefore do not require mitigation.	No direct effects on environmental justice communities, as defined by EO 12898.
	Geographic Extent	Effects realized within counties at the Census Block Group level.		Effects realized within counties at the Census Block Group level.	Effects realized within counties at the Census Block Group level.
	Duration or Frequency	Persists during the life of the project.		Persists for as long as the entire construction phase or a portion of the operations phase.	NA

NA = Not Applicable

6.2.10.3. 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. American Indian tribes are considered environmental justice populations (CEQ, 1997); thus, impacts on tribal cultural resources (for instance, due to construction) could be a concern from an environmental justice perspective.

Impacts are considered environmental justice impacts only if they are *both* "adverse" and "disproportionately high" in their incidence on environmental justice populations relative to the general population (CEQ, 1997). The focus in environmental justice impact assessments is always, by definition, on adverse effects. However, telecommunications projects, such as those proposed by FirstNet, could have beneficial effects. These effects may include better provision of police, fire, and emergency medical services; improvements in property values; and the generation of jobs and income. These impacts are considered in the Socioeconomics Environmental Consequences (Section 6.2.9).

Construction impacts are localized, and property value impacts of wireless telecommunications projects rarely extend beyond 300 meters (984 feet) of a communications tower (Bond, Sims, & Dent, 2013). In addition, impacts related to deployment are of short duration. The potential for significant environmental justice impacts from the FirstNet deployment activities would be limited. Most, but not all, of the FirstNet operational activities have very limited potential for impacts as these activities are limited in scale and short in their duration.

Before FirstNet deploys projects, additional site-specific analyses to identify specific environmental justice populations and assess specific impacts on those populations may be necessary. Such analyses could tier-off the methodology and results of this PEIS. The areas shown in the environmental justice screening map of Affected Environment (Section 6.1.10.4) as having moderate potential or high potential for environmental justice populations would particularly warrant further screening. As discussed in Section 6.1.10.3, Environmental Setting:

Minority and Low-Income Populations, Nevada's population has lower percentages of minorities than the region and considerably higher percentages than the nation. It has a lower rate of poverty than the region and the same rate as the nation. The areas with moderate potential or high potential for environmental justice populations are fairly evenly distributed across Nevada. They occur within the largest population concentrations and in the sparsely populated regions of the state. Further analysis using the data developed for the screening analysis in Section 6.1.10.4, Environmental Justice Screening Results, may be useful. In addition, USEPA's EJSCREEN tool and USEPA's lists of environmental justice grant and cooperative agreement recipients may help identify local environmental justice populations (USEPA, 2015d; USEPA, 2016l).

A site-specific analysis would also evaluate whether an actual environmental justice impact on those populations would be likely to occur. Analysts could use the evaluation presented below under "Activities with the Potential to Have Impacts" as a starting point. Analysts should bear in mind that any such activities that are problematic based on the adverse impact criterion of environmental justice might also have beneficial effects on those same environmental justice communities.

6.2.10.4. 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. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Activities Likely to Have No Impacts

Of the types of facilities or infrastructure deployment scenarios described in Section 2.1.2, Proposed Action Infrastructure, the following are likely to have no impacts to environmental justice under the conditions described below:

- Wired Projects
  - Use of Existing Conduit – New Buried Fiber Optic Plant: Installation of fiber optic cable in existing conduit would be through existing hand holes, pulling vaults, junction boxes, huts, and POP structures. Activities at these small entry points would be limited and temporary and thus are not likely to produce perceptible changes affecting any

surrounding communities. Therefore, they would not affect environmental justice communities.

- Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting of dark fiber would be conducted electronically through existing infrastructure, and therefore would have no impacts to environmental justice. If physical access were 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.
- New Build – Submarine Fiber Optic Plant: The installation of cables in limited nearshore and inland bodies of water would not impact environmental justice because there would be no ground disturbance or other impacts associated with this activity that would adversely impact communities. Associated onshore activities occurring at existing facilities such as staging of equipment and materials, or connection of cables, would be small in scale and temporary; thus, they would not impact environmental justice communities. Construction of new landings and/or facilities onshore or the banks of waterbodies that accept submarine cable could temporarily generate noise and dust, or disrupt traffic. If these effects occur disproportionately in environmental justice communities, they would be considered environmental justice impacts.

- Satellites and Other Technologies
  - Satellite-Enabled Devices and Equipment: It is anticipated that the deployment of such devices and equipment would not involve new ground disturbance, impacts to environmental justice communities would not occur. Impacts associated with satellite-enabled devices requiring construction activities are addressed below.
  - Deployment of Satellites: FirstNet does not anticipate launching satellites as part of the deployment of the NPSBN; however, it may include equipment on satellites that are already being launched for other purposes. As adding equipment to an existing launch vehicle would be very unlikely to impact environmental justice, it is anticipated that this activity would have no impact on environmental justice.

Activities with the Potential to Have Impacts

Potential deployment-related impacts to environmental justice for the Preferred Alternative would encompass a range of impacts that could occur as a result of disturbance to communities from construction activities, such as noise, dust, and traffic. The types of infrastructure deployment activities that could be part of the Preferred Alternative and result in potential impacts to environmental justice communities include the following:

- Wired Projects
  - New Build – Buried Fiber Optic Plant: New fiber optic cable installation usually requires construction activities such as trenching, plowing (including vibratory plowing), or directional boring, as well as construction of hand holes, pulling vaults, junction boxes, huts, and POP structures. These activities temporarily could generate noise and dust, or

disrupt traffic. If such impacts occur disproportionately to environmental justice communities, they would be considered environmental justice impacts.

- New Build – Aerial Fiber Optic Plant: Pole/structure installation could temporarily generate noise and dust, or disrupt traffic. If these effects occur disproportionately in environmental justice communities, they would be considered environmental justice impacts.
- New Build – Submarine Fiber Optic Plant: The installation of cables in limited nearshore and inland bodies of water would not impact environmental justice because there would be no ground disturbance or other impacts associated with this activity that would adversely impact communities. Associated onshore activities occurring at existing facilities such as staging of equipment and materials, or connection of cables, would be small in scale and temporary; thus, they would not impact environmental justice communities. Construction of new landings and/or facilities onshore or the banks of waterbodies that accept the submarine cable could temporarily generate noise and dust, or disrupt traffic. If these effects occur disproportionately in environmental justice communities, they would be considered environmental justice impacts.
- Installation of Optical Transmission or Centralized Transmission Equipment: If installation of transmission equipment would occur in existing boxes or huts, there would be no adverse impacts on surrounding communities, and thus no potential for environmental justice impacts. Installation of optical transmission equipment or centralized transmission equipment requiring construction of new utility poles, hand holes, pulling vaults, junction boxes, huts, and POP structures could temporarily generate noise and dust, or disrupt traffic. If these effects occur disproportionately in environmental justice communities, they would be considered environmental justice impacts.

- Wireless Projects
  - New Wireless Communication Towers: Installation of new wireless towers and associated structures, such as generators, equipment sheds, fencing, security and aviation lighting, electrical feeds, and concrete foundations and pads, or access roads requires construction activities that could temporarily generate noise and dust, or disrupt traffic. New communication towers sometimes have adverse impacts on nearby property values (Bond, Sims, & Dent, 2013). (See Socioeconomics Environmental Consequences for additional discussion.) If these effects occur disproportionately in environmental justice communities, they would be considered environmental justice impacts.
  - Collocation on Existing Wireless Tower, Structure, or Building: Collocation would include mounting or installing equipment (such as antennas) on an existing facility. This activity would be small in scale, temporary, and highly unlikely to produce adverse human health or environmental impacts on the surrounding community. Thus, it would not impact environmental justice communities. If collocation requires construction for additional power units, structural hardening, and physical security measures, the

construction activity could temporarily generate noise and dust and disrupt traffic. If these effects occur disproportionately in environmental justice communities, they would be considered environmental justice impacts.

- Deployable Technologies: COWs, COLTs, and SOWs and aerial deployable technologies require storage, staging, and (for aerial deployables) launch and landing areas. To the extent such areas require new construction, noise and dust could be temporarily generated, and traffic could be disrupted. If these effects occur disproportionately in environmental justice communities, they would be considered environmental justice impacts.

In general, the impacts from the abovementioned activities would be short-term and could potentially involve objectionable dust, noise, traffic, or other localized impacts due to construction activities. In some cases, these effects and aesthetic effects could potentially impact property values, particularly from new towers. These impacts are expected to be less than significant, but are problematic from an environmental justice perspective if they occur disproportionately in environmental justice communities. Since environmental justice impacts occur at the site-specific level, analyses of individual proposed projects would help determine potential impacts to specific environmental justice communities. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, operation activities associated with the Preferred Alternative would consist of primarily of routine maintenance and inspection of fixed infrastructure. It is anticipated that such activities would not result in environmental justice impacts, as the intensity of these activities would be low (low potential for objectionable effects such as noise and dust) and their duration would be very short. Routine maintenance and inspection would not adversely affect property values, for the same reasons. Any major infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the abovementioned deployment activities that involve construction.

Impacts are expected to be less than significant given the short-term nature and limited geographic scope for individual activities. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

6.2.10.5. Alternatives Impact Assessment

The following section assesses potential impacts to environmental justice associated with the Deployable Technologies Alternative and the No Action Alternative.

Deployable Technologies Alternative

Under the Deployable Technologies Alternative, a nationwide fleet of mobile communications systems would provide temporary coverage in areas not covered by the existing, usable infrastructure. There would be no collocation of equipment and minimal new construction associated with wired or wireless projects discussed above under the Preferred Alternative. Some limited construction could be associated with implementation such as land clearing or paving for parking or staging areas. The specific infrastructure associated with the Deployable Technologies Alternative would be the same as the deployable technologies implemented as part of the Preferred Alternative but would likely be implemented in greater numbers, over a larger geographic extent, and used with greater frequency and duration. Therefore, potential impacts to environmental justice communities resulting from implementation of this alternative could be as described below.

Deployment Impacts

As explained above, deployable technologies such as COWs, COLTs, and SOWs, along with aerial deployable technologies, could require storage, staging, and launch/landing areas. To the extent such areas require new construction, noise and dust could be generated temporarily, and traffic could be disrupted. If these effects occur disproportionately in environmental justice communities, they would be considered environmental justice impacts. Impacts are expected to be less than significant because they would be temporary in nature. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

The ongoing presence of facilities for housing and maintaining deployable technologies may have adverse aesthetic aspects (e.g., large areas of pavement and large numbers of parked vehicles) that could negatively affect the value of surrounding properties. In addition, equipment maintenance activities at such facilities may temporarily generate noise, and operational activities may generate traffic. These effects may be adverse in themselves, and may impact property values. If these effects occur disproportionately in environmental justice communities, they would be considered environmental justice impacts. Impacts are expected to be less than significant as operations are expected to be temporary in nature. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

No Action Alternative

Under the No Action Alternative, the NPSBN would not be deployed. Therefore, there would be no associated construction or installation activities to deploy wired, wireless, deployable infrastructure or satellites and other technologies. As a result, there would be no impacts to environmental justice as a result of deployment and operation of the No Action Alternative. Environmental conditions would therefore be the same as those described in Section 6.1.10, Environmental Justice.

6.2.11. Cultural Resources

6.2.11.1. Introduction

This section describes potential impacts to cultural resources in Nevada associated with deployment and operation of the Proposed Action and Alternatives. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

6.2.11.2. Impact Assessment Methodology and Significance Criteria

The potential impacts of the Proposed Action on cultural resources were evaluated using the significance criteria presented in Table 6.2.11-1. As described in Section 6.2, Environmental Consequences, the categories of impacts are defined as potentially significant, less than significant with mitigation incorporated, less than significant, or no impact. Characteristics of each impact type, including magnitude or intensity, geographic extent, and duration or frequency, were used to determine the impact significance rating associated with each potential impact.

Given the nature of this programmatic evaluation, and because the Proposed Action could potentially cover a wide variety of actions that would take place in various landscapes, the potential impacts to cultural resources addressed in this section are presented as a range of possible impacts.

Table 6.2.11-1: Impact Significance Rating Criteria for Cultural Resources

Type of Effect	Effect Characteristics	Impact Level			
		Adverse Effect	Mitigated Adverse Effect[a]	Effect, but Not Adverse	No Effect
Physical damage to and/or destruction of historic properties[b]	Magnitude or Intensity	Effects to a contributing portion of a single or many historic properties.	Adverse effect that has been procedurally mitigated through Section 106 process.	Effects to a non-contributing portion of a single or many historic properties.	No direct effects to historic properties.
	Geographic Extent	Direct effects areas of potential effect (APE).		Direct effects APE.	Direct effects APE.
	Duration or Frequency	Permanent direct effects to a contributing portion of a single or many historic properties.		Permanent direct effects to a non-contributing portion of a single or many historic properties.	No direct effects to historic properties.
Indirect effects to historic properties (i.e., visual, noise, vibration, atmospheric)	Magnitude or Intensity	Effects to a contributing portion of a single or many historic properties.	Adverse effect that has been procedurally mitigated through Section 106 process.	Effects to a contributing or non-contributing portion of a single or many historic properties.	No indirect effects to historic properties.
	Geographic Extent	Indirect effects APE.		Indirect effects APE.	Indirect effects APE.
	Duration or Frequency	Long-term or permanent indirect effects to a single or many historic properties.		Infrequent, temporary, or short- or long-term or permanent indirect effects to a single or many historic properties.	No indirect effects to historic properties.
Loss of character defining attributes of historic properties	Magnitude or Intensity	Effects to a contributing portion of a single or many historic properties.	Adverse effect that has been procedurally mitigated through Section 106 process.	Effects to a non-contributing portion of a single or many historic properties.	No direct or indirect effects to historic properties.
	Geographic Extent	Direct and/or indirect effects APE.		Direct and/or indirect effects APE.	Direct and/or indirect effects APE.

Type of Effect	Effect Characteristics	Impact Level			
		Adverse Effect	Mitigated Adverse Effect[a]	Effect, but Not Adverse	No Effect
	Duration or Frequency	Long-term or permanent loss of character defining attributes of a single or many historic properties.		Infrequent, temporary, or short-term changes to character defining attributes of a single or many historic properties.	No direct or indirect effects to historic properties.
Loss of access to historic properties	Magnitude or Intensity	Effects to a contributing portion of a single or many historic properties.	Adverse effect that has been procedurally mitigated through Section 106 process.	Effects to a non-contributing portion of a single or many historic properties.	No segregation or loss of access to historic properties.
	Geographic Extent	Any area surrounding historic properties that would cause segregation or loss of access to a single or many historic properties.		Any area surrounding historic properties that could cause segregation or loss of access to a single or many historic properties.	No segregation or loss of access to historic properties.
	Duration or Frequency	Long-term or permanent segregation or loss of access to a single or many historic properties.		Infrequent, temporary, or short-term changes in access to a single or many historic properties.	No segregation or loss of access to historic properties.

[a] Whereas mitigation measures for other resources discussed in this PEIS may be developed to achieve an impact that is "Less than Significant with Mitigation Incorporated," historic properties are considered to be "non-renewable resources," given their very nature. As such, any and all unavoidable adverse effects to historic properties, per Section 106 of the NHPA (as codified in 36 CFR Part 800.6), would require FirstNet to consult with the SHPO/THPO and other consulting parties, including American Indian Tribes and Native Hawaiian Organizations, to develop appropriate mitigation.

[b] Per NHPA, a "historic property" is defined as any district, archaeological site, building, structure, or object that is either listed or eligible for listing in the NRHP. Cultural resources present within a project's APE are not historic properties if they do not meet the eligibility requirements for listing in the NRHP. Sites of religious and/or cultural significance refer to areas of concern to American Indian Tribes and other consulting parties that, in consultation with the respective party(ies), may or may not be eligible for listing in the NRHP. These sites may also be considered TCPs. Therefore, by definition, these significance criteria only apply to cultural resources that are historic properties, significant sites of religious and/or cultural significance, or TCPs. For the purposes of brevity, the term historic property is used here to refer to either historic properties, significant sites of religious and/or cultural significance, or TCPs.

6.2.11.3. 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 6.2.11-1, direct deployment impacts could be potentially significant if FirstNet's deployment locations were in areas with moderate to high probabilities for archaeological deposits, within historic districts, or at historic properties. To the extent practicable, FirstNet would attempt to minimize activities in areas with archaeological deposits or within historic districts. However, given archaeological sites and historic properties are present throughout Nevada, some deployment activities may be in these areas, in which case BMPs (see Chapter 9) would help avoid or minimize the potential impacts.

Indirect Effects to Historic Properties (i.e., visual, noise, vibration, atmospheric)

The potential for indirect effects to historic properties would be present during deployment of the proposed facilities/infrastructure and during trenching, grading, and/or foundation excavation activities. Indirect effects include the introduction of visual, noise, atmospheric, and/or vibration effects that diminish a property's historic integrity. The greatest likelihood of potentially significant impacts from indirect effects would be from the deployment of equipment in areas that would cause adverse visual effects to historic properties. To the extent practicable, FirstNet would attempt to minimize activities in areas within or adjacent to historic districts or properties.

Loss of Character Defining Attributes of Historic Properties

Deployment of FirstNet equipment has the potential to cause the loss of character defining attributes of historic properties; such attributes are the features of historic properties that define their NRHP eligibility. Examples of such impacts would be the loss of integrity of archaeological sites through ground disturbing activities, and direct impacts to historic buildings from equipment deployment that adversely alter historic architectural features. Chapter 9, 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.

Loss of Access to Historic Properties

The deployment of equipment requiring a secure area has the potential to cause the loss of access to historic properties. The highest potential for this type of significant impact would be from the deployment of equipment in secure areas that impact the access to sites of cultural importance to American Indians. It is anticipated that FirstNet would identify potential impacts to such areas through the NHPA consultation process, and would minimize deployment activities that would cause such loss of access.

6.2.11.4. Potential Impacts of the Preferred Alternative

The following section assesses potential impacts associated with implementation of the Preferred Alternative, including deployment and operation activities.

Deployment Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, implementation of the Preferred Alternative could result in the deployment of various types of facilities or infrastructure. Depending on the physical nature and location of the facility/infrastructure and the specific deployment requirements, some activities would result in potential impacts to cultural resources, while others would not. In addition, and as explained in this section, the same type of Proposed Action Infrastructure could result in a range of no impacts to less than significant impacts depending on the deployment scenario or site-specific conditions. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Activities Likely to Have No Impacts

Of the types of facilities or infrastructure deployment scenarios described in Section 2.1.2, Proposed Action Infrastructure, the following are likely to have no impacts to cultural resources under the conditions described below:

- Wired Projects
  - Use of Existing Conduit – New Buried Fiber Optic Plant: Disturbance associated with the installation of fiber optic cable in existing conduit would be limited to entry and exit points of the existing conduit in previously disturbed areas. It is anticipated that there would be no impacts to cultural resources since the activities that would be conducted at these small entry and exit points are not likely to produce impacts.
  - Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting up of dark fiber would have no impacts on cultural resources. If required, and if done in existing huts with no ground disturbance, installation of new associated equipment would also have no impacts to cultural resources because there would be no ground disturbance and no perceptible visual changes.
- Satellites and Other Technologies
  - Satellite-Enabled Devices and Equipment: It is anticipated that the installation of permanent equipment on existing structures and the use of portable devices that use satellite technology would not impact cultural resources because those activities would not require ground disturbance or create perceptible visual effects.
  - Deployment of Satellites: FirstNet does not anticipate launching satellites as part of the deployment of the NPSBN; however, it could include equipment on satellites that are already being launched for other purposes. As adding equipment to an existing launch vehicle would be very unlikely to impact cultural resources, it is anticipated that this activity would have no impact on cultural resources.

Activities with the Potential to Have Impacts

Potential deployment-related impacts to cultural resources as a result of implementation of the Preferred Alternative would encompass a range of impacts that could occur as a result of ground disturbance activities, including destruction of cultural or historic artifacts. The types of infrastructure deployment activities that could be part of the Preferred Alternative and result in potential impacts to cultural resources include the following:

- Wired Projects
  - New Build – Buried Fiber Optic Plant: Plowing (including vibratory plowing), trenching, or directional boring and the construction of POP, huts, or other associated facilities or hand-holes to access fiber could result in potential impacts to cultural resources. Soil disturbance and heavy equipment use associated with plowing, trenching, or directional boring as well as land/vegetation clearing, excavation activities, and landscape grading associated with construction of POPs, huts, or other associated facilities or hand-holes to access fiber could result in the disturbance of archaeological sites, and the associated structures could have visual effects on historic properties.
  - New Build – Aerial Fiber Optic Plant: Ground disturbance during the installation of new utility poles and the use of heavy equipment during the installation of new utility poles and hanging of cables could result in the disturbance of archaeological sites, and the associated structures could have visual effects on historic properties within Nevada.
  - New Build – Submarine Fiber Optic Plant: The installation of cables in or near bodies of water could impact cultural resources where there potential to contain archaeological sites. Impacts to cultural resources could also potentially occur as result of the construction of landings and/or facilities on shores or the banks of water bodies that accept the submarine cable, which could result in the disturbance of archaeological sites (archaeological deposits tend to be associated with bodies of water), and the associated structures could have visual effects on historic properties.
  - Installation of Optical Transmission or Centralized Transmission Equipment: If installation of transmission equipment would occur in existing boxes or huts and require no ground disturbance, there would be no impacts to cultural resources. If installation of transmission equipment required grading or other ground disturbance to install small boxes or huts, or access roads, there could potentially be impacts to cultural resources. Ground disturbance could impact archaeological sites, and the associated structures could have visual effects on historic properties.
  - Collocation on Existing Aerial Fiber Optic Plant: Soil excavation and excavated material placement during the replacement of poles and structural hardening could result in direct and indirect effects to cultural resources, although any effects to access would be short-term. Heavy equipment use associated with these activities as well as with installing new fiber on existing poles could result in direct and indirect effects to cultural resources.

- Wireless Projects
  - New Wireless Communication Towers: Deployment of new wireless towers and associated structures (generators, equipment sheds, fencing, security and aviation lighting, electrical feeds, and concrete foundations and pads) or access roads could result in impacts to historic properties. Land/vegetation clearing, excavation activities, landscape grading, and other ground disturbance activities during the deployment of new wireless towers and associated structures or access roads, could result in the disturbance of archaeological sites. The deployment of new wireless communication towers and their associated structures could result in visual impacts to historic properties or the loss of access to historic properties.
  - Collocation on Existing Wireless Tower, Structure, or Building: Collocation would involve mounting or installing equipment (such as antennas or microwave dishes) on an existing tower could result in impacts to historic properties. Ground disturbance activities could result in the disturbance of archaeological sites, and the deployment of collocated equipment could result in visual impacts or physical damage to historic properties, especially in urban areas that have larger numbers of historic public buildings.
  - Deployable Technologies: Implementation of deployable technologies could result in potential impacts to cultural resources if deployment occurs in unpaved areas, or if the implementation results in paving of previously unpaved surfaces. In addition, impacts to historic properties could occur if the deployment is long-term, or if the deployment involves aerial technologies with the potential for visual or other indirect impacts.

In general, the abovementioned activities could potentially involve ground disturbance, construction of access roads and other impervious surfaces, landscape grading, and heavy equipment movement. Potential impacts to cultural resources associated with deployment could include physical damage to or destruction of historic properties, indirect impacts including visual effects, the loss of access to historic properties, or the loss of character-defining features of historic properties. These activities could affect, but not adversely affect, cultural resources, as the potential adverse effects would be temporary and limited to the area near individual Proposed Action deployment site. Additionally, some equipment proposed to be installed on or near properties that are listed or eligible for listing on the NRHP could potentially be removed. Additionally as appropriate, FirstNet would engage in consultation as required under Section 106 of the NHPA. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impact.

Operation Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, operation activities associated with the Preferred Alternative would consist of routine maintenance and inspection of the facilities. Any major communications infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the abovementioned deployment impacts. It is anticipated that there would be no effect to cultural resources associated with routine inspections of the Preferred Alternative. If usage of heavy equipment as part of routine maintenance or inspections occurs off established access roads or corridors, or if the acceptable load of the surface is exceeded, ground disturbance impacts on archaeological sites could result as explained above. These potential impacts would be associated with ground disturbance or modifications of properties, however, due to the small scale of expected activities, these actions could affect but would not likely adversely affect, cultural resources. In the event that maintenance and inspection activities occur off existing roads, FirstNet would engage in consultation as required under Section 106 of the NHPA. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

6.2.11.5. Alternatives Impact Assessment

The following section assesses potential impacts to cultural resources associated with the Deployable Technologies Alternative and the No Action Alternative.

Deployable Technologies Alternative

Under the Deployable Technologies Alternative option, a nationwide fleet of mobile communications systems would provide temporary coverage in areas not covered by the existing, usable infrastructure. There would be no collocation of equipment and minimal new construction associated with wired or wireless projects discussed above under the Preferred Alternative. Some limited construction could be associated with implementation such as land clearing or paving for parking or staging areas. The specific infrastructure associated with the Deployable Technologies Alternative would be the same as the deployable technologies implemented as part of the Preferred Alternative but would likely be implemented in greater numbers, over a larger geographic extent, and used with greater frequency and duration. Therefore, potential impacts to cultural resources as a result of implementation of this alternative could be as described below.

Deployment Impacts

As explained above, implementation of deployable technologies could result in impacts to cultural resources if deployment occurs in unpaved areas, or if the implementation results in paving of previously unpaved surfaces. Some staging or landing areas (depending on the type of technology) may require land/vegetation clearing, excavation, and paving. These activities could result in impacts to archaeological sites. These activities could affect, but not adversely affect, cultural resources due to the limited amount of expected ground disturbing activities and the short-term nature of deployment activities. However, in the event that land/vegetation clearing is required, FirstNet would engage in consultation as required under Section 106 of the NHPA. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

As explained above, operation activities would consist of implementation/running of the deployable technology and routine maintenance and inspections. As with the deployment impacts, it is anticipated that there would be effects, but no adverse effects to historic properties associated with implementation/running of the deployable technology. No adverse effects would be expected to either site access or viewsheds due to the temporary nature of expected activities. As with the Preferred Alternative, it is anticipated that there would be no effects to cultural resources associated with routine inspections of the Preferred Alternative, assuming that the same access roads used for deployment are also used for inspections. If usage of heavy equipment as part of routine maintenance or inspections occurs off established access roads or corridors, impacts to archaeological sites could occur, however, in the event that this is required, FirstNet would engage in consultation as required under Section 106 of the NHPA. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

No Action Alternative

Under the No Action Alternative, the NPSBN would not be deployed; therefore, there would be no associated construction or installation of wired, wireless, deployable infrastructure or satellites and other technologies. As a result, there would be no impacts to cultural resources as a result of deployment and operation of the Proposed Action. Environmental conditions would therefore be the same as those described in Section 6.1.11, Cultural Resources.

6.2.12. Air Quality

6.2.12.1. Introduction

This section describes potential impacts to Nevada's air quality from deployment and operation of the Proposed Action and alternatives. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

6.2.12.2. Impact Assessment Methodology and Significance Criteria

The impacts of the Proposed Action on Nevada's air quality were evaluated using the significance criteria presented in Table 6.2.12-1. The categories of impacts are defined as potentially significant, less than significant with mitigation incorporated, less than significant, or no impact. Characteristics of each impact type, including magnitude or intensity, geographic extent, and duration or frequency, were used to determine the impact significance rating associated with each potential impact.

Given the nature of this programmatic evaluation, and because the Proposed Action could potentially cover a wide variety of actions that would take place in various landscapes, the potential impacts to Nevada's air quality addressed in this section are presented as a range of possible impacts.

Table 6.2.12-1: Impact Significance Rating Criteria for Air Quality

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
Increased air emissions	Magnitude or Intensity	Pollutant concentrations would exceed one or more NAAQS in nonattainment and maintenance areas. Emissions in attainment areas would cause an area to be out of attainment for any NAAQS. Projects do not conform to the SIP covering nonattainment and maintenance areas.	Effect that is potentially significant, but with mitigation is less than significant.	Negligible emissions would occur for any criteria pollutants within an attainment area but would not cause a NAAQS exceedance.	Action would not cause pollutant concentrations to exceed the NAAQS in nonattainment and maintenance areas. Emissions in attainment areas would not cause air quality to go out of attainment for any NAAQS. Projects are *de minimis* or conform to the SIP covering nonattainment and maintenance areas.
	Geographic Extent/Context	NA		NA	NA
	Duration or Frequency	Permanent or long-term.		Short term.	Temporary.

NA = Not Applicable

6.2.12.3. 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 many 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 Nevada that are in maintenance or nonattainment for one or more criteria pollutants; PM levels are a statewide concern (see Section 6.1.12, Air Quality and Figure 6.1.12-1). Five of the counties in Nevada are designated as maintenance areas for one or more of the following pollutants: CO, PM_{10}, SO_2, and ozone (Table 6.1.12-5); counties located in the western (Washoe) and southern (Clark) portion of the state are designated nonattainment or maintenance for two or more NAAQS pollutants including CO, PM_{10}, and ozone (Figure 6.1.12-1).

Based on the significance criteria presented in Table 6.2.12-1, 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 Nevada; however, NAAQS exceedances are not anticipated. Given that nonattainment areas are present throughout Nevada (Figure 6.1.12-1), 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.

6.2.12.4. 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. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Activities Likely to Have No Impacts

Of the types of facilities or infrastructure deployment scenarios described in Section 2.1.2, Proposed Action Infrastructure, the following are likely to have no impacts to air quality under the conditions described below:

- Wired Projects
    - Use of Existing Conduit – New Buried Fiber Optic Plant: Activities associated with the installation of fiber optic cable in existing conduit would be limited to entry and exit points of the existing conduit. Gaining access to the conduit and installing the cable may result in minor disturbance at entry and exit points; however, this activity would be temporary and infrequent, and is not expected to produce any perceptible changes in air emissions.
    - Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting up dark fiber would require no construction and have no short- or long-term emissions to air quality because it would create no new sources of emissions.
- Satellites and Other Technologies
    - Satellite Enabled Devices and Equipment: The duration of construction activities associated with installing permanent equipment on existing structures would most likely be short-term. It is anticipated that insignificant concentrations of criteria pollutants would be emitted during installment of this equipment from the use of machinery. Deployment and operation of satellite-enabled devices and portable equipment are expected to have minimal to no impact on ambient air quality concentrations.
    - Deployment of Satellites: FirstNet does not anticipate launching satellites as part of the deployment of the NPSBN; however, it may include equipment on satellites that are already being launched for other purposes. As adding equipment to an existing launch vehicle would be very unlikely to impact air quality resources, it is anticipated that this activity would have no impact on those resources.

Activities with Potential Impacts to Air Quality

Construction, deployment, and operation activities related to the Preferred Alternative could impact air quality by generating various quantities of criteria and air pollutant emissions. It is expected that such impacts would be less than significant 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 waterbodies 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 conducting excavation activities and landscape grading to install new wireless towers and associated structures or access roads could result in products of combustion and fugitive dust.
    - Collocation on Existing Wireless Tower, Structure, or Building: Vehicles and equipment used to mount or install equipment, such as antennas or microwave dishes, on an existing tower could impact air quality. However, if additional power units, structural hardening, and physical security measures required grading or excavation, then exhaust and fugitive dust from heavy equipment used for these activities could also result in increased air emissions.

- Deployable Technologies: The type of deployable technology used would dictate the types of air pollutants generated. For example, mobile equipment deployed via heavy trucks could generate products of combustion from the internal combustion engines associated with the vehicles and onboard generators. These units may also generate fugitive dust depending on the type of road traveled during deployment (i.e., paved versus unpaved roads). Aerial platforms (e.g., UASs or other aircraft) would generate pollutants during all phases of flight.

In general, the pollutants of concern from the abovementioned activities would be products of combustion from burning fossil fuels in internal combustion engines and fugitive dust from site preparation activities and vehicles traveling on unpaved road surfaces. Any major infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the construction impacts. These impacts are anticipated to be less than significant due to the limited nature of the deployment. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, operation activities associated with the Preferred Alternative would consist of routine maintenance and inspection of the facilities. Any major communications infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the abovementioned deployment impacts. It is anticipated that there would be less than significant impacts to air quality associated with routine inspections of the Preferred Alternative due to the limited nature of the activity. If usage of heavy equipment as part of routine maintenance or inspections occurs off established access roads or corridors additional air quality impacts may occur, however, they would be less than significant as they would still be limited in nature. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

6.2.12.5. Alternatives Impact Assessment

The following section assesses potential impacts to air quality associated with the Deployable Technologies Alternative and the No Action Alternative.

Deployable Technologies Alternative

Under the Deployable Technologies Alternative, a nationwide fleet of mobile communications systems would provide temporary coverage in areas not covered by the existing, usable infrastructure. There would be no collocation of equipment and minimal new construction associated with wired or wireless projects discussed above under the Preferred Alternative. Some limited construction could be associated with implementation such as land clearing or paving for parking or staging areas. The specific equipment associated with the Deployable Technologies Alternative could include heavy trucks with onboard generators, aerial vehicles (e.g., UASs or other aircraft), and ground support vehicles and other equipment for aerial deployment. The stand-alone Deployable Technologies Alternative differs from the Preferred Alterative in the number of mobile and aerial vehicles likely to deploy, the distances traveled from storage locations, and the duration of deployment. The potential impacts to air quality are as follows:

Deployment and Operation Impacts to Air Quality

Implementing deployable technologies could result in products of combustion from mobile equipment deployed via heavy trucks using internal combustion engines associated with the vehicles and onboard generators. While a single deployable vehicle may have an insignificant impact, multiple vehicles operating for longer periods, in close proximity, may have a greater cumulative impact, although this is expected to be less than significant based on the defined significance criteria, since activities would be temporary and short-term. These vehicles may also produce fugitive dust if traveling on unpaved roads. Some staging or landing areas (depending on the type of technology) may require excavation, site preparation, and paving. Heavy equipment used for these activities could emit products of combustion as a result of burning fossil fuels in internal combustion engines. The deployment and operation of aerial technology is anticipated to generate pollutants during all phases of flight, except for balloons. The products of combustion from ground support vehicles, as well as the duration of ground support operations and travel between storage and deployment locations would dictate the concentrations and associated impacts. Additionally, routine maintenance and inspections of the deployable technologies are anticipated to be less than significant, given that these activities are of low-intensity and short duration. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

No Action Alternative

Under the No Action Alternative, FirstNet would not deploy the NPSBN and there would be no impact to ambient air quality. By not deploying NPSBN, FirstNet would avoid generating emissions from construction, installation, or operation of wired, wireless, or deployable infrastructure or technologies; satellites; and other technologies.

6.2.13. Noise

6.2.13.1. Introduction

This section describes potential noise impacts from construction, deployment, and operation of the Proposed Action and alternatives in Nevada. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

6.2.13.2. Impact Assessment Methodology and Significance Criteria

The noise impacts of the Proposed Action were evaluated using the significance criteria presented in Table 6.2.13-1. As described in Section 6.2, Environmental Consequences, the categories of impacts are defined as potentially significant, less than significant with mitigation incorporated, less than significant, or no impact. Characteristics of each impact type, including magnitude or intensity, geographic extent, and duration or frequency, were used to determine the impact significance rating associated with each potential impact.

Given the nature of this programmatic evaluation, and because the Proposed Action could potentially cover a wide variety of actions that would take place in various landscapes, the potential noise impacts to Nevada addressed in this section are presented as a range of possible impacts.

Table 6.2.13-1: Impact Significance Rating Criteria for Noise

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
Increased noise levels	Magnitude or Intensity	Noise levels would exceed typical noise levels from construction equipment and generators. Noise levels at noise sensitive receptors (such as residences, hotels/motels/inns, hospitals, and recreational areas) would exceed 55 dBA or specific state noise limits. Noise levels plus baseline noise levels would exceeds 10 dBA increase from baseline noise levels (i.e., louder). Project noise levels near noise receptors at National Parks would exceed 65 dBA.	Effect that is potentially significant, but with mitigation is less than significant.	Noise levels resulting from project activities would exceed natural sounds, but would not exceed typical noise levels from construction equipment or generators.	Natural sounds would prevail. Noise generated by the action (whether it be construction or operation) would be infrequent or absent, mostly immeasurable.
	Geographic Extent/Context	County or local.		County or local.	County or local.
	Duration or Frequency	Permanent or long-term.		Short term.	Temporary.

6.2.13.3. Description of Environmental Concerns

Increased Noise Levels

The Proposed Action has the potential to generate noise during construction and operation of various equipment used for deployment. These noise levels could be above what is typically generated in a given area and may alter the ambient acoustical environment. If significant, the noise could cause impacts on residential areas, or other facilities that are sensitive to noise, such as churches, hospitals, or schools. The construction activities for deploying some of the various equipment evaluated under the Proposed Action could cause short-term impacts to nearby populations. However, it is likely that there would be less long-term effects from operational use of the proposed equipment (see Section 6.1.13, Noise).

Based on the significance criteria presented in Table 6.2.13-1, noise impacts would likely be less than significant given the size and nature of the majority of the proposed deployment activities. The majority of FirstNet's deployment activities would not be located in sensitive areas nor would a large number of noise sources be deployed/operated long-term in the same area. Noise levels from deployment activities are not expected to exceed typical noise levels for short-term/temporary construction equipment or generators.

To the extent practicable, FirstNet would attempt to mitigate or minimize noise effects during construction or operation. BMPs and mitigation measures could help to limit impacts on nearby noise-sensitive receptors. However, given that much of the concentration and setup of equipment would often occur in populated areas, FirstNet operations would not be able to completely avoid noise impacts due to construction and operations at various receptors.

6.2.13.4. Potential Impacts of the Preferred Alternative

The following section assesses potential impacts associated with implementation of the Preferred Alternative, including construction, deployment, and operation activities.

Deployment Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, implementing the Preferred Alternative could result in deploying various types of facilities or infrastructure. Depending on the physical nature and location of the facility/infrastructure and the specific deployment requirements, some activities would result in potential noise impacts and while others would not. In addition, the same type of Proposed Action Infrastructure could result in a range of no impacts to less than significant impacts depending on the deployment scenario or site-specific conditions. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Activities Likely to Have No Impacts

Of the types of facilities or infrastructure deployment scenarios described in Section 2.1.2, Proposed Action Infrastructure, the following are likely to have no noise impacts under the conditions described below:

- Wired Projects
  - Use of Existing Conduit – New Buried Fiber Optic Plant: Disturbance associated with the installation of fiber optic cable in existing conduit would be limited to entry and exit points of the existing conduit in previously disturbed areas. Noise generated by equipment required to install fiber would be infrequent and of short duration, and is not expected to create perceptible impacts.
  - Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting up dark fiber would require no construction or installation activities, and therefore would have no noise impacts.
- Satellites and Other Technologies
  - Satellite Enabled Devices and Equipment: The duration of construction activities associated with installing permanent equipment on existing structures would most likely be short-term. It is anticipated that insignificant levels of noise would be emitted during installment of this equipment. Noise caused by these construction and installation activities would be similar to other construction activities in the area, such as the installation of cell phone towers or other communication equipment. Deployment and operation of satellite-enabled devices and equipment are expected to have minimal to no impact on the noise environment.
  - Deployment of Satellites: FirstNet does not anticipate launching satellites as part of the deployment of the NPSBN; however, it may include equipment on satellites that are already being launched for other purposes. As adding equipment to an existing launch vehicle would be very unlikely to impact noise resources, it is anticipated that this activity would have no impact on those resources.

Activities with the Potential for Noise Impacts

Construction, deployment, and operation activities related to the Preferred Alternative could create noise impacts from either the construction or operation of the infrastructure. The types of infrastructure deployment scenarios or deployment activities that could be part of the Preferred Alternative and result in potential impacts to air quality include the following:

- Wired Projects
  - New Build – Buried Fiber Optic Plant: Plowing (including vibratory plowing), trenching, or directional boring and the construction of POPs huts, or other associated facilities or hand-holes to access fiber as well as land/vegetation clearing, excavation activities, and landscape grading could result in high noise levels from the use of heavy equipment and machinery.

- New Build – Aerial Fiber Optic Plant: The use of heavy equipment during the installation of new poles and hanging cables, as well as constructing access roads, POP huts, or other associated facilities to house plant equipment would be short-term and could result in increased noise levels from the use of vehicles and machinery.
- Collocation on Existing Aerial Fiber Optic Plant: Excavation equipment used during potential pole replacement, and other heavy equipment used for structural hardening or reinforcement, could result in temporary increases in noise levels from the use of heavy equipment and machinery.
- Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Installation of new associated huts or equipment, if required, could result in short-term and temporarily higher noise levels if the activity required the use of heavy equipment for grading or other purposes.
- New Build – Submarine Fiber Optic Plant: The installation of cables in or near bodies of water would not impact infrastructure resources because there would be no local infrastructure to impact, other than marina operations. However, impacts to infrastructure resources could potentially occur as result of the construction of landings and/or facilities on shores or the banks of water bodies that accept the submarine cable, depending on the exact site location and proximity to existing infrastructure.
- Installation of Optical Transmission or Centralized Transmission Equipment: 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. Aerial platforms (e.g., UASs or other aircraft, except balloons) generate noise during all phases of flight, including takeoff, landing, and flight operations over necessary areas that could impact the local noise environment.

In general, noise from the abovementioned activities would be products of site preparation, installation, and construction activities, as well as additional construction vehicles traveling on nearby roads and localized generator use. These impacts are expected to be less than significant due to the temporary duration of deployment activities. Additionally, pre-existing noise levels achieved after some months (typically less than a year but could be a few hours for linear activities such as pole construction). Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

Operation activities associated with the Preferred Alternative would be less than significant and for routine maintenance and inspection of the facilities because of the temporary nature of the activities which would not create new permanent sources of noise. Any major infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the abovementioned construction impacts. It is anticipated that potential noise impacts would be similar to or less than those described for the deployment activities. If usage of vehicles or heavy equipment as part of routine maintenance or inspections or onsite generator use occurs, potential noise impacts could result as explained above. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

6.2.13.5. Alternatives Impact Assessment

The following section assesses potential noise impacts associated with the Deployable Technologies Alternative and the No Action Alternative.

Deployable Technologies Alternative

Under the Deployable Technologies Alternative option, a nationwide fleet of mobile communications systems would provide temporary coverage in areas not covered by the existing, usable infrastructure. There would be no collocation of equipment and minimal new construction associated with wired or wireless projects discussed above under the Preferred Alternative. Some limited construction could be associated with implementation such as land clearing or paving for parking or staging areas. The specific equipment associated with the Deployable Technologies Alternative would be heavy trucks with onboard generators, aerial vehicles (e.g., UASs or other aircraft), and ground support vehicles and equipment for aerial deployment. The stand-alone Deployable Technologies Alternative differs from the Preferred Alterative in the number of mobile and aerial vehicles likely to deploy, the distances traveled from storage locations and the duration of deployment. The potential noise impacts are as follows:

Deployment Impacts

Implementing deployable technologies could result in noise from mobile equipment deployed via heavy trucks, including not only onboard generators, but also the vehicles themselves. While a single deployable vehicle may have an insignificant impact, multiple vehicles operating for longer periods, in close proximity, may increase localized noise levels. Several vehicles traveling together could also create short-term noise impacts on residences or other noise-sensitive receptors as they pass by. The deployment of aerial technology is anticipated to generate noise during all phases of flight. Aerial technologies would have the highest level of noise impact if they are required to fly above residential areas, areas with a high concentration of noise-sensitive receptors (i.e., schools or churches), or over national parks or other areas where there is an expectation of quiet and serenity on their way to their final destinations. These impacts are expected to be less than significant due to the temporary duration of deployment activities. Residences near deployment areas for aerial technologies (i.e., airports or smaller airfields) could also be affected during takeoff and landing operations. Additionally, routine maintenance and inspections of the deployable technologies are anticipated to be less than significant, given that these activities are of low-intensity and short duration. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

Operation activities associated with the Deployable Technologies Alternative would be similar to several of the deployment activities related to routine maintenance and inspection of the facilities. Operation of generators could also generate noise in the area. However, deployable technologies could be deployed to areas with few existing facilities, so noise impacts could be minimal in those areas. Any major infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the abovementioned construction impacts. It is anticipated that potential noise impacts would be the same as those described for the deployment activities. If usage of vehicles or heavy equipment as part of routine maintenance or inspections occurs, potential noise impacts could result as explained above.

Operational impacts from aerial technologies would include repeated flyovers by UAS vehicles while they are needed in the area. This could generate significant, short-term impacts on any residential areas or other noise-sensitive receptors under the flight path of these vehicles. However, once these operations cease, noise levels would quickly return to baseline levels. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

No Action Alternative

Under the No Action Alternative, FirstNet would not deploy the NPSBN and there would be no impact to ambient noise. By not deploying NPSBN, FirstNet would avoid generating noise from construction, installation, or operation of wired, wireless, deployable infrastructure or satellites and other technologies.

6.2.14. Climate Change

6.2.14.1. Introduction

This section describes potential impacts to climate and climate change-vulnerable resources in Nevada associated with deployment and operation of the Proposed Action and alternatives. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts

6.2.14.2. 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 6.2.14-1. The categories of impacts are defined as potentially significant, less than significant with mitigation incorporated, less than significant, or no impact. Characteristics of each impact type, including magnitude or intensity, geographic extent, and duration or frequency, were used to determine the impact significance rating associated with each potential impact.

Given the nature of this programmatic evaluation, and because the Proposed Action could potentially cover a wide variety of actions that would take place in various landscapes, the potential impacts to climate and climate change-vulnerable resources addressed in this section are presented as a range of possible impacts.

CEQ requires the consideration of climate change from two perspectives. The first is the potential for impacts on climate change through GHG emissions resulting from the Proposed Action or alternatives. The second is related to the implications and possible effects of climate change on the environmental consequences of the Proposed Action or alternatives. This extends to the impacts of climate change on facilities and infrastructure that would be part of the Proposed Action or alternatives (CEQ, 2014).

CEQ has established the significance criteria for GHG emissions at 25,000 MT CO_2e on an annual basis, with the requirement that if projected emissions exceed this threshold, a GHG emissions quantitative analysis is warranted (CEQ, 2014). Although 25,000 MT is a very small fraction (one 266,920th) of the total U.S. emissions of 6,673 MMT CO_2e in 2013 (USEPA, 2015l), the sum of additional emissions as a consequence of the deployment of FirstNet, combined with multiple new sources of CO_2 and other GHGs from other projects and human activities, could be significant.

CEQ guidance for the consideration of effects of climate change on the environmental consequences of the Proposed Action is more general. In addition to the consideration of climate change's effects on environmental consequences, it also includes the impact that climate change may have on the projects themselves (CEQ, 2014). Projects located in areas that are vulnerable to the effects of climate change (e.g., flooding) 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 6.2.14-1: Impact Significance Rating Criteria for Climate Change

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
Contribution to climate change through GHG emissions	Magnitude or Intensity	Exceedance of 25,000 metric tons of CO_2e/year, and global level effects observed.	Effect that is potentially significant, but with mitigation is less than significant.	Only slight change observed.	No increase in greenhouse gas emissions or related changes to the climate as a result of project activities.
	Geographic Extent	Global impacts observed.		Global impacts observed.	NA
	Duration or Frequency	Long-term changes. Changes cannot be reversed in a short term.		Changes occur on a longer time scale. Changes cannot be reversed in the short term.	NA
Effect of climate change on FirstNet installations and infrastructure	Magnitude or Intensity	Climate change effects (such as sea level rise or temperature change) negatively impact FirstNet infrastructure.	Effect that is potentially significant, but with mitigation is less than significant.	Only slight change observed.	No measurable impact of climate change on FirstNet installations or infrastructure.
	Geographic Extent	Local and regional impacts observed.		Local and regional impacts observed.	NA
	Duration or Frequency	Long-term changes. Changes cannot be reversed in a short term.		Changes occur on a longer time scale. Changes cannot be reversed in the short term.	NA

NA = Not Applicable

6.2.14.3. Projected Future Climate

The Southwest is the hottest and driest region in the United States, and the region is already experiencing impacts of climate change. The decade 2001-2010 was the warmest in the 110-year instrumental historical record keeping, with temperatures almost 2 °F higher than historic averages, which included fewer cold air outbreaks and more heat waves. Summertime heat waves are projected to become longer and hotter, whereas the trend of decreasing wintertime cold air outbreaks is projected to continue. These changes will directly affect urban public health and will also have direct impacts on crop yields. (USGCRP, 2014a)

Air Temperature

Figure 6.2.14-1 and Figure 6.2.14-2 illustrate the anticipated temperature changes for low and high GHG emission scenarios for Nevada from a 1969 to 1971 baseline.

Bsk – Figure 6.2.14-1shows that by mid-century (2040 to 2059), temperatures in the entire state of Nevada under a low emissions scenario would increase by approximately 4 °F, and by the end of the century (2080 to 2099) temperatures in the entire state of Nevada under a low emissions scenario would increase by approximately 6° F. (USGCRP, 2009)

Figure 6.2.14-2 shows that by mid-century (2040 to 2059) under a high emissions scenario, temperatures will increase by approximately 5 °F in Nevada. Under a high emissions scenario for the period (2080 to 2099) in Nevada, temperatures will increase by approximately 8° F in the majority of the Bsk region of Nevada while a small eastern portion of the region are projected to increase by 9 °F. (USGCRP, 2009)

Bwk – Temperatures in this region are expected to increase by mid-century (2040 to 2059) and by the end of the century (2080 to 2099) at the same rate as the Bsk region under a low emissions scenario. Under a high emissions scenario, temperatures in the Bwk region at mid-century are projected to be the same as the Bsk region, however by the end of the century temperatures are projected to increase by only 8 °F in the Bwk region. (USGCRP, 2009)

Csb – Temperatures in this region are expected to increase by mid-century and by the end of the century at the same rate as the Bwk region in both a low emission and high emissions scenario. (USGCRP, 2009)

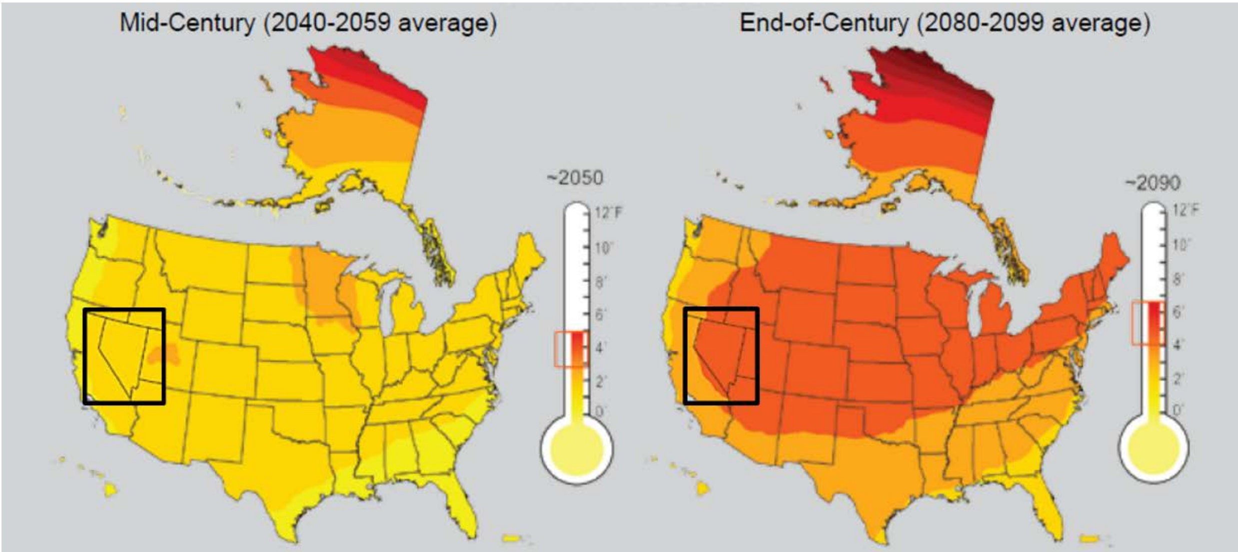


Figure 6.2.14-1: Nevada Low Emission Scenario Projected Temperature Change

Source: (USGCRP, 2009)

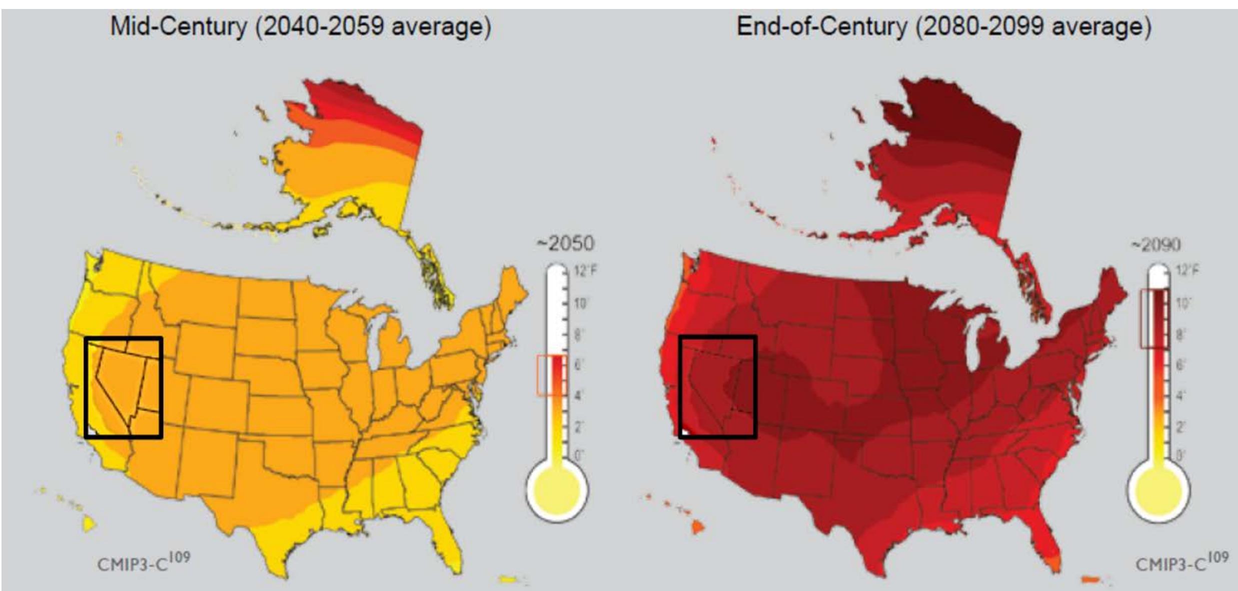


Figure 6.2.14-2: Nevada High Emission Scenario Projected Temperature

Source: (USGCRP, 2009)

Precipitation

Projections of precipitation changes are less certain than those for temperature. Under a high emissions scenario, reduced winter and spring precipitation is consistently projected for the southern part of the Southwest by 2100. In the northern part of the region, projected winter, spring, summer and fall precipitation changes are smaller than natural variations. The Southwest is prone to drought, and future droughts are projected to be substantially hotter, and for major river basins such as the Colorado River Basin, drought is projected to become more frequent, intense, and longer lasting. These drought conditions present a huge challenge for water resource management and natural hazards such as wildfire. (USGCRP, 2014a)

Total seasonal snowfall has generally decreased in southern and some western areas although snow is melting earlier in the year and more precipitation is falling as rain versus snow. Overall snow cover has decreased in the Northern Hemisphere, due in part to higher temperatures that shorten the time snow spends on the ground. (USGCRP, 2014b)

In the majority of Nevada, there is an expected increase in the number of consecutive dry days under low and high emissions scenarios by mid-century (2041 to 2070) as compared to the period (1971 – 2000). An increase in consecutive dry days could lead to drought. (USGCRP, 2014c)

Figure 6.2.14-3 and Figure 6.2.14-4 show predicted seasonal precipitation change for an approximate 30-year period of 2071 to 2099 compared to a 1970 to 1999 approximate 30-year baseline. Figure 6.1.14.6-3 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, 2014c)

Figure 6.2.14-2 shows a high emissions scenario, which assumes continued increases in emissions, with associated large increases in warming and major precipitation changes. (Note: white areas in the figures indicate that the changes are not projected to be larger than could be expected from natural variability.) (USGCRP, 2014c)

Bsk – Figure 6.2.14-1 shows that in a low emissions scenario in the 30-year period for 2071 to 2099, precipitation would increase by 10 percent in the northern portion of the Bsk region with no expected changes in precipitation in the southern portion of the region in winter and spring. There are no expected increases in precipitation in fall or summer other than fluctuations due to natural variability. (USGCRP, 2014c)

Figure 6.2.14-3 shows that if emissions continue to increase, winter precipitation could increase 10, 20, or 30 percent depending on the section of the region over the period 2071 to 2099 with no expected changes in other sections of the region during winter. In spring, precipitation in this scenario could decrease by 10 or 20 percent depending on the section of the region with no expected changes in other sections of the region. Summer precipitation could increase 10 or 20 percent depending on the section of the region with no expected changes in other sections of the region. During fall in this emissions scenario, in the southeast portion of the region precipitation is expected to decrease by 10 percent and in the northeast portion of the region precipitation is expected to increase by 10 percent while in some portions of this region there are no expected changes. (USGCRP, 2014c)

Bwk – In a low emissions scenario, precipitation would increase by 10 percent in winter and spring depending on the portion of the Bwk region while some other portions are not expected to have any fluctuations during winter or spring. There are no expected changes other than normal variability in summer and fall. (USGCRP, 2014c)

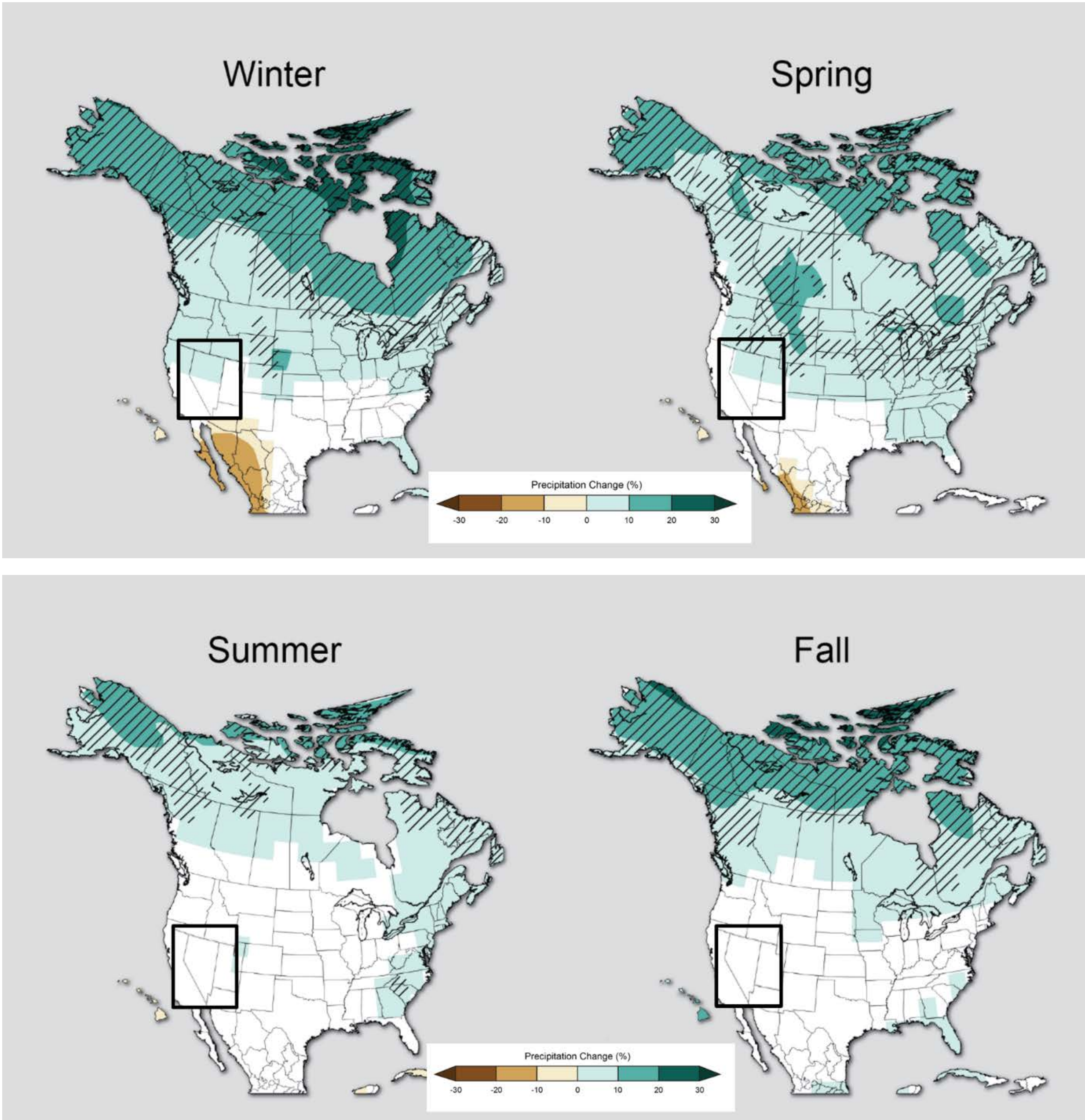
Under a high emissions scenario, precipitation in winter is expected to increase as much as 10 or 20 percent depending on the portion of the Bwk region in Nevada while some portions are not expected to have any changes. Spring precipitation is projected to decrease by 10 or 20 percent depending on the portion of the Bwk region while in other portions there no expected changes to precipitation. In summer, precipitation is expected to increase by 10 or 20 percent. In addition, fall precipitation is expected to increase by 10 percent in some portions of the Bwk region while there are no expected changes in precipitation in other portions of this region in Nevada. (USGCRP, 2014c)

Csb **–** In a low emissions scenario, precipitation would increase by 10 percent in winter and spring depending on the portion of the Csb region while some other portions are not expected to have any fluctuations during winter or spring. There are no expected changes other than normal variability in summer and fall. (USGCRP, 2014c)

If emissions continue to increase, precipitation in winter is expected to increase as much as 20 percent. In spring and fall under a high emissions scenario precipitation is expected to increase at the same rate as in the Csb region. Summer precipitation is expected to increase by 10 percent with no expected changes in some portions of the region. (USGCRP, 2014c)

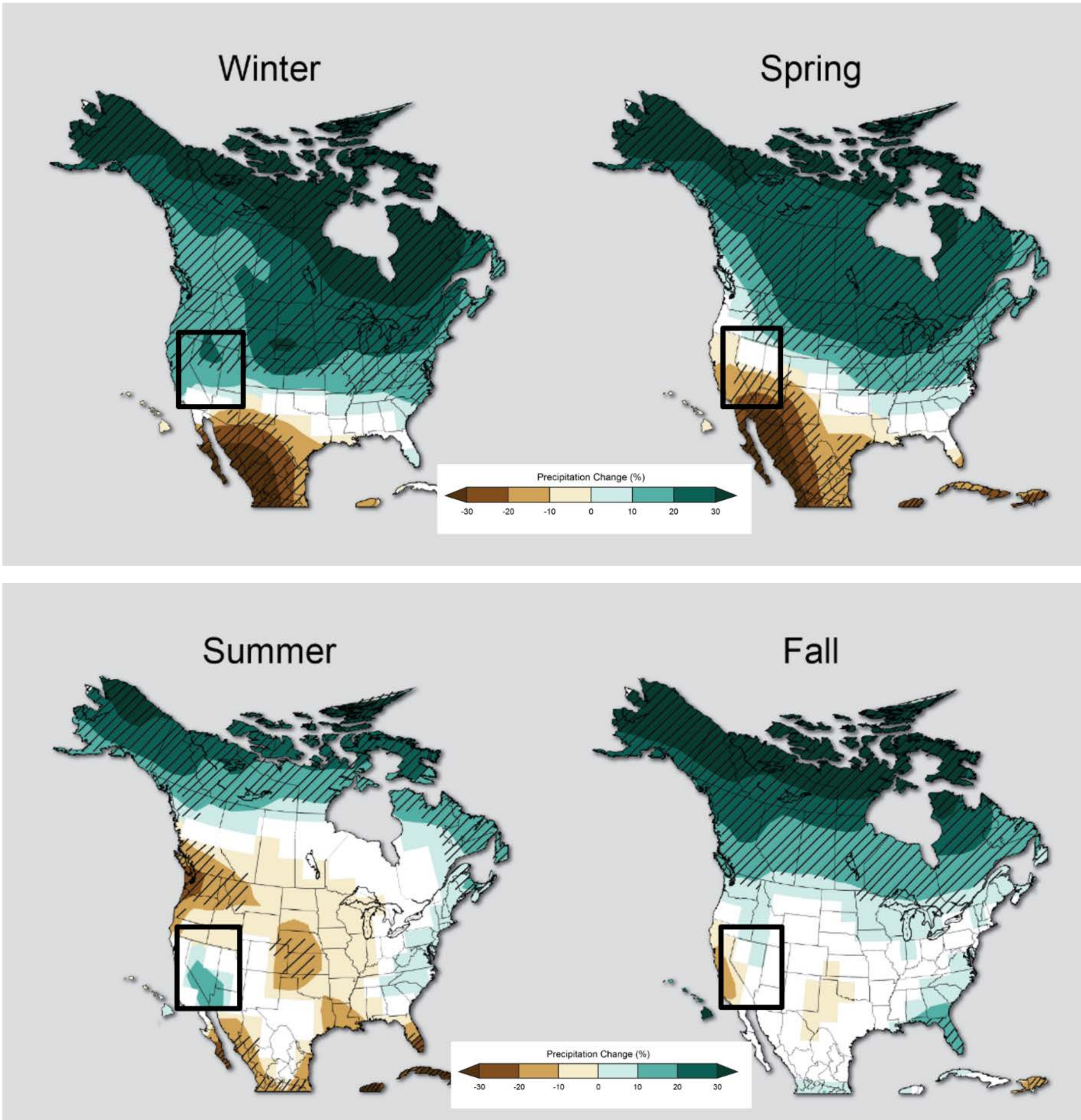
Severe Weather Events

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. 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, 2014b)



Source: (USGCRP, 2014d)

Figure 6.2.14-3: Predicted Seasonal Precipitation Change for 2071 to 2099 Compared to 1970 to 1999 Baseline in a Low Emissions Scenario



Source: (USGCRP, 2014d)

Figure 6.2.14-4: Predicted Seasonal Precipitation Change for 2071 to 2099 Compared to 1970 to 1999 Baseline in a High Emissions Scenario

6.2.14.4. 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 6.2.14-1, climate change impacts as a result of GHG emissions could be significant and require a quantitative analysis if FirstNet's deployment of technology was responsible for increased emissions of 25,000 MT/year or more. The GHG emissions resulting from FirstNet activities fall into two categories: short-term and long-term. Short-term emissions could be associated with deployment activities (vehicles and other motorized construction equipment) and would have no long-term or permanent impact on GHG emissions or climate change. Long-term (both temporary and permanent) emission increases could result from operations, including the use of grid-provided electricity by FirstNet equipment such as transmitters and optical fiber, and from the temporary use of portable or onsite electric generators (a less efficient, more carbon-intensive source of electricity), during emergency situations when the electric grid was down, for example after a hurricane.

A single large cell tower would typically require 20-60 kW of power to operate (Balshe, 2011). The CO_2 emissions associated with the operation of the tower would depend on whether it was supplied by a stand-alone power source, such as a generator, or from the grid, and whether it was operating at full power on a continuous basis. A standard 60kW 3-phase diesel generator consumes approximately 5.0 gallons of diesel per hour (Diesel Service & Supply, 2016). Diesel fuel combustion emits 22.38 lbs. of CO_2 per gallon (EIA, 2015i). A 60kW transmitter running on a generator would therefore be responsible for 1.34 tons of CO_2/day. Running continuously, the tower would cause the emission of 492 tons of CO_2 per year.

However, grid-provided electricity is less carbon-intensive, and would generate approximately 1,136.53 lbs./MWh of CO_2 per year for the same equipment, depending on the region of the U.S. where the electricity was generated (USEPA, 2014d). Actual emissions would depend on the fuel mix and efficiency of the systems from which electricity was generated. Some may even run on low/no-emissions renewable energy. Therefore, this scenario is a "worst-case" for GHG emissions. If the system deployment resulted in the operation of more than 50 60 kW towers operating at maximum power in remote locations on diesel generators on a continuous basis, the 25,000 MT/year threshold may be exceeded and a quantitative analysis required. By comparison, optical fiber is considerably more energy efficient and consumes considerably less power than transmitters (Vereecken, et al., 2011), and would not impact GHG emissions in such a way as to require a quantitative analysis.

Effects of Climate Change on Project-Related Impacts

Climate change may impact project-related impacts by magnifying or otherwise altering impacts in other resources areas. For example, climate change may impact air quality, water resource availability, and recreation. These effects would vary from state to state depending on the resources in question and their relationship to climate change. The severity and length of droughts is expected to increase in Nevada 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, 2015f). Wildland fires may present a risk to both permanent and mobile installations as well as to first responders themselves, as well as impacting ecosystems. Increased and more persistent droughts could significantly impact Nevada's economy as western states compete for the same water resources (USGCRP, 2014f).

Impact of Climate Change on FirstNet Installations and Infrastructure

Climate change impacts on FirstNet installations and infrastructure will vary from state to state, depending on the placement and vulnerability of the installations and infrastructure, and the impacts that climate change is anticipated to have in that particular location. Based on the impact significance criteria presented in Table 6.2.14-1, climate change effects on FirstNet installations and infrastructure would be significant if they negatively affected the operation of these facilities. For areas of Nevada 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 (USGCRP, 2014f) and their potential to damage FirstNet installations and infrastructure. Climate change may expose areas of Nevada increased intensity and duration of heat waves (USGCRP, 2014f), although Nevada does not have large population centers with the significant urban heat islands (with the exception of Las Vegas) that would greatly magnify these effects. Extended periods of extreme heat may increase general demand on the electric grid in Nevada impede the operation of the grid, and overwhelm the capacity onsite equipment needed to keep microwave and other transmitters cool (DOE, 2013).

6.2.14.5. Potential Impacts of the Preferred Alternative

Greenhouse Gas Emissions

The following section assesses potential GHG emission impacts associated with implementation of the Preferred Alternative in Nevada, including deployment and operation activities.

As described in Section 2.1.2, Proposed Action Infrastructure, implementation of the Preferred Alternative could result in the deployment and operation of various types of facilities or infrastructure. Depending on the physical nature and location of the facility/infrastructure and the specific deployment requirements, some activities would result in potential impacts to GHG emissions, climate impacts in other resource areas, and FirstNet infrastructure and operations, and others would not. In addition, and as explained in this section, the same type of Proposed Action infrastructure could result in a range of no impacts to less than significant impacts depending on the deployment scenario or site-specific conditions.

Activities Likely to Have No Impacts

Of the types of facilities or infrastructure deployment scenarios described in Section 2.1.2, Proposed Action Infrastructure, the following are likely to have no impacts to climate change under the conditions described below:

- Wired Projects
  - Use of Existing Conduit – New Buried Fiber Optic Plant: There would be no short-term emissions associated with construction, as construction would not take place. The equipment required to blow or pull fiber through existing conduit would be used temporarily and infrequently, resulting in no perceptible generation of GHG emissions.
  - Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting up dark fiber would require no construction and have no short- or long-term emissions. This would create no perceptible change in GHG emissions.
- Satellites and Other Technologies
  - Distribution of Satellite Enabled Devices and Equipment: The installation of satellite-enabled equipment on existing structures, or the use of portable satellite-enabled devices would not create any perceptible changes in GHG emissions because they would not create any new emissions sources.
  - Deployment of Satellites: FirstNet does not anticipate launching satellites as part of the NPSBN; however, it could include equipment on satellites that are already being launched for other purposes. Therefore, it is anticipated that there would be no GHG emissions or any climate change effects on the project because of these activities.

Activities with the Potential to Have Impacts

The deployment and use of energy-consuming equipment as a result of the implementation of the Preferred Alternative would result in GHG emissions whose significance would vary depending on their power requirements, duration and intensity of use, and number. The types of infrastructure deployment scenarios that could be part of the Preferred Alternative and result in potential impacts to GHG emissions and climate change include the following:

- Wired Projects
  - New Build - Buried Fiber Optic Plant: This activity would include plowing (including vibratory plowing), trenching, and directional boring, and could involve construction of POPs, huts, or other facilities to house outside plant equipment or hand holes to access fiber. These activities could generate GHG emissions.
  - New Build Aerial Fiber Optic Plant: These projects would require construction equipment for installing or replacing new poles and hanging cables as well as excavation and grading for new or modified ROWs or easements. It could also include construction of POPs, huts, or other facilities to house outside plant equipment. These activities could generate GHG emissions.

  - Collocation on Existing Aerial Fiber Optic Plant: These projects would require equipment for replacement of existing wiring and poles. GHG emissions associated with these projects would arise from use of machinery and vehicles to complete these activities.
  - New Build – Submarine Fiber Optic Plant: The deployment of small workboats with engines similar to recreational vehicle engines may be required to transport and lay small wired cable. The emissions from these small 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 it would not occur. Minor, short-term, temporary GHG emissions may result from any associated equipment used for installation, such as cranes or other equipment. Long-term, permanent or temporary increases in GHG emissions would result from the electricity requirements of the towers (both grid-provided and back-up), and would depend on their size, number, and the frequency and duration of their use.
- Deployable Technologies
  - COWs, COLTs, or SOWs: The long-term operations of these mobile systems have the potential to have GHG emission impacts in excess of 25,000 MT if operated in large numbers over the long-term. However, this would be highly dependent on their size, number, and the frequency and duration of their use.

    Emissions associated with the deployment and maintenance of a complete network solution of this type may be significant if large numbers of piloted or unmanned aircraft were used for a sustained period of time (i.e., months to years). Emissions would depend on the type of platforms used, their energy consumption, and the duration of the network's operation.

Potential climate change impacts associated with deployment activities as a result of implementation of the Preferred Alternative include increased GHG emissions. GHG emissions would arise from the combustion of fuel used by equipment during construction and changes in land use. Land use emissions occur as a result of soil disturbance and loss of vegetation are expected to be less than significant due to the limited and localized nature of deployment activities. Chapter 9, BMPs and Mitigation Measures, provide a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to further avoid or minimize potential impacts.

Climate Change Impacts on FirstNet Infrastructure or Operations

Climate change effects on the Preferred Alternative could be potentially significant to less than significant with BMPs and mitigation measures incorporated because climate change may potentially impact FirstNet installations or infrastructure during periods of extreme heat, severe storms, and other weather events. Mitigation measures could minimize or reduce the severity or magnitude of a potential impact resulting to the project, including adaptation, which refers to anticipating adverse effects of climate change and taking appropriate action to prevent and minimize the damage climate change effects could cause.

Climate change's anticipated impact on extreme weather events such as hurricanes or heat waves may increase the severity of the emergencies to which first responders are responding in vulnerable areas, and thus the extent and duration of their dependence on FirstNet resources. FirstNet would likely prepare to sustain these operations in areas experiencing climate and weather extremes through the design and planning process for individual locations and operations.

6.2.14.6. Alternatives Impact Assessment

The following section assesses potential impacts to climate associated with the Deployable Technologies Alternative and the No Action Alternative.

Deployable Technologies Alternative

Under the Deployable Technologies Alternative, a nationwide fleet of mobile communications systems would provide temporary coverage in areas not covered by the existing, usable infrastructure. There would be no collocation of equipment and minimal new construction associated with wired or wireless projects discussed above under the Preferred Alternative. Some limited construction could be associated with implementation such as land clearing or paving for parking or staging areas. The specific infrastructure associated with the Deployable Technologies Alternative would be the same as the deployable technologies implemented as part of the Preferred Alternative but would likely be implemented in greater numbers, over a larger geographic extent, and used with greater frequency and duration.

Deployment Impacts

As explained above, implementation of deployable technologies could involve use of fossil-fuel-powered vehicles, powered generators, and/or aerial platforms. There could be some emissions and soil and vegetation loss as a result of excavation and grading for staging and/or landing areas depending on the type of technology. GHG emissions are expected to be less than significant based on the defined significance criteria, since activities would be temporary and short-term.

Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Operations Impacts

Implementing land-based deployable technologies (COWs, COLTs, and SOWs) 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 due to the temporary nature of the operation of deployables. Some staging or landing areas (depending on the type of technology) may require excavation, site preparation, and paving. Heavy equipment used for these activities could produce emissions as a result of burning fossil fuels in internal combustion engines. The operation of aerial technology is anticipated to generate pollutants during all phases of flight, except for balloons. These activities are expected to be less than significant due the limited duration of deployment activities. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Additionally, routine maintenance and inspections of the deployable technologies are anticipated to be less than significant, given that these activities are of low-intensity and short duration.

Climate Change Impacts on FirstNet Deployable Infrastructure or Operations

Climate change effects have the most noticeable impacts over a long period. Climate change effects such as temperature, precipitation changes, and extreme weather during operations would be expected but could have little to no impact on the deployed technology due to the temporary nature of deployment. However, if these technologies are deployed continuously (at the required location) for an extended period, climate change effects on deployables could be similar to the Proposed Action, as explained above. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

No Action Alternative

Under the No Action Alternative, the NPSBN would not be deployed; therefore, there would be no associated construction or installation of wired, wireless, deployable infrastructure, or satellites and other technologies. As a result, there would be no impacts to GHG emissions or climate as a result of deployment and operation of the Proposed Action. Environmental conditions would therefore be the same as those described in Section 6.1.14, Climate Change.

6.2.15. Human Health and Safety

6.2.15.1. Introduction

This section describes potential impacts to human health and safety in Nevada associated with deployment of the Proposed Action and alternatives. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

6.2.15.2. 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 6.2.15-1. The categories of impacts are defined as potentially significant, less than significant with mitigation incorporated, less than significant, or no impact. Characteristics of each impact type, including magnitude or intensity, geographic extent, and duration or frequency, were used to determine the impact significance rating associated with each potential impact.

Given the nature of this programmatic evaluation, and because the Proposed Action could potentially cover a wide variety of actions that would take place in various landscapes, the potential impacts to human health and safety addressed in this section are presented as a range of possible impacts.

Table 6.2.15-1: Impact Significance Rating Criteria for Human Health and Safety

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
Exposure to Worksite Occupational Hazards as a Result of Activities at Existing or New FirstNet Sites	Magnitude or Intensity	Exposure to concentrations of chemicals above occupational regulatory limits and TWAs. A net increase in the amount of hazardous or toxic materials or wastes generated, handled, stored, used, or disposed of, resulting in unacceptable risk, exceedance of available waste disposal capacity and probable regulatory violations. Exposure to recognized workplace safety hazards (physical and chemical). Violations of various regulations including: OSHA, RCRA, CERCLA, TSCA, EPCRA.	Effect is potentially significant, but with mitigation is less than significant.	No exposure to chemicals above health-protective screening levels. Hazardous or toxic materials or wastes could be safely and adequately managed in accordance with all applicable regulations and policies, with limited exposures or risks. No exposure to unsafe working conditions or other workplace safety hazards.	No exposure to chemicals, unsafe working conditions, or other workplace safety hazards.
	Geographic Extent	Regional impacts observed (“regional” assumed to be at least a county or county-equivalent geographical extent, could extend to state/territory).		Impacts only at a local/neighborhood level.	NA
	Duration or Frequency	Occasional frequency during the life of the project.		Rare event.	NA

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	Less than Significant with BMPs and Mitigation Measures Incorporated	Less than Significant	No Impact
Exposure to Hazardous Materials, Hazardous Waste, and Mine Lands as a Result of FirstNet Site Selection and Site-Specific Land Disturbance Activities	Magnitude or Intensity	Exposure to concentrations of chemicals above regulatory limits, or USEPA chemical screening levels protective of the general public. A net increase in the amount of hazardous or toxic materials or wastes generated, handled, stored, used, or disposed of, resulting in unacceptable risk, exceedance of available waste disposal capacity and probable regulatory violations. Site contamination conditions could preclude development of sites for the proposed use. Violations of various regulations including OSHA, RCRA, CERCLA, TSCA, EPCRA. Unstable ground and seismic shifting.	Effect is potentially significant, but with mitigation is less than significant.	No exposure to chemicals above health-protective screening levels. Hazardous or toxic materials or wastes could be safely and adequately managed in accordance with all applicable regulations and policies, with limited exposures or risks. No exposure to unstable ground conditions or other workplace safety hazards.	No exposure to chemicals, unstable ground conditions, or other workplace safety hazards.
	Geographic Extent	Regional impacts observed ("regional" assumed to be at least a county or county-equivalent geographical extent, could extend to state/territory).		Impacts only at a local/neighborhood level.	NA
	Duration or Frequency	Occasional frequency during the life of the project.		Rare event.	NA

Type of Effect	**Effect Characteristics**	**Impact Level**			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
Exposure to Hazardous Materials, Hazardous Waste, and Occupational Hazards as a Result of Natural and Manmade Disasters	Magnitude or Intensity	Exposure to concentrations of chemicals above regulatory limits, or USEPA chemical screening levels protective of the general public. Site contamination conditions could preclude development of sites for the proposed use. Physical and biologic hazards. Loss of medical, travel, and utility infrastructure.	Effect is potentially significant, but with mitigation is less than significant.	No exposure to chemicals above health-protective screening levels. Hazardous or toxic materials or wastes could be safely and adequately managed in accordance with all applicable regulations and policies, with limited exposures or risks. No exposure to unsafe conditions. No loss of medical, travel, or utility infrastructure.	No exposure to chemicals, unsafe conditions, or other safety and exposure hazards.
	Geographic Extent	Regional impacts observed ("regional" assumed to be at least a county or county-equivalent geographical extent, could extend to state/territory).		Impacts only at a local/neighborhood level.	NA
	Duration or Frequency	Occasional frequency during the life of the project.		Rare event.	NA

NA = Not Applicable

6.2.15.3. 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 6.2.15-1, occupational injury impacts could be potentially significant if the FirstNet deployment locations require performing occupational activities that have the highest relative potential for physical injury and/or chemical exposure. Examples of activities that may present increased risk and higher potential for injury include working from heights (i.e., from towers and roof tops), ground-disturbing activities like trenching and excavating, confined space entry, operating heavy equipment, and the direct handling of hazardous materials and hazardous waste. Predominately, these hazards are limited to occupational workers, but may impact the general public if there are trespassers or if any physical of chemical hazard extends beyond the restricted access of proposed FirstNet work sites.

To protect occupational work, 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, 2016d).

1.) Engineering controls;

2.) Work practice controls;

3.) Administrative controls; and then

4.) 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,[146] chain locks, bollards, storage containers (for storing equipment and chemicals), or signage and caution tape. Other forms of engineering controls could include machinery designed to manipulate the quality of the work environment, such as ventilation blowers. Whenever practical, engineering controls may result in the complete removal of the hazard from the work site, an example of which would be the transport and offsite disposal of hazardous waste or asbestos containing materials.

[146] Trench boxes are framed metal structures inserted into open trenches to support trench faces, to protect workers from cave-ins and similar incidents. (OSHA, 2016e)

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, 2016d). 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, SOPs would be developed and implemented by FirstNet partner(s) for critical and/or repetitive tasks that require attention to detail, specialized knowledge, or clear step-wise directions to prevent worker injury and to ensure proper execution.

Administrative controls are employer-initiated methods to reduce the potential for injury and physical fatigue (OSHA, 2016d). 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, using the buddy system for dangerous tasks and any other similar activity or processes that are 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 refers 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. (OSHA, 2015c)

The NVOSHA is authorized by OSHA to administer the state program which oversees employee safety in all state and local government workplaces. The FirstNet proposed action and site work will not be performed by state or local employees. The involvement of state and local employees will be limited to emergency responders (e.g., police, fire, emergency medical transporters, etc.) and local government permitting authorities.

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 because of underground shaft collapses or seismic shifting. Based on the impact significance criteria presented in Table 6.2.15-1, human health impacts could be significant if FirstNet deployment sites are near contaminated properties or abandoned 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 Nevada Commission on Mineral Resources, Division of Minerals, 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 proposed FirstNet deployment activities, if any soil or groundwater is stained or emitting an unnatural odor, it may be an indication of environmental contamination. When such instances are encountered, it may be necessary to stop work until the anomaly is further assessed through record reviews or environmental sampling. Proposed FirstNet deployment would attempt to avoid known contaminated sites. However, in the event that FirstNet is unable to avoid a contaminated site, then site analysis and remediation would be required under RCRA, CERCLA, and applicable Nevada 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 Nevada Commission on Mineral Resources, Division of Minerals may require FirstNet to perform environmental clean-up actions at the site to lower the existing levels of contamination. HHRAs help determine which level of PPE (i.e., Level D, Level C, Level B, or Level A) is necessary for a work activity. HHRAs take into account all exposure pathways: absorption, ingestion, inhalation, and injection. Therefore, specific protective measures (e.g., controls and PPE) that disrupt the exposure pathways could be identified, prioritized, and implemented.

Natural and Manmade Disasters

The impacts of natural and manmade disasters are likely to present unique health and safety hazards, as well as exacerbate pre-existing hazards, such as degrading occupational work conditions and disturbing existing environmental contamination. The unique hazards presented by natural and manmade disasters may include, fire, weather incidents (e.g., floods, tornadoes, hurricanes, etc.), earthquakes, vandalism, large- or small-scale chemical releases, utility disruption, community evacuations, or any other event that abruptly and drastically denudes the availability or quality of transportation infrastructure, utility infrastructure, medical infrastructure, and sanitation infrastructure. Additionally, such natural and manmade disasters could directly impact public safety communication infrastructure assets through damage or destruction.

Based on the impact significance criteria presented in Table 6.2.15-1, human health impacts could be significant if FirstNet deployment sites are located in areas that are directly impacted by natural and manmade disasters that could lead to exposure to hazardous wastes, hazardous materials, and occupational hazards. FirstNet's emphasis on public safety-grade communications infrastructure may result in a less than significant beneficial impact, 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. Chapter 9, 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.

6.2.15.4. 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. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Activities Likely to Have No Impacts

Of the types of facilities or infrastructure deployment scenarios described in Section 2.1.2, Proposed Action Infrastructure, the following are likely to have no impacts to human health and safety under the conditions described below:

- Wired Projects
  - Use of Existing Conduit – New Buried Fiber Optic Plant: the pulling or blowing of fiber optic cable would be performed through existing conduit. Use of mechanical equipment would be limited to pulley systems and blowers. Some locations with no existing power supply may require the use of electrical generators. Hazardous materials needed for this work would include fiber optical cable lubricants, mechanical oil/grease, and fuel for electrical generators although these materials are expected to be used infrequently and in small quantities. These activities are not likely to result in serious injury or chemical exposure, or surface disturbances since work would be limited to existing entry and exit points, would be temporary, and intermittent. It is anticipated that there would be no impacts to human health and safety.
  - Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting up of dark fiber would have no impacts to human health and safety because there would be no ground disturbance or heavy equipment used.
- Satellites and Other Technologies
  - Deployment of Satellites: FirstNet does not anticipate launching satellites as part of the deployment of the NPSBN; however, it could include equipment on satellites that are already being launched for other purposes. As adding equipment to an existing launch vehicle would be very unlikely to impact human health and safety resources, it is anticipated that this activity would have no impact on resources.

Activities with the Potential to Have Impacts

Potential deployment-related impacts to human health and safety as a result of implementation of the Preferred Alternative would encompass a range of impacts that occur as a result of ground disturbance activities, construction activities, equipment upgrade activities, management of hazardous materials and/or hazardous waste, and site selection. The types of infrastructure development scenarios or deployment activities that could be part of the Preferred Alternative and result in potential impacts to human health and safety include the following:

- Wired Projects
  - New Build – Buried Fiber Optic Plant: Plowing (including vibratory plowing), trenching, or directional boring and the construction of POPs, huts, or other associated facilities or hand-holes to access fiber would require the use of heavy equipment and hazardous materials. The additional noise and activity at the site would require workers to demonstrate a high level of situational awareness. Failure to follow OSHA and industry controls could result in injuries. Excavation of soil at proposed sites known to contain environmental contamination has the potential to expose workers to harmful chemicals or

releases that could impact the general public in the immediate vicinity. Additionally, some of this work would likely be performed along road ROWs, increasing the potential for vehicle traffic to collide with site workers or equipment. If a proposed deployment activity involves the operation of heavy equipment, managing hazardous materials and hazardous waste management, or other site location challenges, there could be potential human health and safety impacts to consider.

- New Build – Aerial Fiber Optic Plant: Installation of new poles and fiber optic lines could require excavation activities, working from heights, use of hazardous materials, and site locations in ROWs. Hazards associated with the site work include injury from heavy equipment, fall hazards, chemical hazards, and the potential for vehicle traffic to collide with site workers or equipment. Excavation of soil at proposed sites known to contain environmental contamination has the potential to expose workers to harmful chemicals or releases that could impact the general public in the immediate vicinity. If a proposed deployment activity involves the operation of heavy equipment, hazardous materials and hazardous waste management, or other site location challenges, there could be potential human health and safety impacts to consider.
- Collocation on Existing Aerial Fiber Optic Plant: Installation of overhead fiber optic lines would require work from height. In some instances, new poles would be installed requiring excavation activities with heavy equipment. Hazards associated with the site work include injury from heavy equipment, fall hazards, chemical hazards, and the potential for vehicle traffic to collide with site workers or equipment. Excavation of soil at proposed sites known to contain environmental contamination has the potential to expose workers to harmful chemicals or releases that could impact the general public in the immediate vicinity. If a proposed deployment activity involves the operation of heavy equipment, hazardous materials and hazardous waste management, or other site location challenges, there could be potential human health and safety impacts to consider.
- New Build – Submarine Fiber Optic Plant: The installation of cables in or near bodies of water may require workers to operate over aquatic 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 shores or the banks of waterbodies 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 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 RF 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 RF 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 RF emissions, refer to Section 2.4, Radio Frequency Emissions. Use of aerial vehicles would not involve telecommunication site work. Prior to deployment and when not in use, the aerial vehicles would likely require preventive maintenance. Workers responsible for these activities may handle hazardous materials, not limited to fuel, solvents, and adhesives.

- Satellites and Other Technologies
  - Satellite-Enabled Devices and Equipment: The use of portable devices that utilize satellite technology would not impact human health and safety because there is no construction activities or use of hazardous materials. The installation of permanent equipment on existing structures may require workers to operate from heights or in sensitive environments. As a result, the potential for falling, overhead hazards, and falling objects is greater and there is a potential to impact human health and safety.

In general, the abovementioned FirstNet activities could potentially involve site preparation work, construction activities, work in potentially harmful environments (road ROWs, work over water, and environmental contamination, and mine lands), management of hazardous materials and hazardous waste, and weather exposure. Potential impacts to human health and safety associated with deployment of the Proposed Project could include injury from site preparation and operating heavy equipment, construction activities, falling/overhead hazards/falling objects, exposure and release of hazardous chemicals and hazardous waste, and release of historic contamination to the surrounding environment. It is anticipated that potential health impacts associated with human exposure to environmental hazardous materials in air, water, or soil, the risk of road traffic, workplace accidents and injuries, noise exposure, and risk of infectious disease transmission would be less than significant due to the small-scale of likely FirstNet activities that would be temporary and of short duration. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, operation activities associated with the Preferred Alternative would consist of routine maintenance and inspection of the facilities. Any major infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the abovementioned construction impacts. It is anticipated that there would be less than significant impacts to human health and safety associated with routine inspections of the Preferred Alternative. Use of PPE or other mitigation measures could be necessary to adequately protect workers. If usage of heavy equipment were part of routine maintenance, the potential for impacts to human health and safety would also increase. It is anticipated that potential health impacts associated with human exposure to environmental hazardous materials in air, water, or soil, the risk of road traffic, workplace accidents and injuries, noise exposure, and risk of infectious disease transmission would be less than significant due to the small scale of likely FirstNet activities that would be temporary and of short duration. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

6.2.15.5. Alternatives Impact Assessment

The following section assesses potential impacts to human health and safety associated with the Deployable Technologies Alternative and the No Action Alternative.

Deployable Technologies Alternative

Under the Deployable Technologies Alternative option, a nationwide fleet of mobile communications systems would provide temporary coverage in areas not covered by the existing, usable land-based infrastructure. There would be no collocation of equipment and minimal new construction associated with wired or wireless projects discussed above under the Preferred Alternative. Some limited construction could be associated with implementation such as land clearing or paving for parking or staging areas. The specific infrastructure associated with the Deployable Technologies Alternative would be the same as the deployable technologies implemented as part of the Preferred Alternative but would likely be implemented in greater numbers, over a larger geographic extent, and used with greater frequency and duration. Therefore, potential impacts to human health and safety as a result of implementation of this alternative could be as described below.

Deployment Impacts

As explained above, implementation of deployable technologies could result in less than significant impacts to human health and safety. The largest of the land-based deployable technologies may require site preparation work or stabilization work to ensure the self-contained trailers are stable. Heavy equipment may be necessary to complete the site preparation work. However, in general, the deployable technologies are small mobile units that could be transported as needed. While in operation, the units are parked and operate off electrical generators or existing electrical power sources. Connecting deployable technology to a power supply may present increased electrocution risk during the process of connecting power. If the power source were an electrical generator, then there would also likely be a need to manage fuel onsite. These activities could result in less than significant impacts to human health and safety. It is anticipated that potential health impacts associated with human exposure to environmental hazardous materials in air, water, or soil, the risk of road traffic, workplace accidents and injuries, noise exposure, and risk of infectious disease transmission would be less than significant due to the small-scale of likely FirstNet activities that would be temporary and of short duration. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

As explained above, operation activities would consist of implementation/running of the deployable technology and routine maintenance and inspections. As with the Preferred Alternative, it is anticipated that there would be no impacts to human health and safety associated with routine inspections of the Preferred Alternative. Use of PPE or other mitigation measures may be necessary to adequately protect workers. If usage of heavy equipment is part of routine maintenance, the potential for impacts to human health and safety would also increase. These impacts would be less than significant because of the small-scale of likely FirstNet activities; activities associated would routine maintenance, inspection, and deployment of deployable technologies would be temporary and often of limited duration. Chapter 9, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

No Action Alternative

Under the No Action Alternative, the NPSBN would not be deployed; therefore, there would be no associated construction or installation of wired, wireless, deployable infrastructure or satellites and other technologies. As a result, there would be no impacts to human health and safety as a result of construction and operation of the Proposed Action. Environmental conditions would therefore be the same as those described in Section 6.1.15, Human Health and Safety.

NV APPENDIX A – BIOLOGICAL RESOURCES

Table A-1: Key Habitat Communities in Nevada

Vegetative Community Type	USEPA Ecoregion(s)	Description	Distribution
Intermountain cold desert shrub	Central Basin and Range, Mojave Basin and Range, Northern Basin and Range	Characterized by an annual precipitation of less than 10 inches per year, temperature ranges between extremes of -20 °F and 110 °F, and located at the valley bottoms. Species typical of this community include salt tolerant shrubs of the goosefoot family (Chenopodiacea), pickleweed, qualbrush, spiny hopsage, bud sagebrush, and Indian ricegrass.	Most extensive habitat type in Nevada. Distribution generally follows the valley bottoms that occur within the Great Basin geographic region.
Mohave warm desert and mixed desert shrub	Mojave Basin and Range and Arizona/New Mexico Plateau	Includes typical creosote bush plant community, Joshua tree forest, and tall and short blackbush communities.	Found in a variety of elevations in the southernmost section of the state.
Sagebrush	Central Basin and Range, Northern Basin and Range	Most common in valleys and mountain ranges between 4,500 and 10,000 feet. Approximately 27 recognized species and distinct subspecies of sagebrush can be found in Nevada. Dominant species include basin big sagebrush, mountain big sagebrush, Wyoming big sagebrush, low sagebrush, and black sagebrush. Co-dominant plant species include bitterbrush, snowberry, rabbitbrush, snakeweed, white sage, spiny hopsage, bluebunch wheatgrass, bluegrass, needle and thread, Idaho fescue, Indian ricegrass, Great Basin wildrye, Indian paintbrush, lupine, buckwheat, globemallow, and penstemon. Trees most often associated with the type include Utah juniper, western juniper, and pinyon pine.	Widespread through most of the state.
Lower Montaine woodlands and chaparral	Sierra Nevada, Central Basin and Range, Mojave Basin and Range, Arizona/New Mexico Plateau, Northern Basin and Range	This community is found 5,000-8,000 feet in elevation and characterized by pinyon pine and juniper species mixed with shrub species, such as mountain mahogany, sagebrush, black sagebrush, and bitterbrush.	Limited to higher elevations in scattered locations across the state.
Intermountain coniferous forests and woodlands	Central Basin and Range and Mojave Basin and Range	Diverse forested communities. Composition and structure of overstory for this community type is dependent upon the temperature and moisture relationships, and the successional status of the conifer community. White fir dominates at higher, colder locations, while Douglas fir co-dominates intermediate zones in a few eastern mountain ranges.	Isolated in few scattered locations.

Vegetative Community Type	USEPA Ecoregion(s)	Description	Distribution
Sierra Coniferous Forests and Woodlands	Sierra Nevada	This community is comprised of a diverse assemblage of ecological systems starting at the Sierra Nevada foothills and up to the ridges and rocky slopes at timberline. Common species include white fir, Jeffrey pine, incense cedar, ponderosa pine, and sugar pine.	Limited to the Sierra Nevada ecoregion.
Grasslands and meadows	Sierra Nevada, Central Basin and Range, Northern Basin and Range	Grass communities that can vary greatly in species composition, climate, and elevation depending on location. This community is distinguished from wet meadow types by occurring on xeric sites or drying out a portion of the year.	Widely throughout the state.
Aspen woodland	Central Basin and Range, Northern Basin and Range	Within Nevada, this community occupies elevations between 6,000 and 8,000 feet. Climatic conditions vary greatly over the range, but typically receive at least 38 centimeters of precipitation per year.	Widely distributed but limited to upper elevation riparian zones and high elevation saturated soils.
Alpine and Tundra	Sierra Nevada, Central Basin and Range, Northern Basin and Range	Composed of barren and sparsely vegetated substrates that are exposed to desiccating winds, rocky and sometimes unstable substrates. Plant growth is limited by a short growing season. Cryptogrammic crusts are a common feature in this community.	Found at elevations above 10,600 feet.
Intermountain rivers and streams	Central Basin and Range, Northern Basin and Range	Riparian habitats are associated with this community and vary greatly depending on location, elevation, and climate. Aquatic systems in Nevada’s landscape are scarce, naturally disconnected and fragmented. Individual lotic (moving water habitat) systems in this community are critically important for aquatic species because of the unique species and species assemblages that they support.	Widespread throughout the state.
Warm desert riparian	Mojave Basin and Range, Arizona/New Mexico Plateau	Includes tributaries and drainages of the Colorado river. Common woody vegetation in this community includes Fremont cottonwood, Goodding willow, velvet ash, honey, and screwbean mesquite.	Limited to discrete locations within the southern tip of the state.
Springs and springbrooks	Sierra Nevada, Central Basin and Range, Mojave Basin and Range, Arizona/New Mexico Plateau, Northern Basin and Range	Cold, warm, and hot springs all are found in Nevada and over 4,000 springs have been mapped so far within the state. Springs provide crucial habitat to a significant percentage of Nevada’s federally listed and state protected aquatic species.	Widespread throughout the state.

Vegetative Community Type	USEPA Ecoregion(s)	Description	Distribution
Mesquite bosques and desert washes	Mojave Basin and Range,	This community type is found in areas with deep soils and shallow water tables. The characteristic plant species in this habitat type are honey mesquite and catclaw.	Limited to southeast portion of the state.
Marshes	Sierra Nevada and Central Basin and Range	Dependent on moist and saturated conditions. Plant communities vary depending on moisture content and salinity levels.	Discrete locations.
Lakes and reservoirs	Sierra Nevada, Central Basin and Range, Mojave Basin and Range, , Northern Basin and Range	Open water areas of the state that vary in size, elevation, and plant and species communities.	Few scattered communities widely distributed.
Desert playas and ephemeral pools	Central Basin and Range, Mojave Basin and Range, , Northern Basin and Range	Composed mostly of barren or sparsely vegetated playas. When playas receive enough water, they produce a lush growth of emergent and submergent vegetation, and also prodigious volumes of aquatic invertebrates attracting a myriad of waterfowl, shorebirds, and small water birds.	Widely distributed scattered communities.
Sand dunes and badlands	Central Basin and Range and Mojave Basin and Range	Community includes relict bedrock outcrops, weathered soil patches, and aeolian deposits. Sand dune habitats occur between 1050 and 6500 feet. Vegetation commonly associated with this habitat type include desert sand verbena, big greasewood, dale, ricegrass, fourwing saltbush, and four-part horse brush.	Widely but limited.
Cliffs and Canyons	Central Basin and Range, Mojave Basin and Range, Arizona/New Mexico Plateau, Northern Basin and Range	Communities are barren or sparsely vegetated that offer habitat features important to priority species such as raptors.	Widely distributed.
Caves and mines	Sierra Nevada, Central Basin and Range, Mojave Basin and Range, Arizona/New Mexico Plateau, Northern Basin and Range	Found throughout Nevada but are considered the rarest of wildlife habitat types. Terrestrial and aquatic habitats are present in caves and the habitat community provides roosting sites for several species of bats and birds including priority species.	Widely distributed.

Vegetative Community Type	USEPA Ecoregion(s)	Description	Distribution
Developed landscapes	Sierra Nevada, Central Basin and Range, and Mojave Basin and Range	This community consists of suburban development including residential lots, school grounds, athletic fields, golf courses, and parks. These landscaped areas offer unique features for wildlife not otherwise found in this arid climate, such as shade trees, covered porches or garages, lawn irrigation, pools, ornamental shrubs and rock walls, and flower gardens.	Widely distributed.
Agricultural Lands	Sierra Nevada, Central Basin and Range, Mojave Basin and Range, Arizona/New Mexico Plateau, Northern Basin and Range	This community type can be found from 600 feet above sea level (ASL) to over 7,500 feet elevation. Precipitation ranges from less than seven centimeters in the south to close to 38 centimeters at higher elevations in the north, with extreme weather variation throughout the range. Most agricultural crops are grown in valley bottoms and on alluvial deposits and include hay, alfalfa or grass, as the primary harvested crop (i.e., 76% of Nevada's agricultural acreage), while wheat, barley, potatoes, onions, and garlic are also grown in much lesser amount.	Widely distributed.
Barren landscapes	Central Basin and Range, Mojave Basin and Range, and Northern Basin and Range	Barren landscapes consist of lands with less than 15% land cover including bedrock, desert pavement, scarps, tulus, slides, glacial debris, strip mines, gravel pits, etc.	Widely distributed throughout the state.

% = percent, in. = inches, ft. = feet

Sources: (NDOW, 2013a) (USEPA, 2015b) (MT.gov, 2016)

ACRONYMS

Acronym	Definition
AARC	Average Annual Rate of Change
ACHP	Advisory Council on Historic Preservation
ACS	American Community Survey
AFB	Air Force Base
AGL	Above Ground Level
AIM	Aeronautical Information Manual
AIP	Agreement in Principle
AIS	Aquatic Invasive Species
AML	Abandoned Mine Lands
APE	Area of Potential Effect
AQCR	Air Quality Control Region
AQMD	Air Quality Management Division
AQR	Air Quality Regulations
ARPA	Archaeological Resources Protection Act
ASL	Above Sea Level
ASPM	Aviation System Performance Metrics
ATC	Air Traffic Control
ATO	Air Traffic Organization
AZ	Arizona
BAPC	Bureau of Air Pollution Control
BAQP	Bureau of Air Quality Planning
BGEPA	Bald and Golden Eagle Protection Act
BLM	Bureau of Land Management
BLS	Bureau of Labor Statistics
BNSF	Burlington Northern and Santa Fe Railway
CA	California
CAA	Clean Air Act
CDC	Centers for Disease Control and Prevention
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CGP	Construction General Permit
CH_4	Methane
CIMC	Cleanups in My Community
CIO	Chief Information Officer
CO	Carbon Monoxide
CO_2	Carbon Dioxide
COLT	Cell On Light Truck
COW	Cell On Wheels
CRS	Community Rating System
CWA	Clean Water Act
DAQ	Department of Air Quality
DoD	Department of Defense
DOE	Department of Energy
DPBH	Division of Public and Behavioral Health
DPS	Department of Public Safety
DPS	Distinct Population Segment
EDACS	Enhanced Digital Access System
EFH	Essential Fish Habitat
EIA	Energy Information Agency
EMS	Emergency Medical Services
EPCRA	Emergency Planning and Community Right to Know Act

Acronym	Definition
FAA	Federal Aviation Administration
FCC	Federal Communications Commission
FEMA	Federal Emergency Management Agency
FGDC	Federal Geographic Data Committee
FHWA	Federal Highway Administration
FLM	Federal Land Manager
FLPMA	Federal Land Policy and Management Act of 1976
FRA	Federal Railroad Administration
FSDO	Flight Standards District Offices
FSS	Flight Service Station
FTA	Federal Transit Administration
GAP	Gap Analysis Program
GHG	Greenhouse Gas
GPO	Government Printing Office
HAP	Hazardous Air Pollutant
HASP	Health and Safety Plans
HHRA	Human Health Risk Assessment
IFC	International Finance Corporation
IFR	Instrument Flight Rules
IPCC	Intergovernmental Panel On Climate Change
IRS	Internal Revenue Service
LAS	McCarran International Airport
LBS	Locations-Based Services
LCCS	Land Cover Classification System
LMR	Land Mobile Radio
LRR	Land Resource Regions
LTBMU	Lake Tahoe Basin Management Unit
LTE	Long Term Evolution
MACT	Maximum Achievable Control Technology
MBTA	Migratory Bird Treaty Act
MHI	Median Household Income
MHz	Megahertz
MLRA	Major Land Resource Areas
MMPA	Marine Mammal Protection Act
MMT	Million Metric Tons
MOA	Military Operations Areas
MPO	Metropolitan Planning Organization
MSFCMA	Magnuson-Stevens Fisheries Conservation and Management Act
MSL	Mean Sea Level
MSWLF	Municipal Solid Waste Landfill
MYA	Million Years Ago
N_2O	Nitrous Oxide
NAAQS	National Ambient Air Quality Standards
NAC	Nevada Administrative Code
NAGPRA	Native American Graves Protection and Repatriation Act
NAICS	North American Industry Classification System
NAS	National Airspace System
NASA	National Aeronautics and Space Administration
NASAO	National Association of State Aviation Officials
NBRC	Nevada Birds Records Committee
NCCAC	Nevada Climate Change Advisory Committee
NCED	National Conservation Easement Database

Acronym	Definition
NCORE	Nevada Core Systems Network
NCSC	Nevada Communications Steering Committee
NCSL	National Conference of State Legislatures
NDBI	Nevada Department of Business and Industry
NDEM	Nevada Department of Emergency Management
NDEP	Nevada Department of Environmental Protection
NDOW	Nevada Department of Wildlife
NDWP	Nevada Division of Water Planning
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
NevadaDOT	Nevada Department of Transportation
NFIP	National Flood Insurance Program
NHA	National Heritage Areas
NHL	National Historic Landmarks
NHPA	National Historic Preservation Act
NHT	National Historic Trail
NIH	National Institutes of Health
NIST	National Institute of Standards and Technology
NM	Nautical Miles
NNACC	Northern Nevada Area Communications Consortium
NNHP	Nevada Natural Heritage Program
NNL	National Natural Landmarks
NOTAM	Notices To Airmen
NO_X	Oxides of Nitrogen
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NPS	National Park Service
NPSBN	National Public Safety Broadband Network
NRC	National Response Center
NRCS	Natural Resources Conservation Service
NRS	Nevada Revised Statutes
NRHP	National Register of Historic Places
NSA	National Security Areas
NSPS	New Source Performance Standards
NSRS	Nevada Shared Radio System
NTIA	National Telecommunications and Information Administration
NTFI	National Task Force On Interoperability
NV	Nevada
NVDHHS	Nevada Department of Health and Human Services
NVDPS	Nevada Department of Public Safety
NVOSHA	Nevada Occupational Safety and Health Administration
NWEA	Nevada Water Environment Association, Inc.
NWI	National Wetlands Inventory
NWS	National Weather Service
NWR	National Wildlife Refuge
OE/AAA	Obstruction Evaluation and Airport Airspace Analysis
OHV	Off Highway Vehicle
OSHA	Occupational Safety and Health Administration
OTR	Ozone Transport Region
PAB	Palustrine Aquatic Wetlands
PEIS	Programmatic Environmental Impact Statement
PEM	Palustrine Emergent Wetlands

Acronym	Definition
PGA	Peak Ground Acceleration
POP	Points of Presence
PPE	Personal Protective Equipment
PSAP	Public Safety Answering Points
PSCR	Public Safety Communications Research
PSD	Prevention of Significant Deterioration
PUB	Palustrine Unconsolidated Bottom
PUCN	Public Utilities Commission of Nevada
RCRA	Resource Conservation and Recovery Act
RF	Radio Frequency
RNO	Reno/Tahoe International Airport
SAA	Sense and Avoid
SAD	Surface Area Disturbance
SAIPE	Small Area Income and Poverty Estimates
SASP	State Aviation System Plan
SCEC	State Climate Extremes Committee
SCIP	Statewide Communications Interoperability Plan
SDS	Safety Data Sheets
SF_6	Sulfur Hexafluoride
SHPO	State Historic Preservation Office
SIP	State Implementation Plan
SNACC	Southern Nevada Communications Council
SO_2	Sulfur Dioxide
SOC	Standard Occupational Classification
SoNNet	State of Nevada Network
SOP	Standard Operating Procedures
SOW	System On Wheels
SO_X	Oxides of Sulfur
SPL	Sound Pressure Level
SUA	Special Use Airspace
SWPPP	Storm Water Pollution Prevention Plan
THPO	Tribal Historic Preservation Office
TMDL	Total Maximum Daily Load
TPY	Tons Per Year
TRI	Toxics Release Inventory
TWA	Time Weighted Average
UA	Unmanned Aircraft
UAS	Unmanned Aircraft Systems
UHF	Ultra High Frequency
UPRR	Union Pacific Railroad
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
VCP	Voluntary Cleanup Program
VFR	Visual Flight Rules
VHF	Very High Frequency
VOC	Volatile Organic Compounds
WAP	Wildlife Action Plan
WCRCS	Washoe County Regional Communications System
WMA	Wildlife Management Areas

Acronym	Definition
WMD	Wetland Management District
WONDER	Wide-Ranging Online Data For Epidemiologic Research
WPC	Water Pollution Control
WQC	Water Quality Certification
WWI	World War I
WWII	World War II

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