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U.S. Department of the Interior

Mount Rushmore National Memorial
South Dakota



Mount Rushmore National Memorial Independence Day Holiday Fireworks Event Environmental Assessment



February 2020



MOUNT RUSHMORE NATIONAL MEMORIAL INDEPENDENCE DAY HOLIDAY FIREWORKS EVENT

Environmental Assessment

February 2020

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Acronyms and Abbreviations

ACHP	Advisory Council on Historic Preservation
APE	Area of Potential Effect
BMP	Best Management Practice
DO	Director's Order
EA	Environmental Assessment
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FONSI	Finding of No Significant Impact
Memorial	Mount Rushmore National Memorial
MPB	mountain pine beetle
MOA	Memorandum of Agreement
NEPA	National Environmental Policy Act
NFPA	National Fire Protection Association
NHPA	National Historic Preservation Act
NPS	National Park Service
NRCS	Natural Resources Conservation Service
PA	Programmatic Agreement
PEPC	Planning, Environment, and Public Comment
sculpture	The granite statues of Washington, Jefferson, Lincoln, and Roosevelt
SHPO	State Historic Preservation Office
USFS	United States Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WFDSS	Wildland Fire Decision Support System

Mount Rushmore National Memorial Independence Day Holiday Fireworks Event Environmental Assessment

Chapter 1. Introduction

Mount Rushmore National Memorial (Memorial) hosted annual Independence Day holiday fireworks displays from 1998 to 2009, except for 2002 when the displays were cancelled due to excessively dry conditions. These displays were popular events, drawing thousands of visitors to the Memorial and commanding wide television viewership.

On May 6, 2019, the Secretary of the Interior signed a Memorandum of Agreement (MOA) with South Dakota Governor Kristi Noem, which states that “the State of South Dakota and the Department of the Interior have committed to an agreement to exercise their full authorities under State and Federal law to work to return fireworks to the Memorial in a safe and responsible manner on July 3, July 4, or July 5, beginning in the year 2020.” (Appendix B). In accordance with National Park Service (NPS) regulations, such an event is evaluated under the Special Use Permit process.

This Environmental Assessment (EA) assesses the impacts of a proposed fireworks event at the Memorial (project area) and evaluates two alternatives. Under Alternative 1 (the preferred alternative), the Memorial would permit and host an Independence Day celebration, including a fireworks display and other performances, on the evening of July 3, 2020, and could permit similar events in subsequent years.¹ Under Alternative 2 (the no action alternative), a fireworks event would not be permitted, and activities similar to those the Memorial hosted from 2010 to 2018 would occur again in 2020.

The 1,278-acre Memorial is surrounded by the Black Hills National Forest and is northeast of the Black Elk Wilderness and Norbeck Wildlife Preserve (Figure 1). Nearby communities include Keystone (2 miles northeast of the Memorial) and Hill City (12 miles northwest of the Memorial), South Dakota. The Memorial includes a variety of visitor and administrative facilities including visitor parking, information and visitor centers, an amphitheater, walking trails, historic structures and administrative buildings (Figure 2).

¹ This EA will be valid for special use permits for the actions approved in the decision document, for as long as the conditions described and subsequent analysis are valid (NPS 2015).

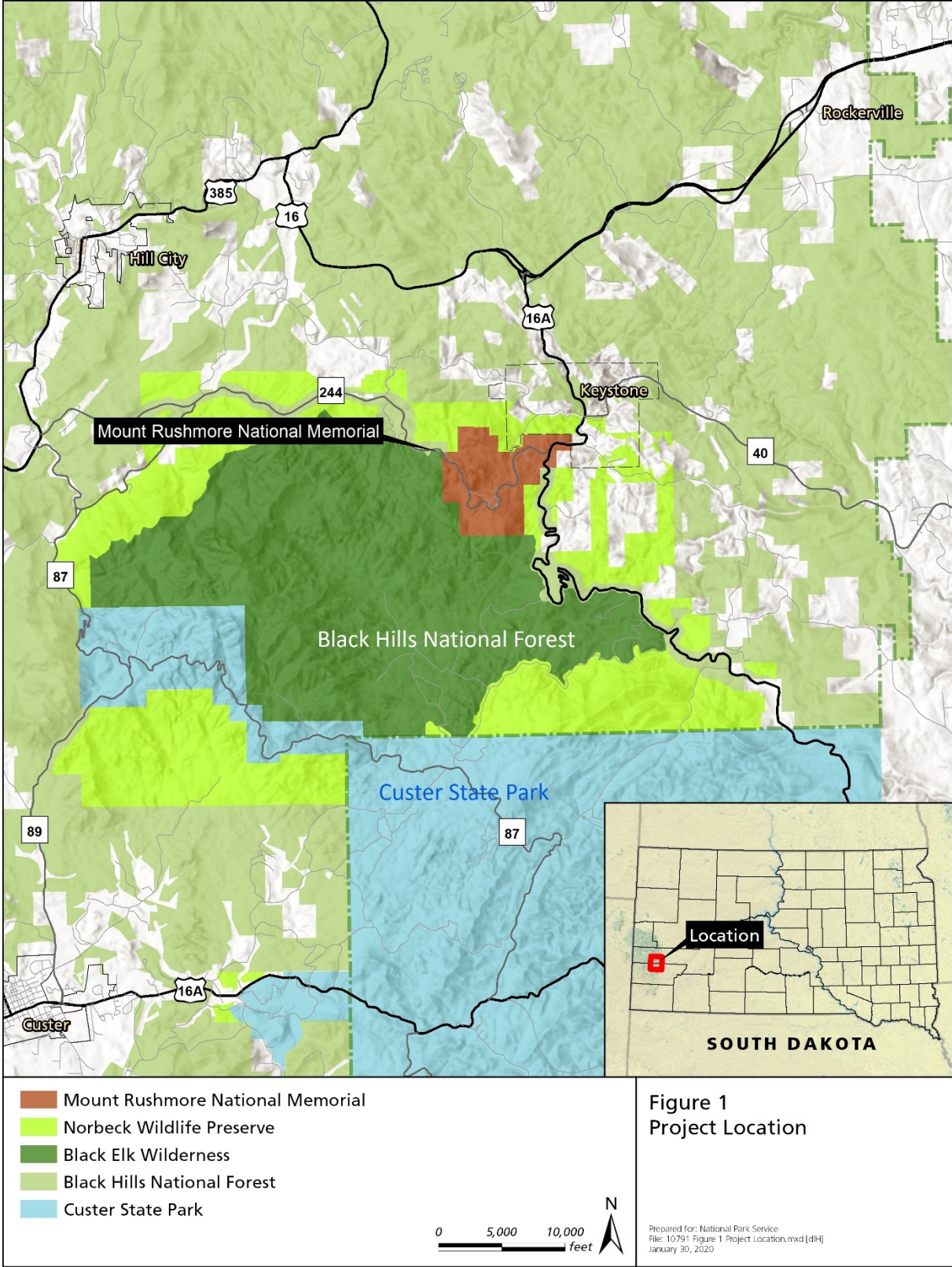


Figure 1. Project Location

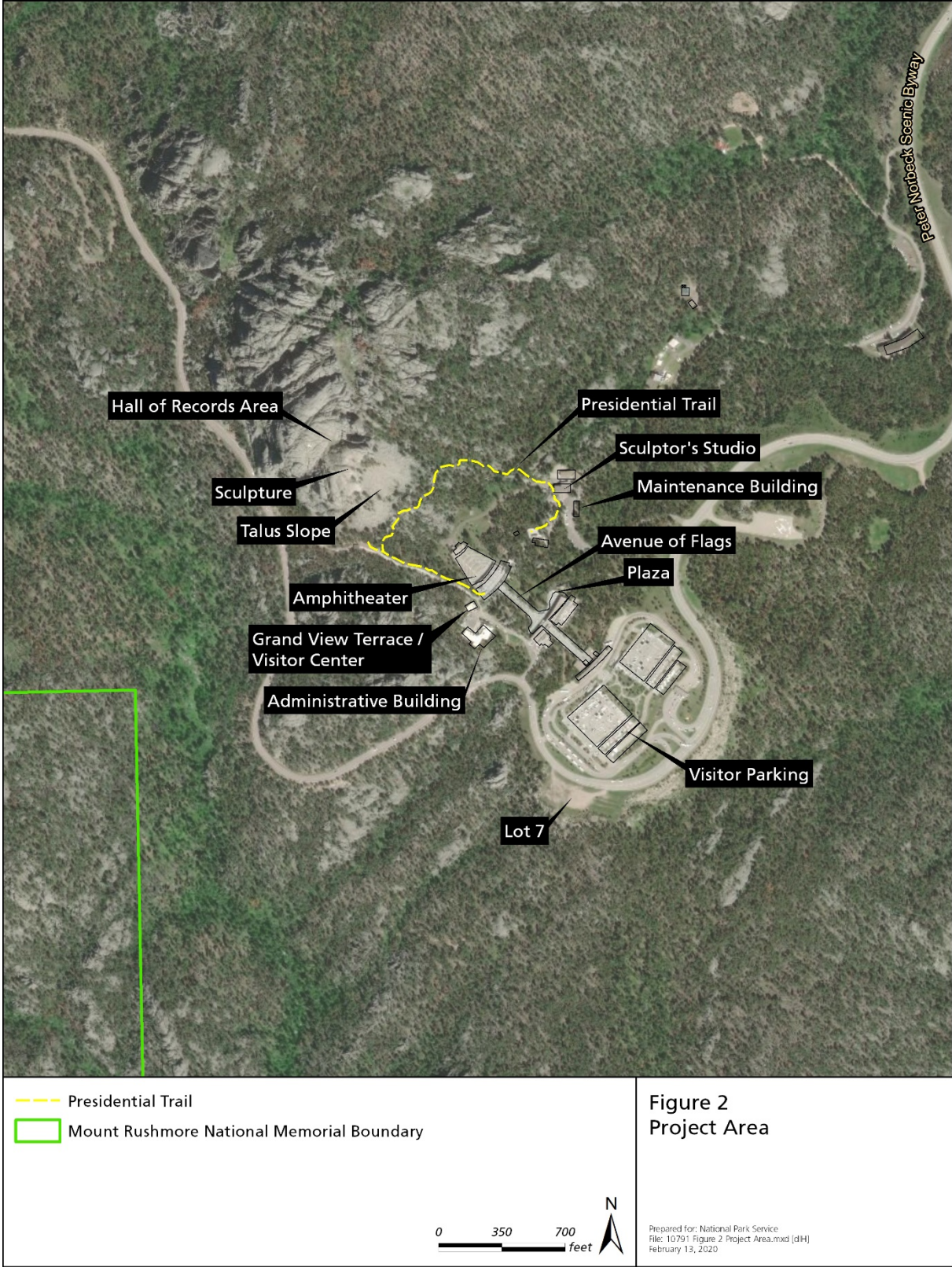


Figure 2. Project Area

1.1 Purpose and Need for Action

The need for the action is to allow for a fireworks event at the Memorial, by issuance of a special use permit by the NPS, for the purpose of celebrating the spirit of Independence Day, and to provide for the enjoyment by the public in a manner that ensures safety and resource protection.

1.2 Issues Analyzed in this Environmental Assessment

Issues related to wildfire potential, environmental contaminants, and cultural resources are analyzed in detail in this EA. Issues associated with vegetation and soils are covered under the wildfire issue, and issues associated with fish and wildlife are covered under both the wildfire and environmental contaminants issue.

1.3 Issues Dismissed from Detailed Analysis

Issues related to socioeconomics, visitor experience, safety and event operations, percussive impacts, night skies, wilderness character, threatened and endangered species, air quality, and vegetation were dismissed from detailed analysis. Appendix A contains a rationale for the dismissal for each topic.

Chapter 2. Alternatives

2.1 Alternative 1: Issue a Special Use Permit to Host an Independence Day Fireworks Event

Alternative 1 is the NPS Preferred Alternative. Under Alternative 1, the Memorial would permit and host an Independence Day celebration, including a fireworks display and other entertainment, on the evening of July 3, 2020. Similar events could be permitted in subsequent years by the Memorial, assuming conditions and impacts remain as described in this document.

The event would include 15 to 30 minutes of fireworks and proximate pyrotechnics displays that would illuminate the sculpture's carved faces of Washington, Jefferson, Roosevelt, and Lincoln. Other types of performances would occur before the fireworks, such as music, speeches, and reenactments. A military flyover, depending on aircraft availability, may also occur. The event may be filmed for viewing audiences and distributed through live and/or delayed broadcasts.

Proposed logistics for the event include:

- The primary seating area for the event would be the amphitheater, which can accommodate about 1,800 visitors (Figure 2). Some additional seating could be used on the Grand View Terrace, at the Sculptor's Studio, or in other viewing plazas in the primary developed area of the Memorial. Lot 7, located across SD Highway 244 to the south of the parking garage, could also be used for seating. Standing room elsewhere on the Memorial grounds may be needed for larger event sizes.
- Viewing screens could be placed in some locations to provide for greater viewing opportunities, as direct views of the amphitheater stage, and the proximate fireworks would be limited in some seating areas.
- Portable bathrooms could be placed in some locations to supplement the capacity of the existing restrooms and wastewater system.
- A ticketing system could be used for the amphitheater seating and/or other areas in the interior of the Memorial, while other areas would be either ticketed or accessible on a first-come, first-served basis.
- The Memorial's parking garage, which holds about 1,000 vehicles, could be used for the event. If the parking capacity in the Memorial garage is exceeded, roadside parking and/or shuttle system options could be used to increase visitor capacity.

2.1.1 Launch Sites and Fireworks Types

The NPS hired a contractor to conduct a professional evaluation of potential discharge sites of aerial fireworks and proximate pyrotechnics within the Memorial (Weeth 2019). Discharge sites were evaluated for compliance with the National Fire Protection Association (NFPA) codes as well as best practices in the design and discharge of fireworks.

Based on the Weeth report, and other resource protection and logistical factors, NPS proposes to allow the discharge of certain sizes and types of fireworks, including proximate pyrotechnics, at three areas: the amphitheater area, the talus slope and Presidential Trail area, and the Hall of Records area (Figure 3). The use of these discharge areas is subject to the safety limitations identified in the report, including minimum separation distances from amphitheater seating (Figure 3) and bulk fuel storage, and subject to display design by a licensed fireworks operator and operational planning by the NPS and partners.

Fireworks are typically considered those used in traditional aerial fireworks displays.

Pyrotechnics are typically considered those used in proximate pyrotechnic performances such as in stadium and theater settings. Pyrotechnics generally produce significantly less smoke and debris than fireworks.

Ground level fireworks include illuminations, “Niagara Falls,” line rockets, and similar effects.

Low level aerial fireworks include pyrotechnic shells, comets, fountains, and mines that are 2 inches or less.

Medium level aerial fireworks include aerial shells, comets, mines, and Roman candles that are larger than 2 inches.

High level aerial fireworks include aerial shells 8 inches and larger.

2.1.1.1 Amphitheater Area

Potential discharge positions in the amphitheater area include the stage and backstage, and areas off the road behind the amphitheater. The stage and backstage area would only be suitable for proximate pyrotechnics, and the amphitheater road position would be suitable for ground level fireworks and pyrotechnics 2 inches or less. Larger fireworks may be possible, at the discretion of the licensed fireworks operator, subject to all applicable fireworks and safety regulations. Temporary free-standing racks may be required in these locations. Protective blankets or similar fire-retardant material at the launch location may also be required to prevent scarring or burning during ignition. The amphitheater access road would remain accessible for emergency egress.

2.1.1.2 Talus Slope and Presidential Trail

A number of sites between the amphitheater area and the base of the sculpture, including the talus slope and openings in the tree canopy, may be suitable for fireworks discharge. The Presidential Trail area is approximately 400 to 500 feet from the amphitheater and 600 feet long with openings at various points in the tree canopy. The talus slope is across the base of the mountain and roughly 500 feet wide and long, and 500 feet from the amphitheater. Other tree canopy openings between the amphitheater and talus slope may also be used. Potential launch sites would be suitable for ground level fireworks and some low level pyrotechnics 2 inches or less. Larger fireworks may be possible, at the discretion of the licensed fireworks operator, subject to all applicable fireworks and safety regulations. Temporary free-standing racks may be required in these locations. Protective blankets or similar fire-retardant material may also be required to prevent scarring or burning during ignition.

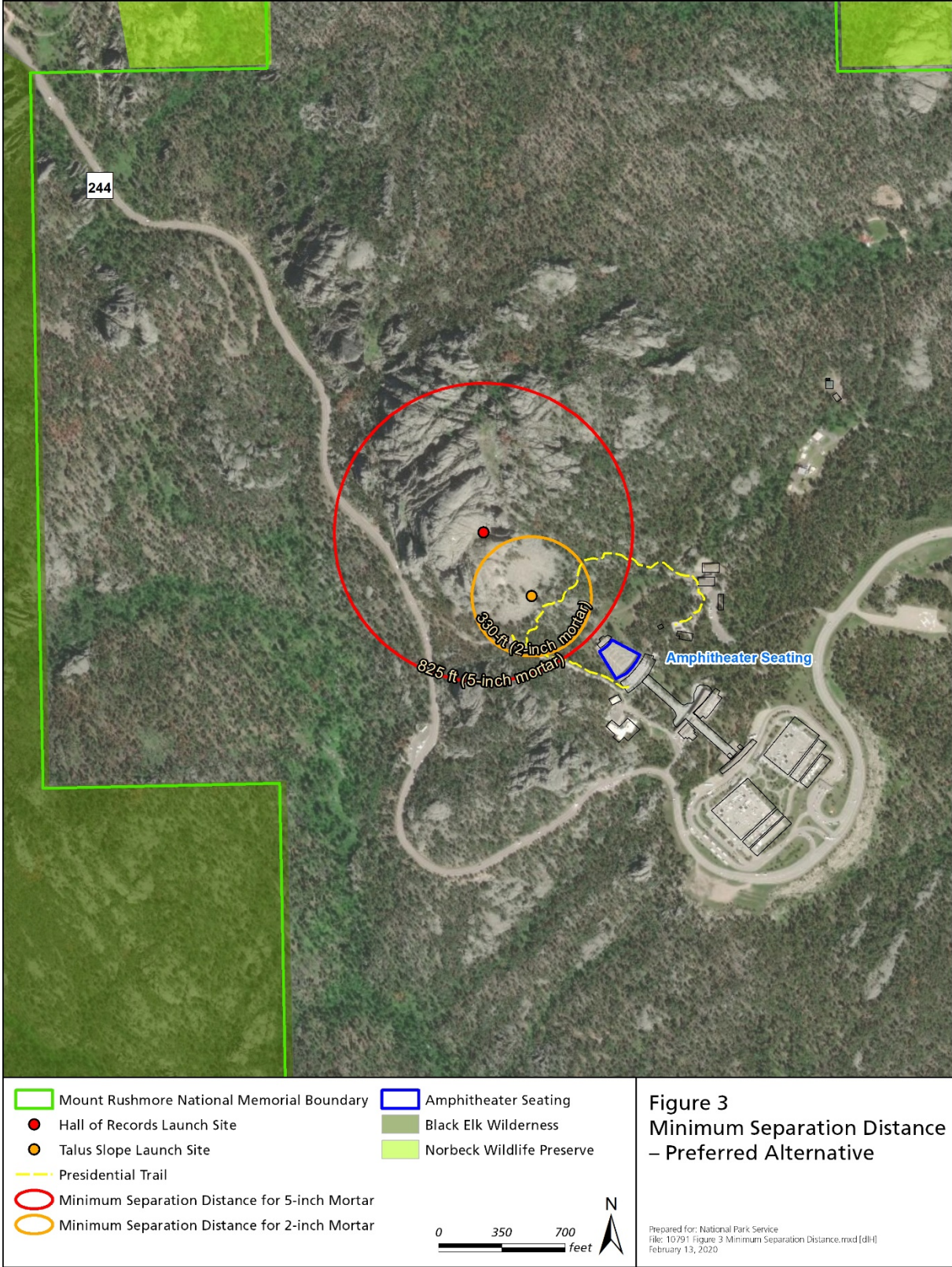


Figure 3. Minimum Separation Distances

2.1.1.3 Hall of Records Area

Portions of this area were found to be feasible for the launch of aerial fireworks 2 to 5 inches subject to safety and resource considerations detailed in the Weeth report (2019). Larger fireworks may be possible, at the discretion of the licensed fireworks operator, subject to all applicable fireworks and safety regulations.

A platform or temporary rack system would likely be required for fireworks at this location. Platforms or racks would be temporary and free-standing; no bolting to the rock would be allowed. Protective blankets or similar fire-retardant material may also be required to prevent scarring or burning during ignition.

The logistics of transporting materials to and from this site are considerable; fireworks would need to be hauled to the site by helicopter or ropes teams. Fireworks contractor staff handling fireworks material would be required to have the appropriate certifications for fireworks handling.

2.1.2 Setup, Spotting, Cleanup, and Monitoring

The state and NPS would work with the fireworks contractor and staff to develop a plan for event staging, ignition, and demobilization. All launch locations would be closed to public access for a predetermined time before and after the event, as fireworks are staged and cleaned up. The fireworks contractor would need to deliver and remove the fireworks and other materials using vehicles, packs, and other means. At the Hall of Records area, this may include the use of a helicopter.

The fireworks contractor would assign staff to monitor the event for any unexploded shells, spot fires, and other concerns. The NPS and fire officials would establish a quick response wildland fire team to respond to any unplanned ignitions.

2.1.3 Monitoring of Environmental Contaminants

The NPS is working with the United States Geological Survey (USGS) to conduct water quality and soil monitoring at the Memorial, which would be increased under the preferred alternative. Baseline data would be collected in spring or early summer 2020, prior to the fireworks event, and monitoring would continue after the event(s) on a schedule determined by USGS and NPS staff. This monitoring program would evaluate the event's impacts on levels of potassium perchlorate, and possibly other chemicals or metals in soils and surface water and groundwater, which are typically present in fireworks (see Section 3.4.2, Impacts of Environmental Contaminants in Alternative 1). This monitoring would supplement groundwater and drinking water testing that currently occurs at the Memorial. Data collected through monitoring would be used to aid in decision making for future fireworks events at the Memorial. If monitoring shows that conditions have changed meaningfully from information presented in this EA, additional analysis may be necessary to evaluate future events.

2.1.4 Stipulations and Mitigations

The event would be conditioned on appropriate weather and wildland fire conditions prior to the event. The NPS and partners would develop an incident management team for this event, and create a Go/No-Go checklist to ensure conditions in and surrounding the Memorial are acceptable for the event to proceed.

Other stipulations and mitigations for the event would include required certifications for all fireworks contractors and staff; requirements on the size and type of fireworks and the duration of the fireworks event (and corresponding number of mortars launched); requirements for the fireworks contractor to disclose the composition of the fireworks; required cleanup activities after the event; fire suppression activities and fuels treatment as outlined in the Prescribed Burn Plan (NPS 2019); and protecting known sensitive cultural resources (see Section 2.1.1 for more detail on the event). Additional conditions and mitigations may be required through the NPS permit issued for the event.

2.1.5 Visitor and Traffic Management

Prior to the fireworks event, a plan would be developed to address event traffic control, visitor management, and emergency response. The NPS and South Dakota Highway Patrol, along with other emergency and security partners, would establish a perimeter around the Memorial facilities for event security. Security screening and safety measures would be developed with partners, in consideration of the number of visitors and conditions on the day of the event. The Memorial would likely be closed to normal visitation for all or part of the day for visitor management and security measures.

2.2 Alternative 2 (No Action Alternative)

Under the no action alternative, no fireworks event would be scheduled, and the nonticketed performances and activities the Memorial has hosted from 2010 to 2018 would occur in 2020. These celebrations have included military bands, presidential reenactments, and a lighting ceremony of the sculpture for an amphitheater audience. These events did not include a fireworks display. (No event was held in 2019 due to a construction project which closed the amphitheater.) The Memorial would be open to visitors during regular hours.

2.3 Alternatives Considered but Eliminated from Detailed Study

2.3.1 Hosting the Event on July 4th

The MOA between the State and the Department of the Interior specifies that fireworks will occur on July 3rd, 4th, or 5th (Appendix B). In discussion with South Dakota officials, neighboring communities, and local area emergency managers, it was determined that July 3, 2020 is the preferred date and that no “rain date” would be scheduled. It was determined that prior commitments precluded assistance with security and emergency response preparation on July 4th, making this day infeasible for a major event. July 3rd was agreed on as feasible to provide the necessary support for the event. Future events would most likely occur on July 3rd for the same reason.

2.3.2 Alternative Launch Sites

Several other fireworks launch sites were considered as alternatives, evaluated by Weeth (2019), and dismissed from detailed analysis for the reasons listed below.

Indian Camp – This site is an important cultural resource site, is in a poor location for fireworks viewing relative to the amphitheater audience, is difficult to access for event preparation, and would require a large aerial fireworks display to be visible to an amphitheater audience, with a large minimum separation distance. The minimum separation distance is the minimum distance recommended by the NFPA between the

location of the fireworks launch site and the proposed main spectator viewing area and flammable, explosive, toxic, or hazardous materials storage areas (Weeth 2019) (Figure 4). Note that Indian Camp is not illustrated on Figure 4 due to cultural sensitivity.

Middle Marker Road/Middle Marker Trail – These sites are located behind the sculpture, as viewed from the amphitheater, requiring the use of larger diameter aerial shell fireworks to be seen by an amphitheater audience. Aerial shells approximately 10 inches or larger would be required and shells of this size would have a greater potential for impacts related to environmental contaminants and wildfire risk. The minimum separation distance from shells fired from this location includes forested areas adjacent to and potentially including the Black Elk Wilderness. As stated in the Weeth report (2019) regarding both Middle Marker sites: “Although the minimum separation distances [from the audience] may provide for larger aerial shells, the other factors at this display site, the differences in elevations between this discharge site and the Amphitheater necessitating using larger diameter aerial shells, the mountainous forest with a heavy fuel load, the likely conditions in early July, the challenges with spotting hazardous debris, the limitations on fire prevention and fire protection measures, and the potential for equipment failures and fireworks malfunctions, firing larger aerial shells pose a significant and unacceptable risk.”


Profile Parking Lot – This site is west of the sculpture. For fireworks launched from this location to be visible to an amphitheater audience, approximately 10-inch-diameter aerial shells would be required. Shells of this size would have a greater potential for impacts related to water contaminants and fire risk. The minimum separation distance from shells fired from this location includes forested areas adjacent to and potentially including the Black Elk Wilderness, creating considerable fire risk. As stated in the Weeth report (2019): “It is quite likely that any such attempt to fire large diameter shells at such steep angles would result in the shells bursting on or striking the rock formations, the forest, the carvings, and possibly even into the Amphitheater and surrounding areas with buildings and spectators. Any aerial fireworks 8 inches or larger that burst low or on the ground would likely result in starting a wildland fire in a multitude of locations over many hundreds of feet wide.”

Sculpture – The Weeth report (2019) noted that some types of fireworks could be suspended from the sculpture or edges of the sculpture. Using these sites would require unacceptable risks to contractors’ safety and risk damage to the sculpture, which is the primary cultural resource identified in the Memorial’s enabling legislation. Past experience shows that fireworks ignited in contact with the sculpture can cause visible rock scarring.

2.3.3 Laser Light Show

The Memorial hosted a laser light show in 2002. However, this event was not deemed to be successful because the Memorial is located at the end of the power grid line, resulting in power fluctuations from 98 to 120 volts. Laser lights require consistent power for a vivid display. In addition, the MOA specifies that the NPS and the state of South Dakota will work to return fireworks displays to the Memorial. A laser light show could become part of the event in the future, but was dismissed because it is infeasible due to power limitations and fails to meet the need for taking action.



<p>● Potential Fireworks Launch Site</p> <p>0 175 350 feet</p> 	<p>Figure 4 Alternative Launch Sites</p> <p>Prepared for: National Park Service File: 10791 Figure 4 Alternative Launch Sites.mxd [dlH] January 30, 2020</p>
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Service Layer Credits:

Figure 4. Alternative Launch Sites

Chapter 3. Affected Environment and Environmental Consequences

3.1 Introduction

This section describes the current conditions of the affected environment and analyzes the potential environmental consequences that would occur as a result of implementing the preferred alternative or no action alternative. The analysis area for this EA differs by resource topic and, in some cases, extends beyond the project area, such as the analysis area for wildfire risk. This is because of the nature of wildfire and the potential for fire to spread once ignited. The analysis area is indicated for each impact topic below. Cumulative impacts also are analyzed for each issue topic below.

As described in the sections below, a fireworks display in 2020 would contribute minimally to wildfire risk, assuming all conditions and mitigations developed by the incident management team are met and followed.

3.2 Cumulative Impact Scenario

Cumulative impacts are defined as “the impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or nonfederal) or person undertakes such other actions” (40 CFR 1508.7). Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time.

The geographic scope of the analysis includes actions in the project area as well as other actions in the Memorial or surrounding lands, including the Black Hills National Forest, where overlapping resource impacts are possible.

3.2.1 Past, Present, and Reasonably Foreseeable Future Actions

The following past, present, and reasonably foreseeable future actions are considered in the cumulative impacts analysis for each issue topic and are based on actions developed during internal scoping.

3.2.1.1 Past and Present Actions

3.2.1.1.1 Previous Fireworks Displays

Previous fireworks displays at the Memorial were held from 1998 through 2001 and 2003 to 2009. No fireworks displays occurred after 2009 due to extreme fire danger from mountain pine beetle (MPB) (*Dendroctonus ponderosae*) kill in the region, as well as fireworks operator safety concerns and visitor experience issues. Previous displays resulted in permanent effects on the sculpture (burn marks on the tops of the sculpture), unexploded ordnance and debris remaining in the forests within and surrounding the Memorial, and various operational challenges for Memorial staff. The effects of past displays on water and soil quality are discussed in Section 3.4, Environmental Contaminants.

3.2.1.1.2 Previous Wildfires in or Near the Memorial

A significant wildfire has not occurred in the area within and surrounding the Memorial in more than a century. Most wildfires have been suppressed, resulting in an abundance of litter and heavy fuels in the surrounding forests (see Section 3.3, Wildfire). Previous fireworks displays resulted in 21 wildfire ignitions, which were quickly suppressed for safety and structural protection purposes.

3.2.1.1.3 Forest Management Actions – Forest Thinning, Prescribed Burns, and MPB Mitigation Measures

Although the Memorial has engaged in mechanized tree thinning, chipping, and removal efforts in response to the MPB outbreak (NPS 2010a), the overall wildfire risk at the Memorial has not changed. The risk of wildfire is dependent on weather, precipitation, wind, ignition sources, and other factors at the time of the fireworks event. Wildfire risk is also dependent on the Memorial's ability to reduce fuel loading prior to the event through prescribed fire, pile burning, or other forest management actions. Dead standing and dead and down pine trees resulting from years of MPB attacks continue to add fuels to the forest floor with resulting increases in fuel loading. Recent wet conditions have not been conducive for prescribed fire; however, there could be an opportunity in spring 2020. Some limited pile burning occurred in 2019 north of the sculpture, and pile burning is planned for winter. The Memorial has conducted fuel removal to protect existing utility lines from a prescribed burn. Similar actions would continue in 2020 as conditions allow, prior to the event.

3.2.1.2 Reasonably Foreseeable Future Actions

3.2.1.2.1 Memorial Fireworks Displays

Although future fireworks displays have not been specifically planned, it is assumed that future fireworks displays (beyond 2020) may occur for the purposes of this analysis, and would be similar in nature to the preferred alternative for this EA.

3.3 Wildfire

3.3.1 Current General Conditions – Wildfire Risk

The analysis area for wildfire risk includes the 1,278-acre Memorial, eastern portions of the 13,426-acre Black Elk Wilderness contiguous to the Memorial, northeast portions of the contiguous 35,000-acre Norbeck Wildlife Preserve, and private lands in the vicinity of Keystone, South Dakota (Figure 1).

For the purposes of the wildfire risk analysis, impacts of wildfire on vegetation, fish and wildlife, soils, and cultural resources are included in this section due to the nature of wildfire and its potential to affect these resources. See also Section 3.4, Environmental Contaminants for an analysis of project impacts on fish and wildlife and Section 3.5, Cultural Resources for an analysis of project impacts on cultural resources.

3.3.1.1 Vegetation

The Memorial is in the Black Hills Plateau ecoregion, which consists of a mixture of warm, dry pine forest and mixed grasslands (Shepperd and Battaglia 2002; Graham et al. 2016). Dominant tree species include ponderosa pine (*Pinus ponderosa*), white spruce (*Picea glauca*), paper birch (*Betula papyrifera*), aspen (*Populus tremuloides*), and bur oak (*Quercus macrocarpa*), which occupy cool, moist areas along the fringes of meadows and open areas. Dominant understory

species include graminoids such as Richardson's sedge (*Carex richardsonii*), Ross's sedge (*C. rossii*), and poverty oatgrass (*Danthonia spicata*), and shrubs such as common juniper (*Juniperus communis*) and kinnikinnick (*Arctostaphylos uva-ursi*) (Ashton et al. 2019).

Exotic plant species occur in low abundance (less than 1 percent cover) at the Memorial. The most common exotic species in the Memorial is Canada thistle (*Cirsium arvense*). Other exotic species include woolly mullein (*Verbascum thapsis*), houndstongue (*Cynoglossum officinale*), and smooth brome (*Bromus inermis*) (Narumalani et al. 2009; Ashton et al. 2019).

Ponderosa pine dominates the forested area and is a fire-adapted species (Arno 2000), evolving to be dependent on frequent low-intensity fires to control seedlings, reduce forest floor debris, and recycle forest nutrients. Historically, fire was the most important ecological process that shaped the composition and structure of plant communities in the Black Hills. These plant communities evolved with frequent wildfire and are often dependent on fire for overall health. The historical fire regime at Mount Rushmore (1529-1893) would be characterized as frequent (fires every 2 to 20 years) low-severity surface fires with occasional patches (less than 100 hectares) of passive crown fire (Brown et al. 2000). The Memorial contains the second largest area of old growth ponderosa pine forest in the Black Hills, covering 66 percent of the Memorial (Symstad and Bynum 2007).

Ponderosa pine is highly flammable and burns with great intensity and severity in the summer season in a typical dry year (2000, 2002, 2007, and 2012). Fire intensity is the energy output from a fire, whereas fire severity is the effect of the fire on the biological system, for example, organic matter loss in the vegetation and substrate, crown scorch, or alteration of soil properties.

3.3.1.2 Fish and Aquatic Invertebrates

Fish species expected to occur in the analysis area that could be impacted by fire include longnose dace (*Rhinichthys cataractae*), white sucker (*Catostomus commersonii*), mountain sucker (*C. platyrhynchus*), common carp (*Cyprinus carpio*), and brook trout (*Salvelinus fontinalis*) (White et al. 2002). Fish surveys in 2002 documented brook trout and longnose dace in Grizzly Bear Creek and brook trout in Beaver Dam Creek in Starling Basin. No fish were found in the small unnamed stream in Lafferty Gulch, although brook trout habitat is present (White et al. 2002). While brook trout individuals could be present in Lafferty Gulch, it is unlikely due to the ephemeral nature of the stream. Lafferty Gulch flows into Battle Creek, which is part of the Middle Cheyenne Spring Creek watershed. This watershed contains seventeen fish species, including some species that are not native to the region (Narumalani et al. 2009).

Aquatic invertebrates found in streams in the Memorial include mayflies (order Ephemeroptera), stoneflies (order Plecoptera), caddisflies (order Trichoptera), dragonflies and damselflies (order Odonata), and true flies (order Diptera) (Rust 2006). Surveys of aquatic invertebrates in the Memorial in 2006 found Grizzly Bear Creek had the highest quality habitat and highest diversity of aquatic invertebrates of the streams in the Memorial, while the small unnamed stream in Lafferty Gulch had the lowest diversity (Rust 2006).

3.3.1.3 Wildlife

A variety of wildlife inhabit the forests and grasslands of the analysis area including ungulates, small mammals, birds, reptiles, amphibians, and invertebrates; these species could be impacted by fire. Common mammal species include mule deer (*Odocoileus hemionus*), least chipmunk (*Tamias minimus*), mountain goat (*Oreamnos americanus*), deer mouse (*Peromyscus maniculatus*), and white-footed mouse (*Peromyscus leucopus*) (Schmidt et al. 2004). Common bird species in the

analysis area include American robin (*Turdus migratorius*), black-capped chickadee (*Parus atricapillus*), chipping sparrow (*Spizella aculeata*), dark-eyed junco (*Junco hyemalis*), mourning dove (*Zenaidura macroura*), and many others. Amphibians found at the Memorial include chorus (*Pseudacris aculeata*) and northern leopard (*Lithobates pipiens*) frogs (Smith et al. 2004). Eleven bat species are present or are likely present in the analysis area including northern long-eared bat (*Myotis septentrionalis*), particularly in Starling Basin where a diverse habitat encourages a wide range of bat species (Licht 2018; Abernethy 2018).

For a discussion of threatened, endangered, and sensitive species, see Section 1.3, Issues Dismissed from Detailed Analysis (Appendix A).

3.3.1.4 Soils

Soils in the analysis area could be impacted by fire. The parent material for soils in the central Black Hills is generally granite or mica schist. Granite is very hard and breaks down slowly through decomposition. Mica schist is a softer metamorphic rock that breaks down more readily and creates well-drained soils. This type of soil is ideal for ponderosa seedlings. In many areas, the bedrock beneath the soil is deeply fractured. Joints and fissures in this rock fill with water that has passed through the soil and are an important source of water for ponderosa pine root systems (NPS 2016).

Major soils in the analysis area are Marshbrook and Cordeston (NPS 2008). Marshbrook soils are subject to soil compaction and rutting from operation of heavy equipment. The very steep side slopes have a high erosion potential when disturbed. Erosion-control measures are needed to reduce erosion and stream sedimentation. Area soils are dominated by decomposing granite. Hydrophobicity likely follows a wildfire in coarse soils. Soil hydrophobicity causes water to collect on the surface rather than be absorbed into the soil, causing more water runoff. Four factors commonly influence the formation of a hydrophobic layer. These include a thick layer of plant litter prior to the fire, high-intensity surface and crown fires, prolonged periods of intense heat, and coarse-textured soils. Very high temperatures are required to produce the gas that penetrates the soil and forms a hydrophobic layer. The gas is forced into the soil by the heat of the fire. Soils that have large pores, such as sandy soils and decomposing granite, are more susceptible to the formation of hydrophobic layers because the soils transmit heat more readily than heavy, textured soils, such as clay. The coarse-textured soils also have larger pores that allow deeper penetration of the gas. The high concentrations of chipped material in the duff and dead and down trees from the MPB epidemic may result in prolonged heating of the soils if fire occurs. This could negatively impact soils and contribute to erosion in the short term (NPS 2008).

On the other hand, decomposing granite and underlying granite are not especially susceptible to chemical or physical changes due to heating from fires on the surface, even hot fires with a long, sustained residence time over a given area of ground.

3.3.1.5 Cultural Resources

For a description of the affected environment for cultural resources, see Section 3.5.1.

3.3.1.6 Wildfire Risk Factors

Wildfire risk throughout the analysis area has greatly increased over the past 100 years as a result of numerous factors. Over the last century, interference with natural fire regimes and aggressive fire suppression in dry forests throughout the western United States, including those in the Memorial, have resulted in substantial changes in forest structure, density, composition, and

function (Arno 2000; Shepperd and Battaglia 2002; Graham et al. 2016). These changes include increased tree density, closed crowns, increased forest floor duff and debris depth, and an increase in heavy fuels on the ground in the form of dead trees and limbs. Fuel loading overall has been measured at up to 30 tons per acre—three times the historical loading for the Memorial—and is a direct contributor to fire size and severity (Narumalani et al. 2009). Forest changes can also occur from fuel treatments such as chipping, limbing, chunking, and pruning.

As a result of fire suppression, many stands have dense thickets of small trees and have experienced insect infestations and disease epidemics. The most recent infestation of MPB began on the north side of the Black Hills near Sturgis, South Dakota in 1996 and ended near the Custer, South Dakota area in 2016. This recent MPB epidemic was exacerbated by a robust pine engraver beetle (*Ips pini*) infestation beginning in 2009 that has affected the area over several years, particularly in younger and denser thickets of trees.

The NPS response to the MPB and pine engraver beetle infestation at the Memorial has been aggressive. Foresters identified infested trees, which were then either cut and chipped in place or piled and burned. The NPS sprayed living trees in developed areas with carbaryl to prevent further tree mortality (NPS 2010a). Chipping treatments used to combat the MPB infestation increased the amount of duff on the forest floor. Smoldering duff, in some places 3 feet deep, can greatly exacerbate the severity of a fire by causing hydrophobic conditions in coarser soils, including decomposed granite, and by depleting organic material and destroying seed sources. Burning also releases nutrients into the forest including nitrogen, potassium, and carbon.

As a result of the MPB infestation, tree mortality in the Memorial, the Black Elk Wilderness, and the Norbeck Wildlife Preserve was severe. This tree mortality greatly increased the fuel loading by restructuring the forests, from live aerial fuels to dead and down fuels. Fuel loading in the analysis area ranges from light to heavy, with 8 to 30 tons per acre throughout (Ashton et al. 2012; Narumalani et al. 2009). Fuel loading is generally three times heavier than historic levels.

Like the Black Elk Wilderness, the Norbeck Wildlife Preserve is predominantly old growth and mature timber with thickets of younger trees in the understory. The terrain in both the Black Elk Wilderness and the Norbeck Wildlife Preserve consists of domed granite structures, broken granite formations, steep gullies and channels, and broken and undulating terrain. In areas where the forest canopy opened in the wake of the tree mortality, new seedlings and shrubs proliferated on the ground and added to the “ladder” fuels effect that provide continuous fire material from the forest floor to the crowns of the trees.

The high fuel loading and potential for ladder fuels in the analysis area increase the risk of a stand-replacing fire, which is defined as a fire that consumes approximately 80 percent or more of the aboveground dominant vegetation (Arno 2000).

A significant wildfire has not occurred in the analysis area in more than a century. The most recent wildfire in the analysis area was the Mount Rushmore 1 Fire in 2006. The largest fires in the Black Hills have included the McVey Fire at 20,000 acres in 1939, the Galena Fire at 18,000 acres in 1988, the Jasper Fire at 80,000 acres in 2000, the Battle Creek Fire at 13,395 acres in 2002, and the Legion Lake Fire at 54,023 acres in 2017. The Battle Creek Fire in particular burned at high intensity and high severity. Pre-fire conditions have not returned 17 years later, although pine seedlings are beginning to occupy burned slopes. Because of the lack of significant wildfires in the analysis area, an escaped wildfire at the Memorial would be expected to profoundly change the vegetative structure of the Memorial’s forests, resulting in stand replacement from radiant heat and long fire resident times around tree roots across much of the area and the loss of many, if

not most, of the mature trees and much of the pine reproduction. While such a fire would not be expected to affect the sculpture, it would certainly affect current visual management profiles by reducing mature pine trees and cleaning out the often overly dense understory. There is high potential for large fires in the central Black Hills in July, but this is especially true in particularly dry years. 1939 was one of the driest years of the 1930s, and 1988 was a substantial fire year throughout the West.

3.3.1.6.1 Current Fire Mitigation Activities

The condition of the regional forest communities and lack of natural or prescribed fires at the Memorial are the greatest contributors to overall wildfire risk. Ecological restoration and fuel reduction programs attempt to reduce tree densities and reintroduce fire to fire-deficit landscapes. It is widely understood that treatments including mechanized tree thinning and prescribed fire can help restore more resilient forest conditions.

Recent efforts at the Memorial include thinning, chipping, and tree removal. These efforts have greatly reduced the potential for passive and active crown fire by increasing crown base heights. The overall risk for wildfires remains high, though it has diminished from peak risk in previous years. Figure 5 illustrates that previous fuel reduction treatments have improved the standing fuel load but have also left heavy fuel loading in the form of chipped material and downed and dead material. (Not shown on Figure 5 are additional burns in February 2020 that have reduced chipped, dead, and downed material.)

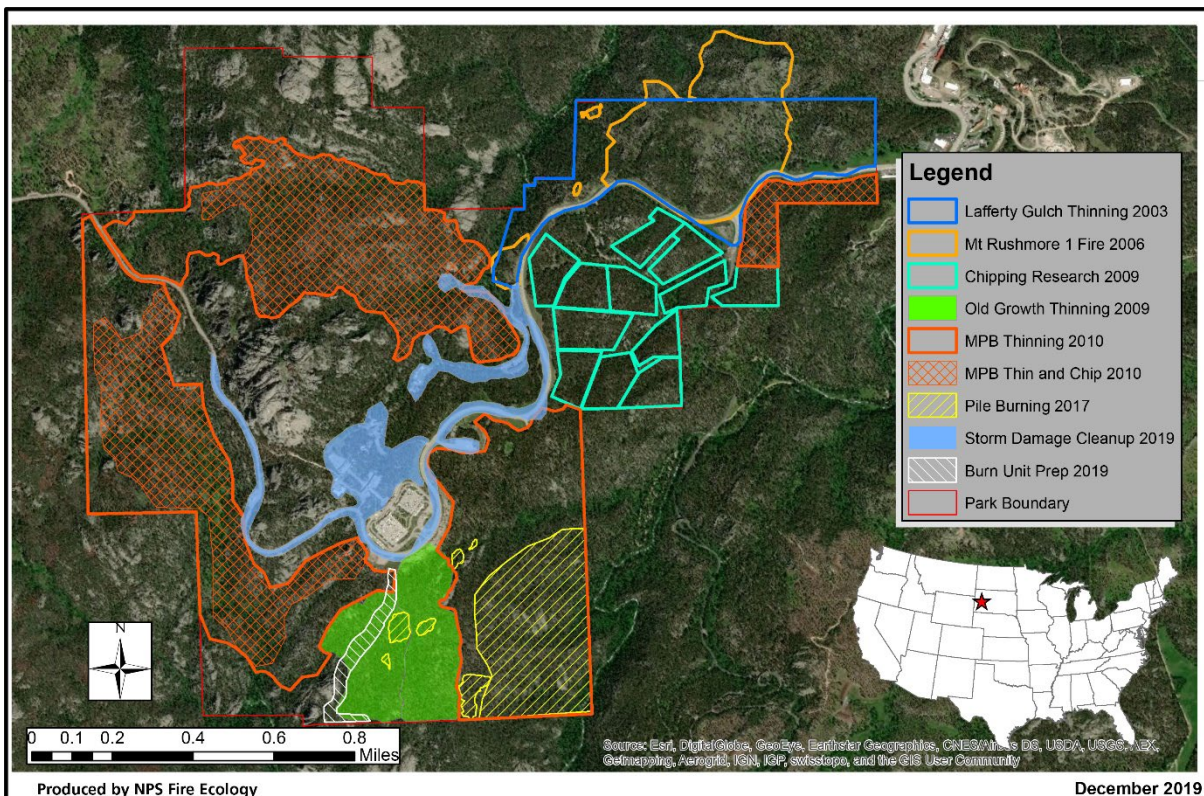


Figure 5. Fuel Reduction Treatments 2003 to Present

Source: Cody Wienk, NPS

While efforts have been widespread, the net effect has not changed wildfire risk. Surface fuel loading has continued to increase yearly with more than 100 years of fire suppression at the Memorial. A prescribed fire would lessen the risk of damaging wildfire across the Memorial (Arno 2000). While the Memorial recently completed a Prescribed Fire Plan (NPS 2019) for two burn units in preparation for the proposed fireworks display, recent wet conditions have not allowed for full implementation of the plan.

3.3.1.6.2 Current Emergency Preparedness

The United States Forest Service (USFS), NPS, other Department of the Interior agencies, and tribes, along with local and state agencies, including Custer and Pennington Counties and the South Dakota Division of Wildland Fire Suppression, participate in annual wildfire exercises involving the Wilderness and the Memorial. The exercises are held because of the potential catastrophic impacts of a wildfire that could escape control efforts and burn to the top of Black Elk Peak, burn Keystone, or run across the basin to Hill City. As a result, fires are managed with a full suppression objective, and prescribed fire has not been used as a management tool in the past to meet natural resource objectives. All wildfires are fought aggressively and extinguished as quickly as possible.

Fire response services in the area are robust, highly trained, and skilled. Interagency partners train together, fight fire together, and offer mutual aid and support through several memoranda of understanding and interagency agreements. These fire response resources are served by the Northern Great Plains Interagency Dispatch Center with the ability to shift resources, including people and equipment, to high-risk areas and active fires without regard to agency sponsorship. Additionally, dispatchers can call on fire response services in four states for response within 24 hours, and nationally within 72 hours. Other air assets, including heavy and very heavy air tankers, are available to respond based on priorities of resources threatened by a given fire. The Memorial and surrounding area would be a high priority for local, regional, and national fire control resources.

3.3.2 Impacts of Wildfire Risk in Alternative 1

3.3.2.1 Determining the Scope of the Analysis

For the purposes of this fire impacts analysis, the Wildland Fire Decision Support System (WFDSS), an integrated computer model (model), was used. The model is a weather and fire behavior prediction tool that provides information on fire season duration, fire size probabilities, fire spread paths and short-term arrival times, fire danger forecasts, and economic impact assessments (Pence and Zimmerman 2011). The model was used to assess impacts and outcomes that could occur in various weather conditions. The model was used to simulate fires resulting from the fireworks discharge in two representative years: a dry year in 2012 and a normal precipitation year in 2013. The model helped to identify the wildfire analysis area, assess potential risks, and analyze the impacts of wildfire for the preferred alternative.

As described below, a fireworks display in 2020 would contribute minimally to wildfire risk in the cumulative effects analysis area, assuming all conditions and mitigations developed by the incident management team are met and followed.

3.3.2.2 Potential Magnitude of Wildfire from Alternative 1

The results of the model reveal a low probability of a high-consequence wildfire event and high probability of a low-consequence wildfire event. In other words, the chances of a major wildfire

burning to Keystone, South Dakota or Horsethief Campground would be quite low—less than 0.02 percent, while the chances of a more modest wildfire are much higher—in excess of 60 percent. The most likely wildfire scenario would be confined entirely to the Memorial. The model shows likely containment of any unplanned fire in the vicinity of the fireworks launch site. This is consistent with the successful containment of small wildfires in previous years that resulted from fireworks displays.

There is a very slight chance (0.02 percent) that an unplanned fire would exceed local emergency services capacity and burn through to Keystone, burn into the Black Elk Wilderness, burn south into Custer State Park, or burn northwest toward Horsethief Campground and Old Hill City Road. Fires would only reach the extent shown in the model if no fire suppression action occurred for 12 hours. In reality, firefighters would aggressively fight any fire resulting from the fireworks show, effectively eliminating the potential for this low-probability event to occur.

The model roughly portrays the expected size of an escaped wildfire on July 3rd in one of two climatic and fuels conditions, an average year and a dry year, with 12 hours of no fire suppression activities. The model simulates 2,000 fires in each year using slightly changed parameters for each fire to establish the probable footprint of a single escaped fire in a given year. Three ignition points were selected surrounding the sculpture for each climatic and fuel condition. Wet years were also modeled but are not shown or discussed further. Fires in wet years have even less impact than normal years and are unlikely to escape any initial ignition.

3.3.2.2.1 *Average Year*

Figure 6 illustrates the potential escaped fire area from an ignition resulting from mortar shrapnel or unexploded ordnance from the Hall of Records area on July 3rd in an average year, with no fire suppression activities for 12 hours. Figure 6 is a gross model depiction of relative fire sizes and is for illustration only.

In an average year, escaped fires would be unlikely. Firefighters on hand during the fireworks displays would be able to quickly engage and extinguish any fire starts, limiting fire sizes and duration to the evening and possibly the next day following the fireworks. In this scenario, fire would be limited to local effects in the area of ignition plus impacts from fire suppression activities such as building a fireline, cutting trees to deny the fire-available fuel, and using aircraft to deliver water and fire retardant to the fire. The total of these effects would be expected to be localized and minimal, as witnessed in previous years.

3.3.2.2.2 *Dry Year*

Figure 7 illustrates the potential for an escaped fire area from an ignition resulting from mortar shrapnel or unexploded ordnance from the Hall of Records area on July 3rd in a dry year, with no fire suppression activities for 12 hours. Figure 7 is a gross model depiction of relative fire sizes and is for illustration only.

A wildfire in a dry year would be more likely to result in a high-consequence fire burning outside the boundaries of the Memorial and toward the town of Keystone, South Dakota, up the northeast aspect of Black Elk Peak, or into the basin near Horsethief Lake. This wildfire would be expected to take place over 12 hours. To help prevent a wildfire occurring, a Go/No-Go decision matrix would be developed to ensure conditions in and surrounding the Memorial are acceptable for the event to proceed.

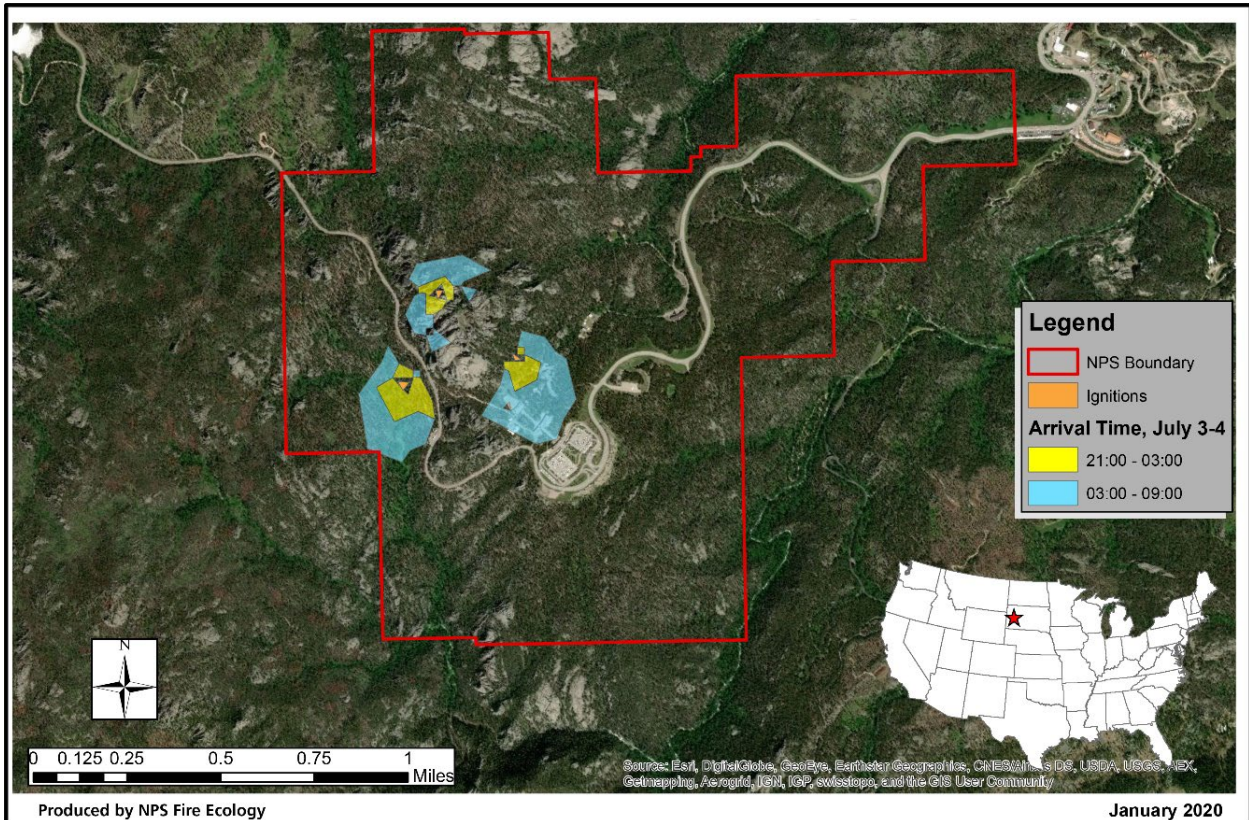


Figure 6. WFDSS Wildfire Spread Average Year.

Source: Cody Wienk, NPS

3.3.2.3 Impacts of an Escaped Fire on July 3rd

3.3.2.3.1 *Vegetation Impacts*

Wildfire acts as a “release” agent, thinning remaining trees, opening the canopy, encouraging growth of surviving trees, and stimulating new growth of understory vegetation. However, wildfires may also have unintended impacts such as killing large old growth trees and creating conditions suitable for encouraging invasive plants.

Most of the understory species within the analysis area are fire tolerant. A wildfire in July in a dry year would severely harm warm season vegetation species and favor cool season species such as smooth brome (an exotic invasive species). Canada thistle, the most common exotic species in the Memorial, thrives in burned or otherwise disturbed areas. In general, the post-fire succession of species would manifest as grasses and sedges, moving to shrubs, then to aspen and birch, and finally to ponderosa pine (Wright and Bailey 1982; Arno 2000). Because ponderosa pine is so aggressive and opportunistic, the species quickly dominates even severely burned areas at the elevations and in conditions found at the Memorial, except in very severe wildfires where seed sources are destroyed.

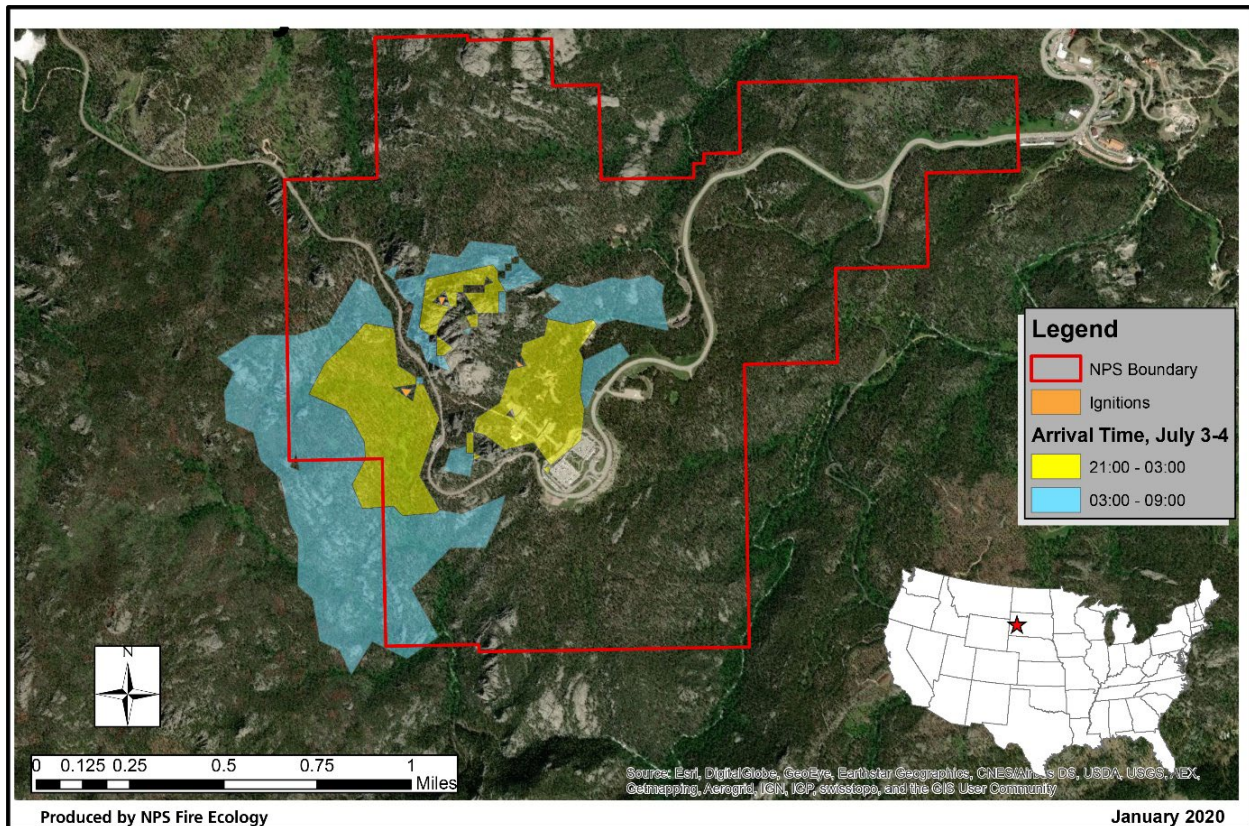


Figure 7. WFDSS Wildfire Spread Dry Year.

Source: Cody Wienk, NPS

Surface water quantities increased by 12 percent for several years following the 1990 Cicero Peak fire in one study in Custer State Park (Neary et al. 2008). Abundant water, atypical for dry ponderosa pine forests, coupled with increased nutrients, means that living trees that survive a fire are stronger, healthier, and more vigorous. Fire-weakened trees remain a target for MPB for several years following a fire. The 60,000-acre Oil Creek Fire in the Western Black Hills resulted in a total post-fire mortality from MPB of less than 200 mature trees (Carroll 2016).

A fire occurring within the model parameters would have environmental consequences, but flora in general would recover well over several years. Even following a severe fire, the overall impacts would not be expected to cause a major change in vegetation communities. The broken nature of the terrain and the resulting discrete islands of trees among the granite formations throughout the Memorial would ensure some continuity for seed sources following a fire.

3.3.2.3.2 *Fish, Aquatic Invertebrates, and Wildlife Impacts*

Fires affect fish and wildlife mainly through impacts on their habitat. Fires often cause short-term increases in food that contribute to increases in populations of some animals (Graham et al. 2016). Recovering grasses and shrubs greatly increase forage which, in turn, favors grazers like deer and elk, leading to proportionate increases in cougar and coyote populations. The increased visibility in the fire area allows raptors to better see and hunt prey more effectively. Woodpecker species thrive as they forage for insects that help wood decompose. These increases depend on the animals' ability to thrive in the altered, often simplified, habitat. The extent of fire impacts on animal communities generally depends on the extent of change in habitat structure and species composition. Stand-replacement fires, which are highly unlikely to result from the actions in the

preferred alternative, usually cause greater changes in the vegetation communities of forests than in those of grasslands. Within forests, stand-replacement fires usually alter the wildlife community more dramatically than understory fires. Fires that leave standing or downed dead trees and patches of early successional plants provide important habitat for a range of wildlife species.

The vulnerability of insects and other invertebrates to fire depends on their location at the time of the fire. While adults can burrow or fly to escape injury, species with immobile life stages that occur in surface litter or aboveground plants are more vulnerable (Smith 2000). However, aboveground microsites, such as the unburned center of a grass clump, can provide protection.

Fires generally kill or injure a small proportion of wildlife populations. Small mammals with limited mobility living aboveground appear to be most vulnerable to fire-caused injury and mortality, but occasionally even large mammals are killed by fire. Because mortality rates of mammals are low, direct fire-caused mortality has little influence on populations of these species as a whole. The ability of mammals to survive fire depends on their mobility and on the uniformity, severity, size, and duration of the fire. Most small mammals avoid fire by using underground tunnel systems, whereas large mammals must find a safe location in unburned patches or outside the burn. Rabbits, harvest mice, and woodrats (dusky-footed, desert, and white-throated) are more vulnerable to fire-caused mortality than deeper-nesting species, especially because their nests are constructed of dry flammable materials. Woodrats are particularly susceptible to fire mortality because of their reluctance to leave their houses even when a fire is actively burning (Wright and Bailey 1982; Arno 2000; Shepperd and Battaglia 2002; Graham et al. 2016). Many bat species roost under the bark of snags or live trees and are able to escape fire through flight. Bat species of the Northern Great Plains rear their pups in June and July (including during the Memorial's Independence Day event), and pups may not be able to escape in the event of a wildfire.

Fire-caused bird mortality depends on the season, uniformity, and severity of burning. Mortality of adult songbirds is rare, but mortality of nestlings and fledglings does occur. Nest destruction and mortality of young have been reported for several ground-nesting species. Wild turkeys rarely re-nest if their nests are destroyed after two to three weeks of incubation. In forested areas, fire impacts on birds depend largely on fire severity. The young of ground-nesting birds in low vegetation are vulnerable even to understory fire during the nesting season. Species nesting in the canopy could be injured by intense surface and/or crown fires, but these types of fire are more common in late summer than during the early nesting season.

There are few reports of fire-caused injury to herpetofauna, even though many of these animals, particularly amphibians, have limited mobility (Smith 2000). The vulnerability of snakes to fire may increase while they are in ecdysis (the process of shedding skin). Species in ecosystems that no longer experience high-frequency, low-severity fires may not be adapted to avoid fire.

Wildfire can affect fish and aquatic invertebrates by altering water chemistry and flow. Water quality parameters can be compromised by wildfire, including decreases in dissolved oxygen and pH and elevated turbidity. Large fires can increase runoff, causing increased sedimentation in streams, and post-fire flooding from runoff can change the community structure of fish and aquatic invertebrates (Bixby et al. 2015).

In general, fire impacts on wildlife under any of the model scenarios would be minimal and limited to changes in wildlife habitat in the analysis area. A low-consequence wildfire (which is the most likely scenario) would have localized impacts on wildlife habitat and would not likely

result in a reduction of the species' population in the analysis area despite occasional instances of individual wildlife mortality. The surrounding forest lands and prairies would provide retreat habitat for individual species, and most wildlife species would quickly repopulate the fire area as plant regrowth occurs following a fire.

3.3.2.3.3 *Soils Impacts*

Localized hydrophobicity would be expected from a severe wildfire in the analysis area. Wildlife walking on the surface, rainfall, and wind-driven pruning of trees would break up the hydrophobic soil, reestablishing normal hydrologic function. Long-term impacts resulting from wildfire would be insignificant due to the dominance of the granitic soils and rock formations throughout much of the Memorial. No long-lasting impacts were observed in soils in previous area fires (pers. obser. F. Carroll 2019).

The Battle Creek Fire occurred northwest of the Memorial (2002), and the Cicero Fire (1990) and the Galena Fire (1998) occurred southeast of the Memorial. Though these were stand-replacing, high-severity, and high-intensity wildfires, the most notable fire impacts were limited to vegetation. No long-lasting impacts were observed in soils, and hydrophobicity was short term.

3.3.2.3.4 *Water Quality Impacts*

Wildfire impacts on water quality result from increased erosion from burned areas and resulting increases in sedimentation. Small escaped wildfires would not likely affect water quality in the drainage basins at the Memorial, or the larger watershed. A larger escaped fire could affect the water quality of local water supplies and systems including streams, local reservoirs, and treatment plants. In a study published in May 2016, USGS scientists noted the presence of multiple trace metals in post-fire storm water. They discovered elevated levels of iron, lead, nickel, and zinc in the streams and traced the contaminants back to a nearby wildfire (USGS 2016a). In general, changes in the magnitude and timing of snowmelt runoff influence when water supply reservoirs are filled. Large fires can increase sediment loading of water supply reservoirs, shorten reservoir lifetime, and increase maintenance costs. Fires increase nutrient loading of streams with dissolved organic carbon, major ions, and metals. Post-fire erosion and transport of sediment and debris to downstream water treatment plants, water supply reservoirs, and aquatic ecosystems could occur. Increased turbidity (cloudiness caused by suspended material) or heightened iron and manganese concentrations may increase chemical treatment requirements and produce larger volumes of sludge, both of which would raise operating costs. Changes in source water chemistry can alter the treatments needed to meet drinking water requirements (USGS 2016a).

There would be slight short-term impacts on water quantity resulting from an escaped fire. Surface water quantities in the analysis area would increase for a period following a fire, as much as 12 percent in studies conducted in Custer State Park following the Cicero Peak Fire (Neary et al. 2008). Because dead trees no longer use available water, more water is available to the system for other uses, other plants, and for increased stream flows. This is a function of fewer plants competing for the water, the ease of rain drops to penetrate the canopy following the fire, and hydrophobic soil conditions that encourage overland flow. Ponderosa pine trees easily absorb water from the ground and return sugar to the roots. Again, because large fires and escaped fires are improbable, these types of water quality effects from fire are also unlikely.

3.3.2.3.5 *Black Elk Wilderness/Norbeck Wildlife Preserve Impacts*

A wildfire in either a dry or normal year is not projected to reach the Harney Lookout Tower or move over the top of Black Elk Peak toward Custer. Dominant winds in the area are from the

northwest to southeast, as demonstrated by the model and by the 2002 Battle Creek Fire northwest of the Memorial. It is a USFS priority to keep any escaped fire out of the Wilderness as topography, weather, fuels, and access issues make fighting fire in the Wilderness problematic. Both the NPS and USFS have full administrative authority to fight fire in these areas as aggressively as necessary, but heavy equipment use in the Wilderness is precluded both by the terrain and the *Black Hills National Forest Land and Resource Management Plan* (USFS 2006).

A high-consequence fire in the Norbeck Wildlife Preserve would be expected to be stand replacing, and tree mortality would be high in July in a dry year. While there is a low probability that an escaped fire would burn for more than 24 hours following ignition, such an event would be a wind-driven fire characterized by fire burning in the crowns of the trees, killing the trees and spreading quickly by spotting and wind-driven embers. Fires escape initial attack due to high winds more than other factors. When the winds die or become calm, fires are more easily contained. Prominent examples of large fires in the area over the past 20 years demonstrate what would be expected from such fires. The forest would be badly burned in a large wildfire and replaced by grasses and shrubs for decades following the fire. The area of the 2002 Battle Creek Fire northwest of the Memorial is largely meadowland with grass and shrubs. Regrowth of pine trees is progressing but is not expected to be widespread for at least 25 more years. Under the preferred alternative, the probability of a major high-consequence fire is very low, and such impacts on the Black Elk Wilderness and Norbeck Wildlife Preserve from wildfire are unlikely.

3.3.2.3.6 *Other Impacts*

Power and communications infrastructure is susceptible to wildfire as it is located aboveground. Both an active fire and related suppression activities would potentially compromise the infrastructure.

Fuel storage areas include aboveground tanks containing thousands of gallons of propane and fuel. Memorial personnel have successfully mitigated potential impacts on fuel storage through site maintenance and protection of key facilities. The Memorial would protect fuel storage both from the fireworks displays and from any resulting wildfire by clearing and treating fuels in the immediate vicinity and stationing rapid response teams/assets in these locations (point protection and repositioning resources).

3.3.2.4 **Cumulative Impacts**

Experience with extensive aerial fireworks in the analysis area, including large mortar-fired displays, has demonstrated that fireworks can be safely and successfully performed over a wide variety of changing weather conditions, in both average and dry years. While more than 20 fires were ignited by fireworks inside the Memorial over the years, all of these fires were quickly contained and resulted in localized impacts due to the availability and proximity of emergency fire response teams. If the Memorial is unable to complete additional prescribed burns in spring 2020, the proposed fireworks event could still proceed if conditions fall within the parameters outlined in the Go/No-Go checklist on the day of the event.

A fireworks display in 2020 would contribute minimally to wildfire risk in the cumulative effects analysis area, assuming all conditions and mitigations developed by the incident management team are met and followed. Conversely, any prescribed burns that are implemented prior to the fireworks display would have a beneficial contribution to cumulative effects of wildfire in the analysis area.

3.3.3 Impacts of Wildfire in Alternative 2

Under the no action alternative, there would be no potential for wildfires ignited from an Independence Day celebration fireworks event. Wildfire risks from normal operations at the Memorial are part of ongoing fire planning for the Northern Great Plains Interagency Dispatch Center and normal Memorial operations. The overall risk of a severe wildfire would range from low to high within the Memorial, depending on the weather conditions in the region and the effectiveness of prescribed burning activities.

3.3.3.1 Cumulative Impacts

Previous fireworks displays have resulted in more than 20 small wildfires, each less than 1 acre. These small wildfires were extinguished with minimal impact on resources due to readily available emergency fire response teams and favorable weather conditions. There would be no contribution to the cumulative effects of wildfire under the no action alternative.

3.4 Environmental Contaminants

The analysis area for environmental contaminants includes the 1,278-acre Memorial, including the three drainage basins described below (Lafferty Gulch, Starling Gulch, and Unnamed tributary to Grizzly Bear Creek) (Figure 8).

3.4.1 Current General Conditions – Environmental Contaminants

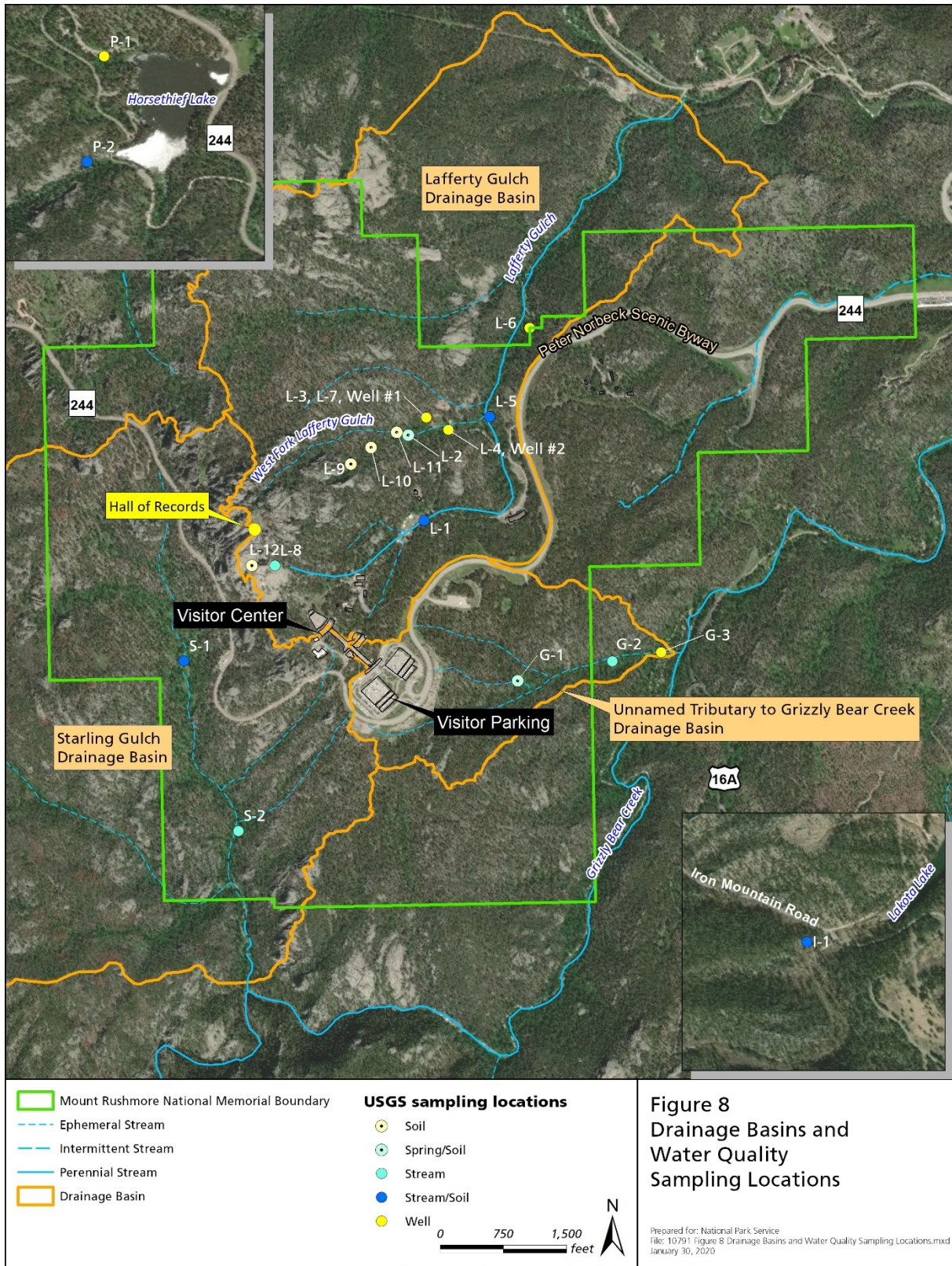
3.4.1.1 Water and Soil Quality

3.4.1.1.1 Sample Sites

The Memorial is in the east-central region of the Black Hills and consists of Precambrian-age bedrock of granite, pegmatite sills and dikes, and schist. Three streams are present within the Memorial: Lafferty Gulch in the north, Starling Gulch in the southwest, and the Unnamed tributary to Grizzly Bear Creek in the southeast (Figure 8). These three streams drain to the north, south, and east, respectively. Groundwater occurs in localized aquifers within the bedrock, and flow is controlled by secondary permeability caused by the fracturing and weathering of the bedrock. This combination of factors, along with surficial deposits of colluvium, can result in the rapid movement of large quantities of recharged groundwater. The groundwater system in the West Fork Lafferty Gulch is isolated due to the prevention of downgradient movement by an igneous sill, which acts as a dam.

Water Sampling Locations

Two groundwater wells, used for drinking water production, are located within the West Fork Lafferty Gulch (Figure 8) and have been designated as Well #1 (200 feet deep) and Well #2 (500 feet deep). For use in monitoring water quality, these wells have been designated as sample sites L-3 and L-4, respectively. A spring (L-2), upstream of the production wells, originates from the same groundwater source as the production wells and creates a shallow stream that flows through the West Fork Lafferty Gulch. Production water, pumped from both Wells #1 and #2, is treated at the Memorial's on-site water treatment plant via microfiltration. Samples collected at site L-7 represent the water quality post-treatment. Secondary treatment consisting of reverse osmosis is used to treat perchlorate in drinking water used by staff who live at the Memorial.



Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Figure 8. Drainage Basins and Water Quality Sampling Locations

Located in the main Lafferty Gulch channel (near the Memorial's northern boundary), sample site L-5 is downstream of both the spring well (L-2) and the production wells (L-3 and L-4) as well as downstream of the confluence with the West Fork Lafferty Gulch (Figure 8). Two other stream sampling sites are present within the main stem of Lafferty Gulch, L-1 and L-8. Site L-8 is the closest sampling site to the previous fireworks launch area in the Hall of Records area, while L-1 is midway between sites L-8 and L-5 in the main stem of Lafferty Gulch. Surface water samples have also been collected from two locations within Starling Gulch (S-1 and S-2) and from two locations within the Unnamed tributary to Grizzly Bear Creek (G-1, a spring, and G-2, the tributary). The geology of the spring at G-1 is similar to that present at L-2, where an igneous sill blocks the downstream flow of groundwater, resulting in surface flow.

Soil Sampling Locations

USGS (2016b) soil sampling locations L-9, L-10, L-11, and L-12 (Figure 8) were chosen to target areas where the largest amount of firework debris was suspected. Sites L-9, L-10, and L-11 are located in the West Fork Lafferty Gulch drainage upstream from the production wells (sites L-3 and L-4). Site L-12 is located within the Hall of Records area where a shallow layer of soil and weathered rock overlies the large granite outcrop.

Reference Sampling Locations

To aid in defining background levels of perchlorate and metals, the USGS (2016b) collected soil, surface water, and groundwater from reference sites located outside of the Memorial. Figure 8 displays the reference site locations P-1, P-2, and I-1.

3.4.1.1.2 Firework Contaminants

A firework is the combination of a fuel (typically a metal or metalloid) and an oxidizer (typically perchlorate or nitrate salts) to enhance combustion along with binders, stabilizers, and anticaking agents (PB Energy Storage Services, Inc. (PB Energy 2011)). A propellant supplies the lift during the launch of fireworks and the ignition results in the combustion of the firework. Combustion products are released to the environment and include numerous metals and metal compounds used as fuels and coloring agents as well as numerous salts used as oxidizers (PB Energy 2011). Environmental contaminants associated with fireworks include perchlorate, thiocyanate, and nitrate in addition to numerous other compounds that are released to the environment, partially due to the incomplete combustion of the fireworks. Additionally, fireworks that do not ignite when launched result in debris and unexploded ordnance (i.e., aerial shells). If this material is not retrieved, they can break down over time and release their contaminant loads to the environment.

3.4.1.1.3 Perchlorate

Perchlorate is both a naturally occurring and man-made anion that is typically found in the form of perchloric acid and salt compounds formed with ammonium, potassium, and sodium. Perchlorate is typically the oxidizer of choice in fireworks because it gives up all four of its oxygen atoms during combustion, making it the most effective oxidizer available. Currently, fireworks, used by pyrotechnic professionals and individuals alike, contain up to of 70 percent potassium perchlorate (Cao et al. 2019). In the environment, perchlorate is both highly soluble and mobile in water; it is also highly stable and can take decades to degrade in both groundwater and surface water. In addition, perchlorate rapidly migrates through soil and into groundwater.

From 2011 to 2015, USGS scientists conducted a study analyzing both water and soil samples collected from sites located in the Memorial. They concluded that the past fireworks displays are the most probable source of the perchlorate contamination present at the Memorial (USGS 2016b). In the soil samples collected, perchlorate concentrations were the highest (0.0023 and

0.0017 milligrams per kilogram (mg/kg) in samples collected in the West Fork Lafferty Gulch. These concentrations are approximately an order of magnitude higher than the concentrations measured at the reference sites located outside the Memorial.

Water samples collected from the Memorial have been analyzed for perchlorate since 2011. As reported by the USGS (2016b), the aquifer underlying the West Fork Lafferty Gulch is highly susceptible to contamination. This susceptibility is due to the hydrogeologic conditions of an igneous intrusive body, which acts as a dam and thus limits groundwater movement. This limitation on the ability of environmental contaminants to be flushed out of the groundwater system results in an increase in the residence time of a contaminant. Similar to the soil sample results, water samples collected from the Lafferty Gulch basin, which includes the West Fork Lafferty Gulch, contained the highest concentrations of perchlorate (USGS 2016b). Perchlorate has been measured with varying concentrations in Well #1 (Site L-3) from 11 to 38 micrograms per liter ($\mu\text{g/L}$), in finished drinking water (Site L-7) from 12 to 29 $\mu\text{g/L}$, in surface water collected at L-5 from 6 to 18 $\mu\text{g/L}$, and in spring water collected at L-2 from 12 to 54 $\mu\text{g/L}$.² The perchlorate monitoring data collected at individual water sample sites display an overall decreasing trend over time (Figure 9). Monitoring data displayed in Figure 9 represents a mixture of data collected by the USGS (2016b) from 2011 to 2014 and NPS data collected primarily from 2016 to 2019. Both the interim and proposed EPA standards are conservative; research suggests that an average adult would need to consume water with concentrations of at least 180 $\mu\text{g/L}$ as a regular drinking water source before they experienced thyroid problems (Greer et al. 2002).

The U.S. Environmental Protection Agency's (EPA) Interim Drinking Water Health Advisory for perchlorate is 15 $\mu\text{g/L}$. However, EPA is currently involved in a rulemaking process to establish a Maximum Contaminant Level (MCL) of 56 $\mu\text{g/L}$ (EPA 2019a). Other MCLs under consideration are 18 and 90 $\mu\text{g/L}$. The current deadline for this process is now June 19, 2020 (pers. comm., L Christ, EPA 2019e).

Perchlorate data were not collected at the Memorial prior to the fireworks shows conducted from 1998 to 2009. Thus, the natural background levels of perchlorate at the Memorial prior to any of the fireworks displays is unknown. The timing and magnitude of perchlorate concentrations in environmental media at the Memorial immediately following a fireworks display are also unknown. (Environmental media refers to components of the natural environment including air, water, soil, and organisms that could contain contaminants.) Samples were collected prior to and immediately following a fireworks display adjacent to a lake in Oklahoma. Wilkin et al. (2007) reported (1) an increase of perchlorate in the lake's surface water, including concentrations 24 to 1,028 times the mean background level (0.043 $\mu\text{g/L}$) within 14 hours after a fireworks show, and (2) decreasing perchlorate concentrations (toward background levels) within 20 to 80 days following the show due to natural attenuation.

² Concentrations of contaminants reported for water are relative to a given volume (e.g., milligrams per liter or micrograms per liter) while concentrations reported for soil are relative to a given weight (e.g., milligrams per kilogram or micrograms per kilogram). There are 1,000 micrograms in 1 milligram. Units reported herein are listed as reported by the laboratory.

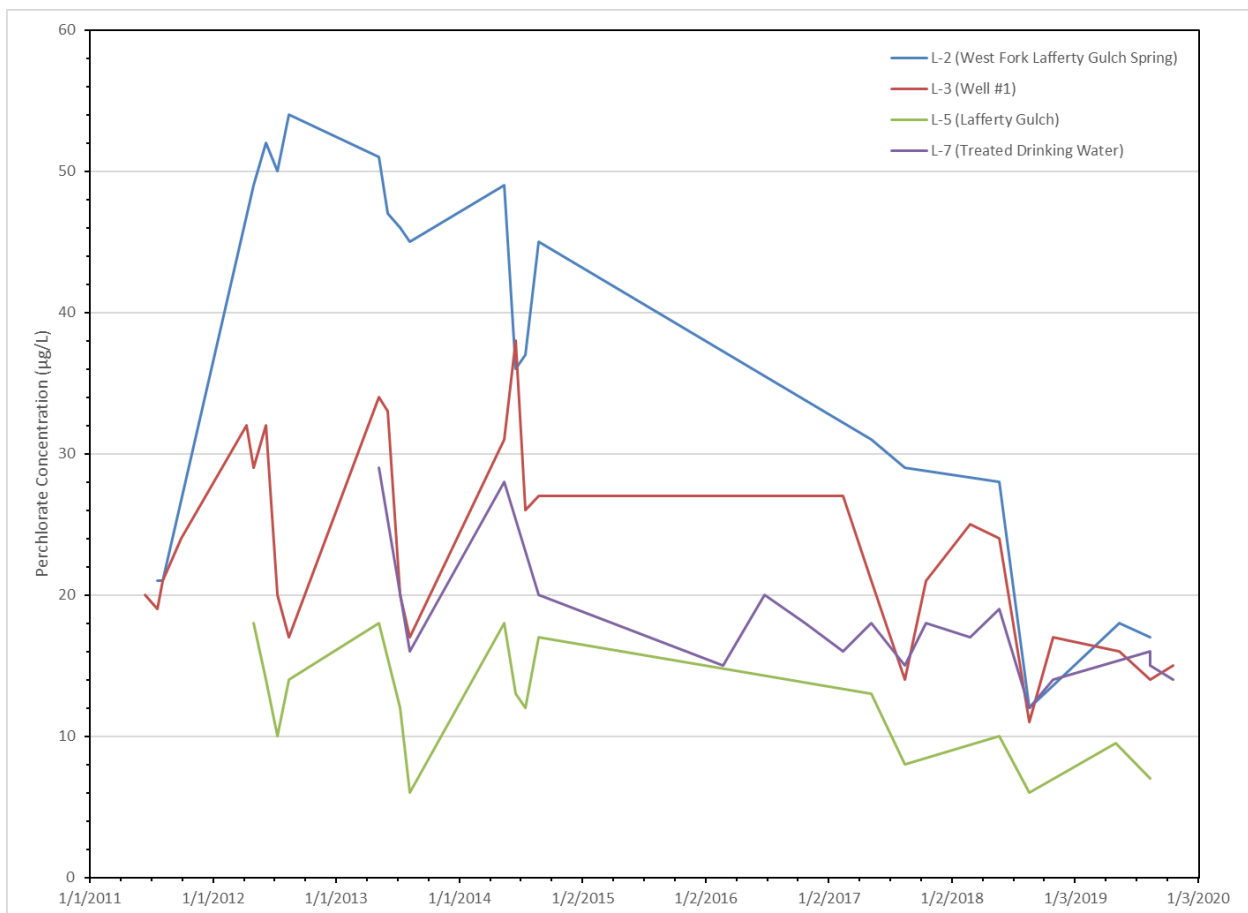


Figure 9. Perchlorate Monitoring Data

3.4.1.1.4 Nitrate

Nitrate is a naturally occurring compound, and various nitrate salts are used in the composition of fireworks. The EPA MCL for nitrate is 10 milligrams per liter (mg/L) (EPA 2019d). Since 1991, nitrate data have been generated from samples collected annually at site L-7, which is the finished drinking water supply for the Memorial. Nitrate levels from 1991 to 2019 ranged from less than 0.5 to 1.35 mg/L. Nitrate data for groundwater and soils have not been collected. Limited data are available on nitrate levels in surface water at the Memorial. Water quality sampling in 2006 found that nitrate levels averaged 1.87 mg/L in the small unnamed stream in Lafferty Gulch, which is known to have been impacted by past fireworks displays. In comparison, concentrations of nitrate in Beaver Dam Creek in the Starling Basin and in Grizzly Bear Creek, both of which are further away from past fireworks displays and thus not heavily impacted, if at all, were below 0.10 mg/L (Rust 2006). These limited data, in combination with the patterns observed in perchlorate concentrations (USGS 2016b), suggest that past fireworks displays likely contributed to increased nitrate levels in Lafferty Gulch, although observed levels remain well below the EPA MCL.

3.4.1.1.5 Thiocyanate

Thiocyanate is a sulfur cyanate anion. Potassium thiocyanate was listed by PB Energy (2011) as a potential propellant used in fireworks. Thiocyanate has not been previously tested for in samples of environmental media collected at the Memorial. A sample was collected at L-7 on December 23, 2019 and was submitted for thiocyanate analysis. Thiocyanate was not detected in the sample.

collected. Thiocyanate can be photochemically degraded to other chemicals containing the cyanate anion if exposed to sunlight (Mediavilla et al. 2019). No samples of environmental media collected at the Memorial have been tested for cyanide.

3.4.1.1.6 *Metals*

Various metals are used as fuels or coloring agents in fireworks. Metals are typically not very water soluble; instead they absorb to particulates in the water column or to substrates (i.e., soils). As part of the USGS study (2016b), soil samples within the Memorial, as well as reference sites located outside the Memorial, were tested for 25 metals. The USGS reported that for 22 of the 25 metals analyzed, the concentrations in soil were greater at sites located within the Memorial than in samples collected at reference sites outside the Memorial. The USGS found that copper and lead (83 and 100 mg/kg, respectively) concentrations within soils collected at the sampling site (L-8) closest to the previous fireworks launch site (Hall of Records area) were approximately an order of magnitude greater than all of the other sample sites. In addition, titanium and barium concentrations (1,200 and 190 mg/kg, respectively) were greatest in two sites located within the Lafferty Gulch drainage basin (USGS 2016b).

In comparison, data generated from the water samples analyzed for the same suite of 25 metals demonstrated that metal concentrations in water at the reference sites (outside the Memorial) had concentrations similar to the sites sampled within the Memorial. Based on these results, the USGS (2016b) concluded that there is little evidence of metal contamination of water due to anthropogenic factors within the Memorial.

3.4.1.2 *Fish and Wildlife*

See Section 3.3, Wildfire for a description of the affected environment for fish and wildlife.

3.4.2 **Impacts of Environmental Contaminants in Alternative 1**

Under the preferred alternative, the size of the fireworks display would be comparable to those previously conducted at the Memorial. Shell sizes would be determined by a licensed fireworks operator to ensure compliance with all applicable regulations, including appropriate minimum separation distances (see Section 2.1.1). The types of fireworks used under the preferred alternative are assumed to be of similar composition to those previously used, and would have similar impacts to previous events.

3.4.2.1 **Water Quality Impacts**

Fireworks contain contaminants that when detonated are likely to be released into the environment. In addition, fireworks that do not detonate after launch and are not recovered can degrade over time and release contaminants into the environment. The fireworks contaminants perchlorate and nitrate are highly soluble and can quickly dissolve into water, while metals generally have a lower water solubility at near neutral pH levels. The USGS (2016b) concluded that past fireworks displays are the most probable source of perchlorate contamination present in soil, surface water, and groundwater at the Memorial. Additionally, the USGS (2016b) noted that the groundwater system at the Memorial is highly susceptible to contamination due to the hydrogeologic conditions present. The total amount of environmental contaminants released as a result of the preferred alternative is not quantifiable given its dependency on many different factors. These factors include the number of fireworks launched, the size and type of the fireworks used, the efficiency of combustion, and the composition and quality of the fireworks used.

The preferred alternative would result in the release of chemicals to the environment within the Memorial, although the amount is not expected to exceed that released in previous years. Any resulting fireworks-related contaminant concentrations in soil, surface water, and groundwater would be due, in part, to the size and type of fireworks used and the duration of the fireworks event (and corresponding number of mortars launched), along with solubility, infiltration rate, and attenuation of a given chemical. Different types of fireworks include different chemical compositions and in varying concentrations.

It is assumed that the release of chemicals to environmental media within the Memorial would be comparable to previous fireworks shows, and contamination levels observed in environmental media would gradually increase each year that fireworks events occur. The amount released per event is not expected to exceed the amount released in previous events. Because previously measured levels were the result of 10 years of fireworks events, contamination levels would not be expected to exceed levels measured previously for several years. Whether future perchlorate concentrations in groundwater used for drinking water will meet regulatory standards will depend in part on the EPA's decision regarding the regulatory standard for perchlorate, which would influence NPS's response in terms of water treatment options.

A monitoring program would also be in place to ensure that any increase in firework-related contamination would be detected as early as possible. Monitoring of environmental media before and after implementation of the preferred alternative also would allow for the quantification of any changes in environmental contaminant concentrations. The NPS and USGS have proposed to implement a collaborative study to conduct pre- and post-display monitoring of soil, surface water, and groundwater within the predicted impact areas from the fireworks display. This monitoring program would both evaluate the event's impacts on the concentrations of environmental contaminants and would supplement existing groundwater and drinking water testing that currently occurs at the Memorial. The likelihood of adverse impacts increases with the long-term continuation of fireworks events. If perchlorate levels in future years exceed previously measured levels, this analysis would need to be revisited.

3.4.2.2 Human Health Impacts

3.4.2.2.1 *Perchlorate, Nitrate, and Thiocyanate*

Exposure to perchlorate, nitrate, and thiocyanate can affect the metabolism, reproduction, and development of exposed individuals by preventing the uptake of iodide by the thyroid gland, which then uses the iodide to produce various thyroid hormones that regulate these processes (Gholamian et al. 2011; Lumen et al. 2013; Chen et al. 2014 as cited in Acevedo-Barrios et al. 2017; Park et al. 2016). However, health effects only occur at exposure levels considerably higher than levels found in the environment (Tarone et al. 2010; Pleus and Corey 2018), including the levels found at the Memorial. Nitrate and thiocyanate have the same mode of action as perchlorate (Tarone et al. 2010; Tonacchera et al. 2004). While the effects of the three chemicals on the thyroid gland are additive, nitrate and thiocyanate have lower potency than perchlorate (Tarone et al. 2010). The EPA Interim Drinking Water Health Advisory for perchlorate is 15 µg/L and the EPA MCL for nitrate is 10 mg/L (EPA 2019d). As described in Section 3.4.1.1.3, Perchlorate, perchlorate concentrations have been measured in drinking water samples that sometimes exceeded 15 µg/L, with an overall downward trend in concentrations over time. Nitrate in drinking water samples has not exceeded the MCL of 10 mg/L, and thiocyanate has not been detected in the one sample collected of the finished drinking water supply for the Memorial (see Section 3.4.1.1.5, Thiocyanate).

The human route of exposure to perchlorate, nitrate, and thiocyanate at the Memorial is expected to be through the drinking water supply. The potential exists that levels of these chemicals in drinking water could become elevated following a fireworks display, especially when considering the existing elevated levels of perchlorate in the Memorial's drinking water. As previously described, the risk of future increases and exposure to these compounds would depend on many factors.

The risk of Memorial employees being exposed to elevated levels of these chemicals in drinking water would be reduced because a local reverse osmosis system is used in staff residences at the Memorial and is effective in removing these chemicals. A monitoring program for contaminants, as described previously, would be implemented for pre- and post-event monitoring of groundwater and surface water within the area potentially affected by the fireworks display, and additional reverse osmosis treatment systems would be added as needed to protect human health. The contractor would also be required, to the extent possible, to remove unexploded ordnance, which is a possible source of water contamination. Given the limited potential for exposure and proposed monitoring measures, and reverse osmosis treatment, human health effects from perchlorate, nitrate, and thiocyanate are not expected to occur.

3.4.2.2.2 *Metals*

As previously described, the USGS (2016b) concluded that reference site metal concentrations in water samples collected outside the Memorial had concentrations within the same range as sites within the Memorial, suggesting little evidence of metal contamination of water due to anthropogenic factors within the Memorial. However, sediment samples from the surface water bodies were not collected for analysis. Given the tendency of metals to absorb to particulate matter in the water column, any metals entering surface waters would settle out in bottom sediments. Therefore, it is unknown if metal contamination of water due to past fireworks displays within the Memorial occurred.

A possible pathway for human exposure to metals would be through the drinking water supply. However, metals are not very water soluble at neutral pH levels and past testing has not found elevated levels of metals in the surface waters at the Memorial (USGS 2016b). As previously described for other contaminants, the risk of future increases and exposure to metals would depend on many factors, and the risks of exposure through drinking water at the Memorial would be reduced by limiting the number, size, and type of fireworks. The risk of Memorial employees being exposed to elevated levels of metals in drinking water following a fireworks display also would be greatly reduced because a reverse osmosis system is used in staff residences at the Memorial. A monitoring program for contaminants, as described previously, would be implemented for pre- and post-event monitoring for metals within the area potentially affected by the fireworks display. Given the limited potential for exposure, human health effects from copper, lead, and other metals are not expected to occur.

3.4.2.3 *Ecological Impacts*

3.4.2.3.1 *Perchlorate*

Studies have found that perchlorate affects many species of wildlife, including mammals, birds, amphibians, fish, and invertebrates (Srinivasan and Viraraghavan 2009; Jomaa et al. 2014; Eck 2015; Williams et al. 2015; Acevedo-Barrios et al. 2017) and perchlorate toxicity varies widely according to species. Exposure to perchlorate can affect the metabolism, reproduction, and development of exposed individuals and irreversible damage can occur if perchlorate interferes with these biological processes. The mode of action of perchlorate is to prevent the uptake of iodide by the thyroid gland, which then uses the iodide to produce various thyroid hormones that

regulate these processes (Gholamian et al. 2011; Lumen et al. 2013; Chen et al. 2014 as cited in Acevedo-Barrios et al. 2017). Controlled laboratory studies have found that perchlorate has limited ability to bioaccumulate in aquatic systems (Williams et al. 2015). The EPA and NPS have not set ecological screening values for perchlorate in water or soil (NPS 2018). Perchlorate levels in Starling Gulch were elevated compared to background levels, ranging from 0.61 to 19 $\mu\text{g/L}$, while surface water samples from Grizzly Bear Creek showed no signs of contamination (USGS 2016b).

Because elevated perchlorate concentrations were found at the site closest to the previous fireworks launch site, future perchlorate contamination would be expected to be greatest in the areas closest to future launch sites. The degree and severity of impacts would depend on the chemical composition and number of fireworks used, and other variables such as the degree of combustion, as previously described for other contaminants. No fish are present in Lafferty Gulch; however, adverse impacts on birds, mammals, amphibians, and invertebrates could result from increased perchlorate levels following future fireworks displays. Impacts on organisms could be expected to occur within hours after the fireworks display and attenuate over time.

It is assumed that the release of perchlorates to environmental media within the Memorial would be comparable to previous fireworks shows, and contamination levels observed in environmental media would gradually increase each year that fireworks events occur. The amount released per event is not expected to exceed the amount released in previous events. Because previously measured levels were the result of 10 years of fireworks events, perchlorate levels would not be expected to exceed levels measured previously for several years. A monitoring program would also be in place to ensure that any increase in metals contamination would be detected as early as possible (see Section 2.1.3).

3.4.2.3.2 Nitrate

Potential adverse impacts on aquatic life from elevated levels of nitrate could include algal blooms, which could potentially produce harmful toxins. In addition, once these blooms die off, algal decomposition could decrease dissolved oxygen concentrations in the aquatic environment, which could result in an increase in fish mortality and other aquatic organisms. High levels of nitrates could also have toxic effects on aquatic or terrestrial organisms that ingest the water. Nitrate has the same mode of action as perchlorate, inhibition of iodide uptake by the thyroid gland. Carmago et al. (2005) reviewed the published data on nitrate toxicity to aquatic species and found that long-term exposure to concentrations of 10 mg/L of nitrate (the EPA drinking water standard) can adversely affect aquatic invertebrates, fish, and amphibians. A safe level of 2 mg/L was recommended to protect freshwater aquatic organisms (Carmago et al. 2005). The NPS has not selected ecological screening values for nitrate (NPS 2018).

As described above, water quality sampling in 2006 found that nitrate levels averaged 1.87 mg/L in the small unnamed stream in Lafferty Gulch (Rust 2006), which is known to have been impacted by past fireworks displays. However, while elevated, the nitrate concentrations measured in 2006 in Lafferty Gulch were below the 2.0 mg/L recommended to protect freshwater aquatic organisms. Use of fireworks would result in the release of nitrates into the environment, which could result in increased nitrate levels in streams in the Memorial, especially in the unnamed stream in Lafferty Gulch, which has shown increased nitrate levels following past fireworks displays. The amount of nitrate distributed to environmental media would be dependent on factors discussed previously (e.g., number, size, and type of fireworks used).

It is assumed that the release of nitrates to environmental media within the Memorial would be comparable to previous fireworks shows, and contamination levels observed in environmental

media would gradually increase each year that fireworks events occur. The amount released per event is not expected to exceed the amount released in previous events. Because previously measured levels were the result of 10 years of fireworks events, nitrate levels would not be expected to exceed levels measured previously for several years. A monitoring program would also be in place to ensure that any increase in nitrate contamination would be detected as early as possible (see Section 2.1.3).

3.4.2.3.3 *Thiocyanate*

Thiocyanate can adversely affect both aquatic and terrestrial organisms if ingested. Like perchlorate and nitrate, thiocyanate can inhibit iodide uptake by the thyroid gland. Additional impacts on fish exposed to thiocyanate could also include reduced hemoglobin levels via the same mechanism as perchlorate and nitrate (Lanno and Dixon 1996). The NPS has not selected ecological screening values for thiocyanate (NPS 2018).

Potential adverse impacts on mammals, fish, amphibians, and invertebrates could result from increased thiocyanate concentrations following future fireworks displays. As described in Chapter 3, Affected Environment and Environmental Consequences, limited sampling at the Memorial did not detect thiocyanate in the Memorial's finished drinking water (site L-7); however, surface water, groundwater, and soil at the Memorial have not been tested for thiocyanate or cyanide in the event thiocyanate is photochemically degraded.

As previously described, different types of fireworks include different chemical compositions in varying concentrations. The amount of thiocyanate distributed to environmental media is dependent on factors discussed previously (e.g., number, size, and type of fireworks used).

It is assumed that the release of thiocyanates to environmental media within the Memorial would be comparable to previous fireworks shows, and contamination levels observed in environmental media would gradually increase each year that fireworks events occur. The amount released per event is not expected to exceed the amount released in previous events. Because previously measured levels were the result of 10 years of fireworks events, thiocyanate levels would not be expected to exceed levels measured previously for several years. A monitoring program would also be in place to ensure that any increase in thiocyanate contamination (or cyanide, if there is the potential for photochemical degradation) would be detected as early as possible (see Section 2.1.3).

3.4.2.3.4 *Metals*

Copper is highly toxic to fish, amphibians, and invertebrates, while lead also has adverse impacts on aquatic organisms such as developmental problems, muscular and neurological degeneration, reproductive problems, and paralysis (EPA 2019e). Copper has low potential for bioconcentration in fish, but high potential in mollusks, while lead does not bioaccumulate and tends to decrease with increasing trophic levels in freshwater habitats (EPA 2019e). As previously described, the USGS (2016b) found that concentrations of metals in surface water samples collected at the Memorial following past fireworks displays were within the range of concentrations collected at the reference sites outside the Memorial. This suggests that 10 years of fireworks displays from 1998 through 2009 either did not elevate metals or elevated metals attenuated before the first year of USGS monitoring in 2011. The potential exists that metals could settle out of the water column and into benthic sediments, and these sediments then could be remobilized into the water column each time these bottom sediments are disturbed by high water flows. In addition, organisms that live or feed in benthic sediments would have increased exposure to metals, if present.

Elevated levels of copper and lead (83 and 100 mg/kg, respectively) were found in soils at the sampling site closest to the fireworks launch site in Lafferty Gulch (USGS 2016b). These levels exceeded the NPS ecological screening values for birds (28 mg/kg for copper and 56 mg/kg for lead) and mammals (49 mg/kg for copper and 11 mg/kg for lead). Potential adverse impacts of copper exposure on birds include both reduced growth rates and egg production and developmental abnormalities. In mammals, adverse effects can include liver cirrhosis, necrosis in the kidneys and brain, gastrointestinal distress, lesions, low blood pressure, and fetal mortality (EPA 2019e). Potential adverse impacts on birds and mammals from lead exposure include damage to the nervous system, kidneys, and liver; sterility; growth inhibition; developmental retardation; and detrimental effects in blood. However, these impacts are generally the result of exposure from ingesting lead shot, sinkers, or paint, rather than food chain exposure from inorganic lead (EPA 2019e).

Because elevated copper and lead concentrations were found at the site closest to the previous fireworks launch site, future copper and lead contamination would be expected to be greatest in the areas closest to the launch site. Impacts on birds and mammals from ingestion of copper and lead would be expected to be localized near the launch site and within the fallout zone and would affect individuals rather than populations. The degree and severity of impacts would depend on the chemical composition and number of fireworks used, and other variables such as the degree of combustion, as previously described for other contaminants.

It is assumed that the release of metals to environmental media within the Memorial would be comparable to previous fireworks shows, and contamination levels observed in environmental media would gradually increase each year that fireworks events occur. The amount released per event is not expected to exceed the amount released in previous events. Because previously measured levels were the result of 10 years of fireworks events, metals levels would not be expected to exceed levels measured previously for several years. A pre- and post-event surface water and soil monitoring program would also be in place to ensure that any increase in metals contamination would be detected as early as possible (see Section 2.1.3).

3.4.2.4 Cumulative Impacts

As discussed above, previous fireworks displays contributed to contamination of surface water, groundwater, and soil with associated impacts on natural resources within the Memorial. Potential future displays would add an additional amount of contaminants to this impacted area. Future displays may reverse the natural attenuation that has been observed in perchlorate concentrations in groundwater and surface water since fireworks ceased.

3.4.3 Impacts of Environmental Contaminants in Alternative 2

Under the no action alternative, no new contaminants would be released to the environment from an Independence Day celebration fireworks display. Existing contaminants from previously conducted fireworks events would continue to persist for an unknown length of time. Unexploded ordnance within the fallout zone not previously collected likely have already degraded and released their load of contaminants into the environment. Existing monitoring programs at the Memorial would continue. No new impacts on human health and safety or natural resources would be expected, and natural attenuation of contaminants from past fireworks displays would continue.

3.4.3.1 Cumulative Impacts

As discussed above, previous fireworks displays contributed to the contamination of water resources, which resulted in impacts on natural resources within the Memorial. There would be no new impacts under the no action alternative.

3.5 Cultural Resources

The NPS has defined the area of potential effect for cultural resources as the boundaries of the Memorial or about 1,278 acres within the Black Hills of South Dakota. The Memorial's period of significance extends from 3,500 BC to AD 1967, and the cultural resources found range from pre-contact archeological sites to structures built during the Mission 66 era (Historic Resources Group, Inc. 2013). Recent timeframes in the period of significance include sculpture construction (1925 – 1941), Mission 66 program era (1956 – 1966), and Parkscape USA program (1967 – 1972) (Carr et al. 2015).

The Memorial was established in 1925 to commemorate democratic ideals and institutions and to memorialize four presidents who best represented those ideals – Washington, Jefferson, Lincoln, and Theodore Roosevelt. The sculpture was the idea of Doane Robinson, State Historian for South Dakota, who originally considered constructing the sculpture in Custer State Park. However, Danish-American sculptor Gutzon Borglum selected Mount Rushmore and led the planning and construction of the sculpture. Planning and execution of the sculpture took place from 1925 to 1941 (Paula S. Reed & Associates 2016). Much of the Memorial's infrastructure was built by the Civilian Conservation Corps in the late 1930s and early 1940s.

3.5.1 Current General Conditions – Cultural Resources

3.5.1.1 Mount Rushmore Cultural Landscape and Historic District

A Cultural Landscape Inventory was conducted in 2014, which identified Spatial Organization, Natural Systems and Features, Cultural Traditions, Circulation, Vegetation, Topography, Buildings & Structures, Small Scale Features, and Views & Vistas as contributing characteristics of the landscape (NPS 2014). The landscape is significant for its preservation of natural resources and the natural setting of the Black Hills. Exposed granite that forms the raw material for the sculptures, rugged terrain, and old growth ponderosa pine are integral components of the natural setting. The vegetation is particularly significant to the setting and feeling. Ponderosa pine was planted in the 1960s to better frame the view toward the sculpture and to screen the talus slope below the sculpture. Old growth ponderosa pine, which covers approximately 66% of the Memorial, is now extremely rare in the Black Hills (see Section 3.3, Wildfire).

The cultural landscape is significant for its association with Northern Great Plains tribes, and the importance of the Black Hills to these tribes cannot be overstated. Since time immemorial, the Lakota have occupied the Black Hills (or *paha sapa*), the “heart of everything that is” (*Wamakaognaka E’Cante*). The 1851 Horse Creek Treaty and the subsequent 1868 Fort Laramie Treaty were signed by the federal government and several Tribal Nations, and established expansive reservations of millions of acres, including the Black Hills where the Memorial is located. Not long after these treaties were signed, persistent encroachment by white settlers and the military reduced the size of the reservations. The Fort Laramie Treaty was abrogated by the federal government in 1877, resulting in the exclusion of much of the original treaty land (including the Black Hills) from the reservations. In 1980, the Supreme Court found that just compensation to the Sioux Nation of Indians had not occurred for lands taken by the United States. The ownership of the Black Hills remains disputed by a number of tribes.

The Six Grandfathers, a mountain of great significance to the Lakota, was called several different names by white settlers and explorers; the United States Board of Geographic Names officially recognized the name “Mount Rushmore” in 1930. In the early 1900s, the faces of four presidents were carved into the mountain, and this act is regarded by many tribes as a desecration.

The Memorial’s historic district is also identified as a significant feature of the cultural landscape and was administratively nominated for listing in the National Register of Historic Places in 1966. It was affirmed for listing in 1984 under Criterion A (American values and federal work programs), Criterion B (Gutzon Borglum), Criterion C (work of a master and rustic and modern architecture), and Criterion D (archeological data) (NPS 1966, 1984). The historic district was updated in 2013 to encompass the entire Memorial, and this increased the number of contributing resources from 8 to 33 (Historic Resources Group, Inc. 2013).

Contributing buildings, structures, and objects include the original eight nominated in 1984: the sculpture (formally titled “Shrine of Democracy”), Hall of Records, Sculptor’s Studio, residence, lift platform, historic compressor (object), one water reservoir, and stairways. Buildings, structures, sites, and objects listed under the 2013 updated nomination include an apartment building for Memorial personnel, a maintenance garage, the Flank restroom, a residence garage, water reservoir, a talus slope of sculpture debris below the sculptures, Observation Point (and associated path), Iron Mountain Road, South Dakota Highway 244, Profile view pull-off, service roads, stone culverts, stone retaining walls, curbing and steps, a guard shack, and the Borglum Memorial View Terrace. Contributing objects include sculpture tools and equipment, searchlights, and telephone poles. Twenty-four buildings and structures are noncontributing to the historic district.

3.5.1.2 Archeological Resources and Traditional Cultural Sites

The updated 2013 historic district nomination includes six significant archeological sites, including two precontact Native American artifact scatters, two mining-related sites, and segments of the Horse Thief Lake Road (replaced by SD 244) (Historic Resources Group, Inc. 2013). The updated nomination also identifies a general area original to the carving and early tourism period (referred to as the visitor core) that requires further study to determine what is original and what was adaptively reused by the NPS. Cultural resource data provided by the Midwest Archeological Center identify a total of 34 archeological resources within the Memorial boundary. Of these, only two archeological sites date from the precontact period; the remaining sites are historical and predominantly mining related.

The number of precontact archeological resources is comparatively few given the size of the Memorial and when compared to the surrounding region (Rom et al. 1996). During consultation with Tribal Historic Preservation Officers, the adequacy and completeness of the existing archeological survey data has been questioned (see Chapter 4), and additional resources (both tangible and intangible) may be located in the Memorial that are not yet documented.

3.5.2 Impacts on Cultural Resources of Alternative 1

The preferred alternative has the potential to cause both direct and indirect impacts on contributing resources to the historic district and cultural landscape, and to traditional values of associated tribes.

Tribal consultation conducted by the NPS to evaluate the effects of reinstating a fireworks show at the Memorial has identified concerns about the appropriateness and potential effects of celebrating Independence Day at the Memorial. As noted above, the Black Hills are sacred to

many tribes and there remain issues with the very establishment and carving of the Memorial in an area of profound cultural value to tribes.

The few significant known tangible archeological resources within the Memorial would not likely be impacted by fireworks or wildfire directly because of their nature and location, but could be affected by wildfire response. These resources would be avoidable using specific response measures.

An additional tribal cultural sites survey would be conducted prior to the event to document both tangible and intangible resources, and measures to protect any newly documented sites would be developed through consultation with tribes (see Section 4.2, Tribal Consultation). All tribes consulted objected to the event and regard it as inappropriate and an adverse effect.

Potential auditory and visual effects to tribal people conducting ceremonies after dark near the Memorial would be short term and would be similar in duration and impact to other fireworks displays conducted in the local area during the same weekend.

The 2015 *Foundation Document: Mount Rushmore National Memorial* identifies fireworks as a major threat to the sculpture, based on the nature of the fireworks program from 1998 to 2009 and its impacts on the cultural resources of the Memorial. If fireworks are launched from the Hall of Records area, short-term impacts would occur on the Hall of Records area from construction of a platform from which the fireworks mortars would be launched from within the canyon leading to the Hall of Records. The fireworks show would lead to the deposition of unexploded ordnance and mortar debris within the minimum separation distance, causing impacts on the historic district and cultural landscape. Although it would be the responsibility of the fireworks contractor to remove unexploded ordnance and fireworks debris from the minimum separation distance, the rugged topography of the area would preclude complete recovery of unexploded ordnance and debris. Unexploded ordnance fallout and fireworks malfunction have the potential to cause impacts on buildings, structures, and the cultural landscape from burn marks and scorching, which occurred during past shows. A fireworks malfunction within the Hall of Records area could cause adverse impacts on the walls and the entrance to the Hall of Records. Elevating the platform above the Hall of Records reduces the potential for these impacts.

Impacts on the historic district and cultural landscape could occur from unexploded ordnance fallout, the ignition of wildfires, and the subsequent response to contain and extinguish the wildfire. Wildfire has the potential to impact contributing resources to the historic district, especially combustible resources such as buildings, and to adversely impact the cultural landscape, including vegetation, natural systems, views and vistas, and cultural values and traditions. Wildfire response could require overland access by brush trucks and the excavation of hand lines to contain the fire. (See Section 3.3, Wildfire for additional information on the impacts of wildfire.)

3.5.2.1 Cumulative Impacts

Past, present, and reasonably foreseeable future actions include past fireworks shows (1998 to 2001 and 2003 to 2009) that have left unexploded ordnance and debris across the historic district and cultural landscape. Much of the past unexploded ordnance and debris has fallen on the talus slope, a contributing resource to the historic district and cultural landscape. Past fireworks events have left burn marks on top of the sculpture and embedded plastic debris. The preferred alternative would result in additional unexploded ordnance and debris on the landscape. MPB infestation has already led to the loss of portions of the ponderosa pine forest, increasing the risk

of wildfire and the loss of vegetation that contributes to the cultural landscape (see Section 3.3, Wildfire). Impacts from previous displays would persist, including burn marks on the top of the sculpture.

3.5.3 Impacts on Cultural Resources of Alternative 2

Under the no action alternative, the Independence Day celebration at the Memorial would not include a fireworks display and would be similar to recent years with various performances and activities in the amphitheater. There would be no additional impacts on cultural resources from unexploded ordnance or fireworks debris, or additional risk of wildfire from a fireworks display. Impacts from previous displays would persist, including burn marks on the top of the sculpture.

3.5.3.1 Cumulative Impacts

Past, present, and reasonably foreseeable future actions that would contribute to cumulative effects under the no action alternative would be similar to the preferred alternative; however, in the absence of a fireworks display in 2020, no additional unexploded ordnance, debris, or other cumulative effects on cultural resources would occur.

Chapter 4. Consultation and Coordination

4.1 Agency Consultation

The NPS coordinated with the following agencies for preparation of this EA:

- Black Hills National Forest
- South Dakota State Historic Preservation Office
- State of South Dakota Governor's Office
- U.S. Fish and Wildlife Service
- U.S. Forest Service
- U.S. Geological Survey

4.2 Tribal Consultation

The Memorial initially invited the following tribes to consult on this project:

- Arapaho Tribe of the Wind River Reservation, Wyoming
- Assiniboine and Sioux Tribes of the Fort Peck Indian Reservation, Montana
- Cheyenne River Sioux Tribe of the Cheyenne River Reservation
- Crow Creek Sioux Tribe of the Crow Creek Reservation, South Dakota
- Flandreau Santee Sioux Tribe of South Dakota
- Lower Brule Sioux Tribe of the Lower Brule Reservation, South Dakota
- Northern Cheyenne Tribe of the Northern Cheyenne Indian Reservation
- Oglala Sioux Tribe
- Rosebud Sioux Tribe of the Rosebud Indian Reservation, South Dakota
- Spirit Lake Tribe, North Dakota
- Sisseton-Wahpeton Oyate of the Lake Traverse Reservation, South Dakota
- Standing Rock Sioux Tribe of North & South Dakota
- Yankton Sioux Tribe of South Dakota

Letters were sent to each of the 13 tribes in September and December 2019. Emails were also sent to each tribe in August, September, October, November, and December 2019. All 13 tribes were invited to participate in an internal scoping workshop on the project, held on October 21-22, 2019. No tribal representatives attended the scoping workshop, and the notes were distributed to all 13 tribes. The internal administrative draft of the Environmental Assessment was provided to these 13 tribes for review and comment on December 20, 2019.

In the letter sent on December 9, 2019, the NPS invited the 13 tribes to attend a government-to-government consultation meeting on January 15, 2020 in Rapid City, South Dakota. Five tribes (Northern Cheyenne Tribe, Spirit Lake Tribe, Assiniboine and Sioux Tribes of Fort Peck, Northern Arapaho, and Rosebud Sioux Tribe) attended this meeting.

Several substantive comments and recommendations were recorded at the January 15 meeting. The tribes in attendance expressed an overall objection to the event and its impacts. They also requested that an additional cultural sites survey be conducted, involving tribal surveyors, and recommended delaying the fireworks event for another year or more, to allow for additional planning.

After a deeper examination of ethnographic ties to the Memorial, seven additional tribes having cultural association with the Memorial were invited to consult on the project, in a letter dated February 5, 2020:

Crow Tribe of Montana
Cheyenne and Arapaho Tribes of Oklahoma
Three Affiliated Tribes of the Berthold Reservation, North Dakota
Kiowa Indian Tribe of Oklahoma
Santee Sioux Nation, Nebraska
Shoshone Tribe of the Wind River Reservation, Wyoming
Fort Belknap Indian Community of the Fort Belknap Reservation

Based on input received at the January 15 meeting, an additional meeting to plan for a tribal cultural sites survey was held February 20-21, 2020; all 20 sovereign tribal nations traditionally associated with the Memorial (listed above) were invited to attend. Eight tribes attended this meeting: Rosebud Sioux Tribe, Spirit Lake Tribe, Assiniboine and Sioux Tribes of Fort Peck, Northern Cheyenne, Oglala Sioux Tribe, Cheyenne River Sioux Tribe, Northern Arapaho, and Yankton Sioux Tribe. A representative from the Cheyenne and Arapaho Tribes of Oklahoma called in for portions of the meeting.

The February 20-21 meeting confirmed that the proposed cultural sites survey would occur by mid-May 2020, and an additional government-to-government consultation meeting regarding the Independence Day event would then be planned following the survey. The purpose of this meeting would be to develop mitigation and avoidance strategies for any resources discovered during the tribal survey effort.

Several additional points were raised or reiterated by various tribes at the February 20-21 meeting. Tribes and tribal representatives stated that:

- The NPS needs to consult with tribes in a manner consistent with the individual consultation protocols of each tribe;
- A traditional cultural properties (TCP) survey needs to be conducted, with tribal surveyors;
- Any resources discovered during the TCP survey need to be included as factors in this EA. The timing of the EA's release is therefore critical;
- The Black Hills landscape is a TCP for many tribes, and is inexplicably sacred;
- The Black Hills is a traditional cultural landscape (TCL) under National Register Bulletin 38, having continued use and significance to native people;
- Fireworks are considered an adverse effect to the TCP and TCL, regardless of the results of the planned survey. Impacts of this proposed action are regarded as anticipatory demolition;
- Compliance processes for the fireworks have not proceeded appropriately;
- Disturbances and impacts to cultural resources have already occurred at the Memorial, such as mining, tourism, and road construction;
- If the fireworks ignite a wildfire, fire lines could affect both the surface and subsurface, and disturb cultural resources;
- The Black Hills are disputed treaty land.

During the February 20-21 meeting, President Bear Runner of the Oglala Sioux Tribe read aloud the official position of the Oglala Sioux Tribe, opposing the event based on treaties, federal law, executive order, and the Oglala Sioux Tribe's consultation ordinance.

Additional correspondence regarding the project has been received outside of consultation meetings:

- A comment letter from Chairman Boyd Gorneau of the Lower Brule Sioux Tribe was received on January 2, 2020. Chairman Gorneau stated that the tribe “objects to the reintroduction of fireworks on the top of Mt. Rushmore” and “cannot countenance or agree with an activity that so clearly ignores the realities of our history and spiritual beliefs.” He described how the Great Sioux Reservation was set apart for the Sioux Nation by the Fort Laramie Treaty of 1868, and how eight years later, “our people were forced to relinquish our rights to the Black Hills.”
- A comment letter from Chairman Robert Flying Hawk of the Yankton Sioux Tribe was received on February 7, 2020. Chairman Flying Hawk stated, “We would like to assert for the record, and in the strongest terms, that we object to the reintroduction of the fireworks at Mount Rushmore.” He expressed concerns related to the proposed event's disruption of ceremonial activities that take place near Mount Rushmore, and the fire risk to people who may be conducting ceremonies in remote locations. Chairman Flying Hawk also emphasized the importance of the Black Hills and the Fort Laramie Treaty of 1868, and stated that “to discharge fireworks within or around our sacred sites would be tantamount to sacrilege and would egregiously violate our cultural and spiritual protocols.”

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Chapter 6. Appendices

Appendix A. Issues Dismissed from Detailed Analysis

Issues related to socioeconomics, visitor experience, safety and event operations, percussive impacts, night skies, wilderness character, threatened and endangered species, air quality, and vegetation were dismissed from detailed analysis as described below.

A.1. Socioeconomics

This section addresses potential socioeconomic effects of the fireworks event on local communities, Memorial visitation, and the Memorial concessioner. In the process of developing the proposed action, NPS considered the following variables in terms of event management:

- The location of seating areas, including the amphitheater, Grandview Terrace, Lot 7, portions of Highway 244, and standing room within the Memorial, and the associated capacities of these areas
- Ticketing all or a portion of the event
- The locations for visitor parking, and the potential for shuttles
- The locations and processing time for event security checkpoints
- The need to close the Memorial to regular visitation for all or a portion of July 3rd

These factors create the potential for both positive and negative socioeconomic impacts, would create impacts limited to the days immediately around the event, and would be negligible overall. Therefore socioeconomic effects were not found to be an important decision-making consideration, and this topic is dismissed from full analysis in the EA.

Local Communities

Previous fireworks events at the Memorial exceeded the capacity of the Memorial parking areas, and visitors parked in the town of Keystone, obstructing the typical visitor turnover for local businesses throughout the day and evening. Similar effects could occur under the Preferred Alternative but are expected to be avoided and mitigated by the development of a traffic and visitor management plan.

The proposed July 3rd fireworks event is not expected to conflict with the six nearby community fireworks displays in Pennington or Custer County. In 2018, Rapid City and nearby communities hosted fireworks displays on June 28th, July 2nd, and July 4th. The town of Custer hosted Custer's Old Time Country Fourth of July Celebration fireworks display on July 4th. Therefore the Memorial event will likely complement 4th of July activities in other nearby communities by providing some visitors with additional activities during their trip to the local area.

Memorial Visitation

The fireworks event involves closing the Memorial to regular visitation on July 3rd, which, based on the three-year (2017-2019) estimated daily visitation records, averaged 28,500 visits. The total number of visitors to the fireworks event will be lower than on an average July 3rd day, given seating capacities, but this depends in part on the selected seating areas and length of Memorial closure. Visitors to the Memorial include those who arrive in private vehicles or commercial tour buses and visit the Memorial facilities, as well as visitors viewing the granite statues of Washington, Jefferson, Lincoln, and Roosevelt (sculpture) from various locations along SD 244. It

is assumed that most visitors and commercial bus tour operators would be aware of, and adapt to, the closure by visiting a different time on their trip to the local area and, therefore, the overall impact on Memorial visitation for the 2020 event would likely be minimal. However, it is possible that some visitors that were unaware of, or were unable to adapt to, the July 3rd closure would be affected. It is anticipated most visitors will adapt to the event closure by visiting on a different day during their trip to the local area, and that Memorial visitation in the days surrounding the event could increase.

Memorial Concessioner

The three-year July 3rd average visitation to the Memorial facilities is 14,000 visits throughout the day. (Of the 28,500 total visits, approximately 50% do not use Memorial facilities; they enter the Memorial to see the sculpture and drive on SD 244 but do not enter the developed areas.) Decreases in visitor spending on parking, food and beverage, and retail purchases at the Memorial facilities may negatively affect concessions revenue on July 3rd, but the level of this impact would depend on the overall visitation to the Memorial during the event. Visitation changes to those viewing the sculpture from SD 244 would not affect Memorial concessions revenue. Under the Preferred Alternative, the Memorial would be closed to public visitation for all or a portion of July 3rd and the proposed firework event would allow approximately 8,000 visitors into the Memorial. Assuming all visitors could access Memorial concessions, the Preferred Alternative's impact on Memorial concessioners could range from near zero, if most visitors are able to adapt, up to 6,000 fewer visitors to Memorial concessions. It is anticipated most visitors will adapt to the closure by visiting on a different time during their trip to the local area and, therefore the event could increase overall visitor spending at the Memorial in the days surrounding the event, leading to a cumulatively minor overall impact.

A.2. Visitor Experience

Impacts on visitor experience was not found to be an important decision-making consideration, and this topic is dismissed from full analysis in the EA. While the July 3rd closure would disrupt regular visitor use on the day of the event, it is anticipated most visitors will adapt to the closure by visiting on a different day during their trip to the local area and Memorial visitation would correspondingly increase in the days surrounding the event. Compared to total daily visitors (28,000 daily in the three-year average), over the course of the year, this is a minor displacement effect. In addition, visitors to the fireworks event would have a unique experience viewing fireworks at the Memorial and, if broadcasted, a large television or online audience. Therefore, adverse impacts on the visitor experience would be minimal.

Visitor viewing of the sculpture may be impacted during event preparation, as the fireworks contractor transports materials to the launch sites. In addition, the Presidential Trail and the Wrinkled Rock Climbing trailhead, located northwest and outside of the Memorial, would be closed to the public at some point before the proposed event to prevent access by foot into the Memorial and avoid potential safety issues before, during, and after the fireworks display. The NPS would minimize potential adverse impacts on visitor experience by posting the closure in advance and messaging through multiple outlets. Some visitors may experience crowding and wait times during security screening and while entering and exiting the event, but these effects will be mitigated by the Memorial's efforts to raise awareness about the nature of the event.

A.3. Safety and Event Operations

Potential human health impacts from chemicals in fireworks are analyzed in the Environmental Contaminants section; this section focuses on safety related to event operations. Under all alternatives and options, the event would be managed in accordance with applicable codes related to fireworks displays and physical capacities of the event area as established by the State Fire Marshall, as well as best practices for the management of special events. Security measures will be in place to protect attendees and staff. In addition, prior to the fireworks event, a plan would be developed to address event traffic control, visitor management, and emergency response. Operational Leadership principles will be followed to evaluate, avoid, and mitigate potential hazards. Safety and Event Operations is therefore not analyzed as an impact topic.

A.4 Percussive Impacts

Concerns about the potential percussive effects of fireworks during the 1998 to 2009 fireworks events, documented in a record of observation (Jacob 2014), led to a study of the structural stability of the sculpture (Poluga et al. 2018). This study examined a variety of rock stability characteristics, including a probabilistic analysis of the sculpture's response to seismic conditions. The study concluded:

...that the effects of seismic loading on the stability of the entire slopes on which the Memorial sculptures are located, indicates that all of the slopes are safe against failure. This study assumes that if the slopes are stable against the earthquake force modeled, the vibrations produced by air blasts from fireworks will not cause failures along the slopes. In light of these results, vibrations caused by the Fourth of July fireworks celebrations at the Memorial do not pose a threat to the stability of the Sculpture.

While historic structures are also susceptible to percussive effects, there has never been a known instance of effects on historic structures from fireworks. Based on this finding, the percussive impact of fireworks, and other noise-producing activities, such as a potential military overflight, are assumed to have no impact on the sculpture and other historic structures; therefore, this topic is dismissed from detailed analysis.

A.5 Night Skies

The Memorial illuminates the sculpture every evening, year-round, in the immediate area where the fireworks would occur under the preferred alternative. Additional impacts on night skies under the preferred alternative would be negligible and short term (15 to 30 minutes). For these reasons, this topic was dismissed from detailed analysis.

A.6. Wilderness Character

There is no designated Wilderness within the boundaries of the Memorial, but the designated USFS Black Elk Wilderness lies to the west of the Memorial. No planned activities would occur in designated Wilderness under the preferred alternative (see Section 2.1, Alternative 1); however, the fireworks event may affect Wilderness qualities. The five qualities of Wilderness character, as defined in the Wilderness Act of 1964, are: (1) untrammeled; (2) undeveloped; (3) natural; (4) offers outstanding opportunities for solitude or primitive and unconfined recreation; and (5) other features of scientific, educational, scenic, or historical value. Of these, the preferred alternative may result in temporary impacts on opportunities for solitude from the fireworks event. Visitors camping or recreating in the Black Elk Wilderness may experience visual and

acoustic disturbances from the event; however, these disturbances would last for 15 to 30 minutes. The NPS would minimize potential adverse impacts on the Wilderness experience for visitors by posting the event in advance.

In addition, there is a low probability of accidental wildfire igniting as a result of the fireworks event and affecting the Black Elk Wilderness (see Section 3.3, Wildfire for more detail on these potential effects). Therefore, no meaningful effects on Wilderness or Wilderness character are anticipated, and this topic was dismissed from detailed analysis.

A.7. Threatened, Endangered, and Sensitive Species

The northern long-eared bat (*Myotis septentrionalis*) is listed as threatened under the ESA and is present at the Memorial. The bat could be subject to fireworks and aircraft noise, and could occur in areas subject to fire risk, as described in Section 3.3, Wildfire. However, wildfire effects are temporary, of low probability, and do not constitute incidental or purposeful take, as defined in the 2016 USFWS Programmatic Biological Opinion for the northern long-eared bat (USFWS 2016). The bats are sensitive to acoustics, but are likely to be in roosts and remain sheltered during the event. Under the preferred alternative, no tree removal is planned during preparation of launch sites or during the proposed event, and hibernating bats would not be affected.

The NPS consulted with the USFWS using the Information for Planning and Consultation (IPaC) tool on December 4, 2019 regarding the northern long-eared bat. The NPS received a letter from the USFWS on December 4, 2019 indicating that the proposed fireworks event is consistent with activities analyzed in the northern long-eared bat Programmatic Biological Opinion (USFWS 2016, 2019). The USFWS concurred with the determination that the event may affect the northern long-eared bat, but that any take that may occur as a result is not prohibited under the northern long-eared bat 4(d) rule (USFWS 2019). Actions completed in accordance with the final rule are not likely to jeopardize the continued existence of the species.

The USFWS species list accessed through the IPaC system on December 4, 2019 (USFWS 2019) indicates that four additional ESA-protected species could occur at the Memorial: the least tern (*Sterna antillarum*), the red knot (*Calidris canutus rufa*), the whooping crane (*Grus americana*), and Leedy's roseroot (*Rhodiola integrifolia* ssp. *Leedyi*). The Memorial does not contain habitat for these species, and they are not known to occur at the Memorial. This letter verifies that the Programmatic Biological Opinion (USFWS 2016, 2019) satisfies and concludes NPS responsibility for the preferred alternative under ESA Section 7(a)(2) with respect to the northern long-eared bat.

The red knot and least tern are both shorebirds, and suitable habitat for these species does not occur at the Memorial. The only known wild population of whooping cranes nests in Canada and winters in Texas. Their migration occurs in the fall several months after the proposed fireworks event, and their migration route is not known to include the Memorial. A comprehensive bird survey of the Memorial (Panjabi 2006) and subsequent bird monitoring by Bird Conservancy of the Rockies (NPS 2016) did not find any evidence of these species. Leedy's roseroot also is not known to occur at the Memorial (NPS 2002; Marriott and Mayer 2005) and is found only in Minnesota and New York. The NPS has determined that the proposed fireworks event would have no effect on these four listed species. Additionally, the IPaC tool (USFWS 2019) indicated that no critical habitat for any of these species occurs in the project area.

The bald eagle (*Haliaeetus leucocephalus*) and golden eagle (*Aquila chrysaetos*) are protected under the Bald and Golden Eagle Protection Act. Bald eagles are present at the Memorial in the

winter but would not be expected to occur at the Memorial in the summer and, thus, would not be affected by the fireworks event. Golden eagles have not been documented at the Memorial and are not expected to occur (Panjabi 2006).

Locally listed sensitive species were also considered in the planning process. The Black Hills National Forest Region 2 lists several sensitive species that could be impacted by actions under the preferred alternative, including the northern goshawk (*Accipiter gentilis*), black-backed woodpecker (*Picoides arcticus*), and several bat species: fringed myotis (*Myotis thysanodes*), hoary bat (*Lasiurus cinereus*), spotted bat (*Eduerma maculatum*), and Townsend's big-eared bat (*Corynorhinus townsendii*). In South Dakota, black-backed woodpeckers are also listed as a Species of Greatest Conservation Concern in the Black Hills ecoregion (South Dakota Department of Game, Fish, and Parks 2014).

The northern goshawk is expected to occur in the Memorial (Panjabi 2006), but there are no confirmed observations of this species (Panjabi 2006; NPS 2016). The bird breeds in the surrounding area, and the Memorial contains good potential nesting habitat for the species (mature ponderosa pine with open midstory). The black-backed woodpecker has been observed in the Memorial (NPS 2016). The species depends on forest disturbance, and in the Black Hills, higher abundance of black-backed woodpeckers is associated with MPB infestation and recent wildfire (Matseur et al. 2018). The fringed myotis, hoary bat, and Townsend's big-eared bat occur at the Memorial, but the spotted bat does not (Licht 2018; Abernethy 2018). Wildfire effects on these sensitive species are anticipated to be temporary and of low probability (see Section 3.3, Wildfire), and no tree removal is planned under the preferred alternative. Under the preferred alternative, acoustic effects on these species from aircraft and fireworks would be short-term.

For these reasons, this topic was dismissed from detailed analysis. General effects on wildlife and wildlife habitat are discussed in Section 3.3, Wildfire and Section 3.4, Environmental Contaminants of this EA.

A.8. Air Quality

Air quality may be affected by emissions from the vehicles of visitors, fireworks contractors, and NPS and event partners before, during, and after the event. These impacts would be no greater than, and possibly less than, normal Memorial operations because of the limited number of visitors on that day compared to other summer days. There may be air quality impacts from the potential use of helicopters for event staging and teardown, and by military aircraft from a potential flyover. These impacts would be a negligible addition to regular aircraft traffic in the region. Air quality could also be affected by smoke from the fireworks display; however, these effects are expected to be short-term and negligible and smoke would be expected to dissipate soon after the event. The topic was therefore dismissed from detailed analysis.

A.9. Vegetation

Impacts to vegetation from wildfire are analyzed in Chapter 3.3, Wildfire. Other potential impacts to vegetation include trampling of vegetation from large crowd sizes. This topic was dismissed from detailed analysis due to the event's short-term and minor anticipated effects to vegetation.

Appendix B. Memorandum of Agreement Between the Department of the Interior of the United States of America and the State of South Dakota



MEMORANDUM OF AGREEMENT

BETWEEN

**THE DEPARTMENT OF THE INTERIOR
OF THE UNITED STATES OF AMERICA**

AND

THE STATE OF SOUTH DAKOTA

WHEREAS, Independence Day is the annual commemoration of the birth of the United States of America and the ideals on which the Nation was founded, including life, liberty, and the pursuit of happiness;

WHEREAS, in 1776, President John Adams said that Independence Day “ought to be solemnized with Pomp and Parade...Bonfires and Illuminations from one End of this Continent to the other from this Time forward forever more;”

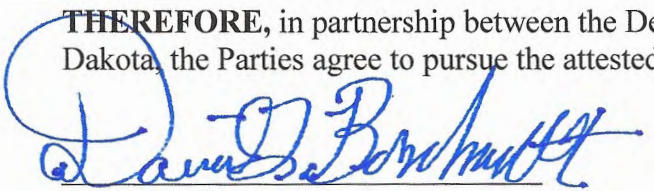
WHEREAS, there is a long history of celebrations of American independence at Mount Rushmore National Memorial, including fireworks displays from 1998 to 2009, through cooperation among local agencies, Mount Rushmore Society, State of South Dakota, Department of the Interior, and other Federal Agencies;

WHEREAS, these events provide opportunities to celebrate the Nation’s founding fathers, the spirit of democracy, and provide an iconic backdrop for the enjoyment and education of a diverse local, national, and international audience;

WHEREAS, the significance of Independence Day holds special meaning at Mount Rushmore National Memorial, where sculpted into granite are the colossal faces of the father of the Nation, the author of the Declaration of Independence, the President who saved the Union, and the President who led that Union into the 20th century and championed conservation; and

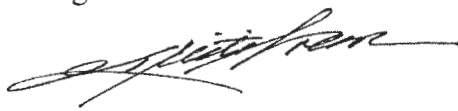
WHEREAS, the State of South Dakota and the Department of the Interior have committed to an agreement to exercise their full authorities under State and Federal law to work to return fireworks to Mount Rushmore National Memorial in a safe and responsible manner on July 3, July 4, or July 5, beginning in the year 2020.

THEREFORE, in partnership between the Department of the Interior and the State of South Dakota, the Parties agree to pursue the attested by their signatures:



Secretary
Department of the Interior

Date: **MAY 06 2019**



Governor
State of South Dakota

Date: **MAY 06 2019**



As the nation's principal conservation agency, the Department of the Interior has the responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

NPS MORU 323/166734

Independence Day Holiday Fireworks Event

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National Park Service
U.S. Department of the Interior

Mount Rushmore National Memorial
South Dakota



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