



Fire Management Plan

Environmental Assessment

November 2022





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

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ON THE COVER

Pile Burning on Oregon Caves National Monument and Preserve
Photo by Ivan Yates, National Park Service

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1 Proposed Action

The National Park Service (NPS) is considering updating the Fire Management Plan (FMP) for the Oregon Caves National Monument and Preserve (ORCA, or Monument and Preserve, or “park”), Oregon, in order to conform with current NPS policy; identify and prioritize manual, mechanical, and prescribed fire treatments; and promote a fire management strategy based on natural ecological processes and conditions characteristic of park ecosystems.

In this Environmental Assessment (EA), the NPS considers the following three alternatives:

1. No action, fire management would include ongoing wildland fire suppression.
2. Fire management and forest resiliency treatments to include wildland fire suppression, manual fuels reduction, pile burning and broadcast prescribe fire.
3. Fire management and forest resiliency treatments to include wildland fire suppression, manual fuels reduction, pile burning and broadcast prescribe fire, and mechanical reduction (e.g., use of masticators, processors, forwarders, and feller bunchers skidders).

This EA has been prepared in accordance with the National Environmental Policy Act (NEPA), NPS Director’s Order 12, and 2015 NPS NEPA Handbook (NPS 2015a).

2 Purpose and Need

The NPS is required to have Fire Management Plans for all units with burnable vegetation as defined by Reference Manual 18: Wildland Fire Management - National Park Service (NPS 2019). Recent revisions to Department of the Interior and NPS fire management policy have resulted in changes to the requirements associated with FMPs, including new formats and templates.

The current FMP was written eight years ago and only applies to the 480-acre National Monument (Monument). No plan exists for fire management of the 4,070-acre Preserve added to ORCA in 2014. Figure 1 shows the location of ORCA and the administrative boundaries for the Monument and Preserve. A new FMP is needed to address current issues including:

- Managing wildland fire to protect the public, park communities, and infrastructure.
- Conserving natural and cultural resources.
- Managing emergency exits from the park.
- Maintaining and restoring natural ecosystems and processes.

The proposed FMP update is also needed to conform to current NPS FMP policy, improve fire and fuels management activities, and, ultimately, to improve landscape resilience and reduce the likelihood of catastrophic wildfires in the future. The proposed FMP update and treatment plan would meet the needs of current NPS policy and ORCA resource management objectives.

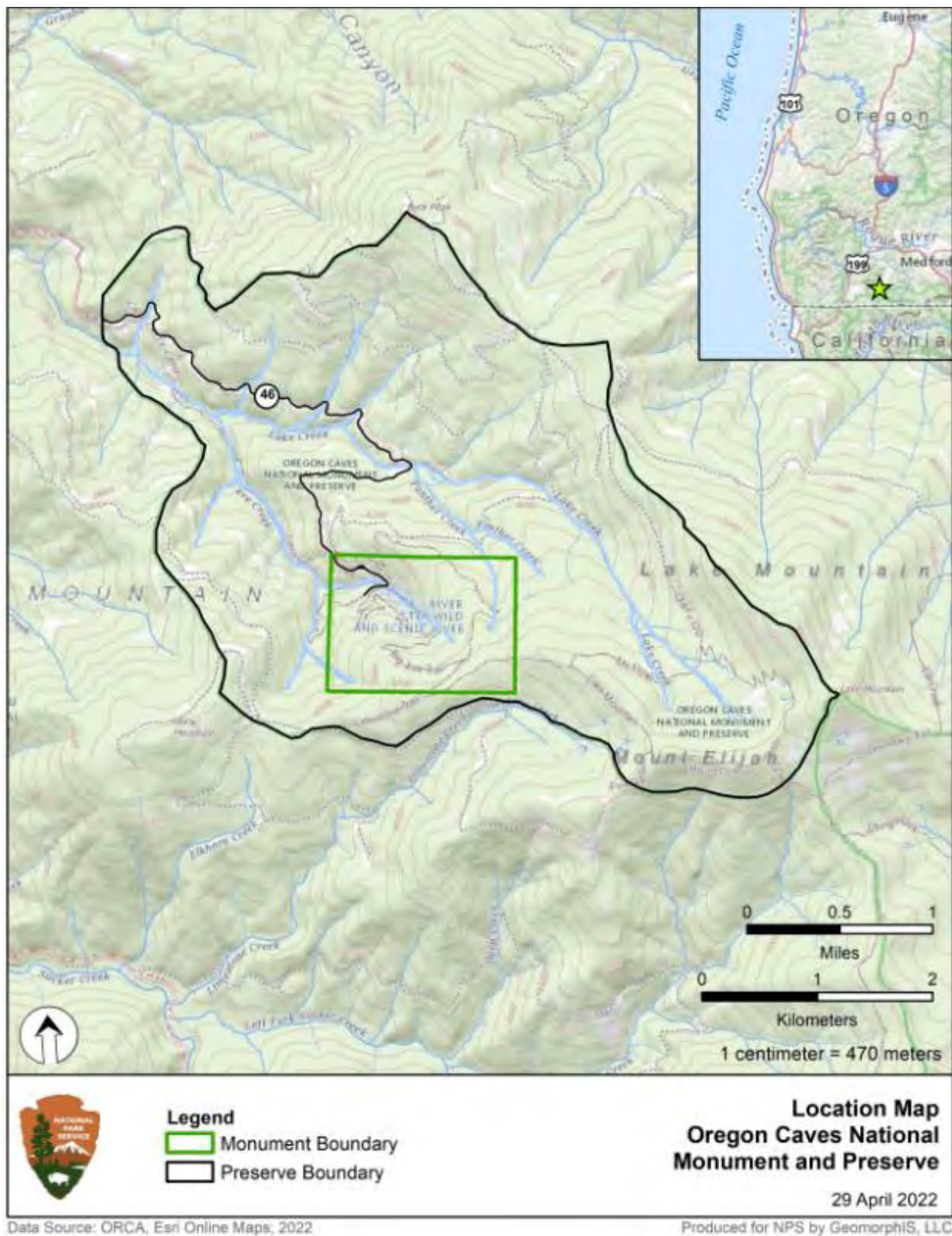


Figure 1. Location of Oregon Caves National Monument and Preserve.

3 Issues

Issues Selected for Detailed Analysis

Identifying significant issues related to a proposed action is an important part of scoping. In the context of NEPA reviews, “issues” or “environmental issues” can be problems, concerns, conflicts, obstacles, or benefits that would result if the proposed action or alternatives, including the no-action alternative, are implemented (NPS 2015a, pp. 50-51). Issues may be raised by the NPS, other agencies, tribal governments, or the public. An NPS Inter-disciplinary Team (IDT), composed of park and regional subject matter experts, conducted an initial “screening” assessment to determine which resources would likely be affected by the proposed action and alternatives under consideration. The following impact topics and related environmental issues were identified in internal scoping, and subsequent public scoping, as key resources of concern. Potential beneficial and adverse effects to these resources are analyzed for each alternative.

Air Quality: Air quality could be moderately affected by smoke from local slash burning in spring and by prescribed burns and wildfires occurring at other times of the year.

Non-native or Exotic Species: Non-native plants and *Phytophthora* (a type of parasitic brown algae) could be spread by water, animals, boots, and vehicles during fuel and fire management activities.

Species of Special Concern or Their Habitat: Fire and fuels management activities could harm or improve special status species and their habitat when reducing overloaded fuels and thick vegetation and reducing canopy density in shaded fuel breaks.

Native Vegetation: Fire and fuels management activities could harm or improve vegetation condition and enhance ecosystem resilience.

Wildlife and Wildlife Habitat: Fire and fuels management activities could harm terrestrial and aquatic species (e.g., by temporary removal of cover/forage/shade, or causing injury or death), but could allow long-term improvement of forage, habitat, and cover, and reduce potential harm to terrestrial and aquatic organisms and habitat by catastrophic wildfires.

Cultural Resources - Archeology: Fire and fuels management activities could potentially disturb/damage surface and near-surface cultural resources.

Historic Structures and Landscapes: Fire and fuels management activities could potentially disturb/damage or reduce risk to prehistoric and historic surface structures and disrupt or enhance cultural landscapes.

Museum Collections: Buildings and the museum collections they hold are at risk of destruction in the event of an uncontrolled fire. Fire and fuels management activities could reduce the risk.

Geologic Features and Soils: Fire and fuels management activities have the potential to alter the flow of water, nutrients, and minerals into the protected cave system, thereby changing geologic conditions within the caves. Alterations in water chemistry could alter geologic processes within the

caves. Fire and fuel management activities have the potential to temporarily increase soil erosion and sedimentation on a treatment site.

Water-Related Resources: Fire and fuels management activities could temporarily remove vegetation cover and may disturb the soil surface, resulting in potential increase in sedimentation, and surface runoff to downstream aquatic systems. The removal of shading vegetation could increase stream water temperatures, while runoff could increase chemical and nutrient loads to aquatic systems.

Issues Considered but Dismissed

The NPS IDT examined several other park impact topics and environmental issues but, upon further development of the proposed alternative treatments, determined the related resources would not be significantly affected by any of the alternatives under consideration (per NPS NEPA Handbook, pp. 50-51; NPS 2015a).

Environmental Justice: Executive Order 12898 requires federal agencies to identify and address disproportionately high and adverse human health or environmental effects of their programs and policies on minorities and low-income populations or communities. ORCA is located in a relatively remote area of southwest Oregon. The proposed fire and fuels management activities would not result in disproportionately high direct or indirect adverse effects on minority or low-income populations or communities.

Indian Trust Resources: Executive Order 13175 requires early consultation if a proposal is to have substantial direct effect on Indian Trust Resources. The proposed project area does not contain Indian Trust Resources. The proposed action would not affect these resources.

Landscape-Level Resources (including lightscapes, soundscapes, and viewsheds): The transitory nature and limited areal extent of each fuel treatment and prescribed burn, would have no noticeable effect on these resources over the project area, or park as a whole. Fire and post-fire alterations to vegetation structure are a natural part of the park ecosystem, and fire management activities would be planned to promote beneficial changes to these resources.

Visitor Use and Experience (including recreational resources and public safety): The transitory nature and limited areal extent of each fuel treatment and prescribed burn, would have no significant effect on visitor use of the park, beyond normal park management and maintenance activities. Fire management activities would be scheduled to avoid high-use visitor periods, and advance notice would be made of any visitor-use areas temporarily closed for safety or post-fire restoration activities.

Human Health and Safety (NPS and contractor staff): Prescribed burning and vegetation treatment activities are inherently dangerous to field workers. Field staff would follow all NPS health and safety rules, regulations, and best management practices associated with wildland and prescribed fire activities, which are not specific to any of the proposed actions.

Wild and Scenic Rivers (WSR): The WSR River Styx flowing within Oregon Caves, along with the WSR eligible Lake Creek and upper Cave Creek, are analyzed with other perennial creeks in the Water-Related Resources section. None of the proposed actions would alter the National Wild and Scenic River designation.

4 Alternatives

Alternative 1: No Action

Under Alternative 1, the No Action Alternative, fire management would include ongoing wildland fire suppression within the park, as well as previous activities approved for the Monument only, including manual thinning, pile burning, and broadcast burning on approximately 277 acres of previous treatment areas (See ORCA Unpublished Draft FMP; NPS 2016). There would only be small hazard-tree reduction projects and no landscape-scale fuels management program implemented within the Preserve and therefore little reduction of wildland fire risk on Preserve lands. Wildfire suppression would include direct attack with hand tools and saws, mechanical equipment where allowed (dozers, masticators, feller bunchers engines, tenders pumps); and indirect attack with hand tools and saws and mechanical equipment, where allowed. Aerial suppression activities would include water and retardant drops by helicopter and air tankers.

The risk of large fires and unwanted high-severity fire impacting ORCA would remain high, with no reduction in risk to mature forests and wildlife habitat, and no improvement to ingress/egress safety of staff or public within the park. No strategic fuelbreaks would be implemented to connect previous fuels projects in the Monument to defensible areas in the Preserve. See Appendix A – Proposed Fire Management Treatments, for details of the No Action Treatment prescriptions.

Alternative 2: Manual Treatments

Under Alternative 2, Manual Treatments, fire management and forest resiliency treatments would include wildland fire suppression, manual fuels reduction, pile burning and broadcast prescribe fire, without the use of heavy equipment off roads/developed areas as described in Alternative 3. The total approximate planned acres for Alternative 2 is 1,073 acres within previous treatment areas and current planned areas.

ORCA would utilize hand thinning and prescribed fire (broadcast and pile burning) to alter fuel conditions around interface and developed areas, in strategic locations of potential control locations (including road edges, trail corridors, and ridge lines), to protect public and staff ingress and egress, to restore fire as an ecosystem process, and to increase forest resiliency considering changing climates and fire regimes. Projects may be re-treated to control re-sprouting vegetation and maintain previous treatments as needed, generally on a 3 to 10-year interval depending on abundance of understory shrubs and resprouting hardwoods, aspect, and elevation. See Appendix A – Proposed Fire Management Treatments, for details of the Manual Treatment prescriptions.

Alternative 3: Manual & Mechanical Treatments (Preferred Alternative)

Under Alternative 3, Manual & Mechanical Treatments, fire management and forest resiliency treatments would include wildland fire suppression, manual fuels reduction, pile burning and broadcast prescribe fire, and mechanical reduction (e.g., use of heavy equipment such as masticators, feller bunchers, tracked chippers, and mini excavators) in specific areas (e.g., slopes less than 30%,

outside riparian and sensitive habitat buffers and avoidance areas, with rehabilitation of all tracks/ruts/depression with appropriate erosion control measures). Fuels reduction mechanical equipment may be utilized on approximately 649 acres of the total 1,073 acres in the previous and currently planned fuels treatment areas. Additionally, there are approximately 765 acres of potential treatment areas on ground that is <30% slope and in specific forest types, where similar projects may be developed in the future. See Appendix A – Proposed Fire Management Treatments, for details of Manual & Mechanical Treatment prescriptions.

Table 1. Summary of Alternatives

Action	Alternative 1: No Action	Alternative 2: Manual Treatments	Alternative 3: Manual & Mechanical Treatments (Preferred Alternative)
Wildland Fire Suppression	Continue Suppression Activities on ORCA	Continue Suppression Activities on ORCA	Continue Suppression Activities on ORCA
Manual Fuels Reduction	Only Projects Planned as Part of the 2016 FMP	Areas Identified in the 2016 and 2022 FMP Treatment Plans	Areas Identified in the 2016 and 2022 FMP Treatment Plans
Pile burning	Only Projects Planned as Part of the 2016 FMP	Areas Identified in the 2016 and 2022 FMP Treatment Plans	Areas Identified in the 2016 and 2022 FMP Treatment Plans
Broadcast Prescribe Fire	Only Projects Planned as Part of the 2016 FMP	Areas Identified in the 2016 and 2022 FMP Treatment Plans	Areas Identified in the 2016 and 2022 FMP Treatment Plans
Mechanical Reduction	None	Heavy Machinery only used on roads or developed areas in support of manual treatments	Areas Identified in the 2016 and 2022 FMP Treatment Plans

5 Affected Environment

Impact Topic

The affected environment consists of “the environment of the area(s) to be affected or created by the alternatives under consideration” (NPS 2015a). The NPS IDT determined that the following impact topics would be potentially affected by Alternative 1 (No Action), Alternative 2 (Manual Treatments), and Alternative 3 (Manual & Mechanical Treatments). Because climate change is an external force influencing all aspects of resource management, we begin this section with a brief overview of how climate change is expected to affect wildfire dynamics within ORCA.

Common to All Impact Topics – Climate Change

The ORCA Resource Stewardship Strategy Summary (“Stewardship Strategy”; NPS 2022b) provides the key issues, stressors, and threats affecting the Monument and Preserve. It touches upon many of

the impact topics analyzed for this EA, including environmental trends and threats associated with anticipated climate change. The Stewardship Strategy summarizes the effect of climate change on wildfire within ORCA:

- Anthropogenic climate change has increased the area burned by wildfire above natural levels for the Western US as a whole, including Southwestern Oregon. The increased heat of climate change has combined with fuel accumulation from unnatural fire suppression to increase surface area burned. The increased summer aridity of projected future climate change increases the risk of large fires in Southwestern Oregon to three times historical frequencies by mid-century. Additionally, long-term fire suppression has changed vegetation composition, increased fuel loads, and increased the risk of catastrophic fire.
- Wildfires can increase tree mortality, alter plant species composition, create disturbance for increased invasion of non-native species, and exacerbate flood risk.
- Increased fire frequency and risk of catastrophic fire poses a significant threat to the National Register of Historic Places (NRHP) listed historic district, which includes a National Historic Landmark, Oregon Caves Chateau. The Historic District is located in an extremely confined space which is much more difficult to defend from wildland fire. The museum collection is housed in an on-site curation facility and had to be evacuated during 2020 Slater Fire, and the Chateau contains original historic furnishing (Golightly, Kramer, and Hamilton 2011).

Key ORCA resources affected by climate change include: native vegetation, riparian and aquatic areas, wildlife, cultural landscapes, historic structures, and museum collections (NPS 2022b).

Air Quality

ORCA is a Class II airshed located in Josephine County, Oregon, which is classified as an attainment area (meeting the National Ambient Air Quality Standards – NAAQS) for 8-hour ozone, particulate matter 10 μm (PM10), particulate matter 2.5 μm (PM2.5), nitrogen dioxide, sulfur dioxide, and lead. The nearest air quality monitoring station to ORCA is located at the Illinois Valley Airport in Cave Junction (13 miles) and in Provolt (15 miles) (NPS 2016).

Most of the air pollution affecting the park comes from regional emission sources outside park boundaries including wildfire, prescribed fire, vehicle exhaust, agriculture (livestock and crop production), dust (paved and unpaved roads), coal-fired power plants, consumer and commercial solvent use, and industrial boilers. Park air quality strategies include implementing goals and activities to improve understanding of conditions and impacts (including smoke), sharing information with stakeholders, collaborating with partners, and improving park environmental leadership (NPS 2022b)

Air quality is moderately affected by local slash burning in spring and at times by regional fires in summer. No other major diffuse or point sources of particulates occur upwind. Increasing residential development in the adjacent Illinois Valley may increase presently minor effects from winter wood burning. Other factors affecting air quality include when surrounding areas experience temperature

inversions or when prescribed burns are in progress. Winds are generally light with prevailing winds coming from a westerly direction (NPS 2016).

Trends: Specific air quality park trends are not available due to lack of an in-park air quality station (NPS 2022b). Interpolating air quality indicator conditions from the park regionally, indicates increasing wildfire occurrence in Southern Oregon and Northern California and increasing smoke impacts on air quality around ORCA (NPS 2022b), and this trend is likely to worsen with increasing wildfire occurrence (Halofsky et al. 2020).

Non-native or Exotic Species

There are 40 non-native vascular plant species known from the Monument and Preserve. Invasive plant and fungal species can be introduced or spread by contaminated material equipment and tools. Invasive plants readily establish in disturbed sites such as fuel breaks and recently burned areas. The most important in terms of numbers of individuals and number of known sites is St. John's wort or Klamath Weed (*Hypericum perforatum*). Hand pulling of all non-native vascular species except grasses has significantly reduced the numbers of individuals and the number of sites in the Monument portion in the last sixteen years, with only recent work to control invasive plants within the Preserve boundary. The composition and extent of non-native or exotic species with the Preserve portion of ORCA is evident along roadways but has yet to be fully assessed. Invasive plant and fungal species can be introduced or spread by contaminated material equipment and tools. Invasive plant and fungal species can be introduced or spread by contaminated material equipment and tools, and readily establish in disturbed sites such as fuel breaks and recently burned areas.

Two non-native *Phytophthora* species threaten the region of the park. *Phytophthora lateralis* has invaded areas of ORCA and affects Port Orford cedar trees. This pathogen causes Port Orford Cedar Root Disease by infecting roots and then moving up the tree, eventually killing it. Port Orford cedar trees are found in moist drainages, where the pathogen is spread by water, and by transfer of infected debris on vehicles, equipment, and hiking boots. A second pathogen, *Phytophthora ramorum* causes Sudden Oak Death Syndrome devastating areas within the bioregion. *P. ramorum* has not yet been found in ORCA but is an invasive threat that has killed more than fifteen trees and shrubs located 30 miles west of ORCA.

Trends: Invasive plant species threaten the structure, function, composition, and diversity of native communities; displace species; alter nutrient cycles and disturbance regimes; and affect visitor experience. Trails and areas surrounding structures within the Monument boundary have had consistent treatment to remove invasive plants since 2008, and show a considerable reduction in invasive plant numbers, with near or complete elimination of invasive species in many areas (Yates 2019). Trails, roads, and facilities within the Preserve border have had limited or no treatment and show considerable impact from invasive plants, particularly St. John's wort, along roads and within meadows.

Species of Special Concern or Their Habitat

Oregon Sensitive Species

The diverse habitat found at ORCA supports a wide variety of species, with some listed as sensitive by the state of Oregon. This includes approximately four amphibians, two birds, and 11 mammals, seven of which are bat species (ODFW 2021a). ORCA provides a hibernaculum and year-round roost for state-listed bat species, including the Townsend's big-eared bat (*Corynorhinus townsendii*), and the fringed bat (*Myotis thysanodes*). Although no fish are found in ORCA streams, the watershed of the park contributes to habitat downstream that supports six state-listed fish species. One state-listed Candidate plant, *Gentiana setigera*, is found in the park.

Federally Listed Wildlife Species

Northern Spotted Owl: potential habitat and Critical Habitat for the federally listed (threatened) northern spotted owl (*Strix occidentalis caurina*) exists in the park. No northern spotted owl residents or nests have been located since 2015. Surveys conducted yearly up to and including 2022 (NPS 2022c).

Franklin's Bumble Bee: potential habitat, and High Probability Zone habitat for the federally listed (endangered) Franklin's bumble bee (*Bombus franklini*) exists in the park. Field surveys have not detected this species since 2012, and it is considered absent from the park. Resurveyed in 2022.

Pacific Coastal Marten: potential habitat for the federally listed (threatened) Pacific coastal marten (*Martes caurina*) exists in the park. No designated Critical Habitat for the marten exists in the park. Field surveys have not detected this species and it is considered absent from the park. Resurveyed in 2022.

Oregon Spotted Frog: potential habitat for the federally listed (threatened) Oregon spotted frog (*Rana pretiosa*) exists in the park. Field surveys have not detected this species and it is considered absent from the park. Resurveyed in 2022.

Oregon Coast Coho Salmon: potential habitat for the federally listed (threatened) Oregon coast coho salmon (*Oncorhynchus kisutch*) exists in the park. The park is within the habitat zone for the species but all fish access is prevented by a physical barrier downstream of the park boundary. Field surveys have not detected this species and it is considered absent from the park. Resurveyed in 2022.

Federally Listed Plant Species

No federally listed endangered or threatened plant species have been found in the park.

Old-Growth Forest Habitat

Though commercial timber harvest has ceased in the Preserve, impacts from previous logging continue to impact park forests, and riparian and aquatic areas. Timber harvest, road development, and road use that occurred in the Preserve area and throughout the region over the last 50 years has compacted soils, leading to sedimentation and erosion in steep areas (NPS 2022b).

Old-growth forest trees provide habitat to bats that roost under the loosely attached bark of large snags of a certain age. Fewer such trees exist because of the presence of more intense fires and growth stagnation in plantation forests from lack of thinning (NPS 2015b). Park staff are concerned about silver-haired and hoary bats, as these species are particularly vulnerable to habitat loss, including reductions in late-successional conifer forests and their components (NPS 2022b).

Trends: A study from 2019 (Wan et al. 2019) suggests the proportion of northern spotted owl habitat impacted by fires would continue to increase, as well as the proportion of northern spotted owl habitat impacted by high-severity wildfire during the current century, which would adversely affect northern spotted owl habitat of all types. Research in 2019 also shows hoary bat numbers are in decline (Rodhouse et al. 2019), which could be further exacerbated by wildfire caused habitat loss.

Native Vegetation

Embedded in the diverse geology of the Klamath-Siskiyou ecoregion, the park contributes to the botanical richness of the area, which contains flora from several US floristic provinces, making it one of the most unique ecoregions in North America. ORCA is characterized by diverse flora across its topographic and geologic settings, containing hundreds of vascular plant species. State of Oregon flora records indicate over 1,500 plant taxa are at their geographic limit in the ecoregion, owing partly to the park's broad elevation range from 2,640 feet to 6,640 feet near the summit of Mt. Elijah. The highest elevations in the park have Shasta red fir (*Abies magnifica*) at the upper limits of forests, and tree islands of red fir and mountain hemlock (*Tsuga mertensiana*) in the subalpine areas (NPS 2022b).

There are 469 vascular plant species found within the park boundaries, including 13 regional endemics and 49 non-native species. At higher elevations in the eastern portion of the Preserve, Bigelow Lakes basin is characterized by subalpine meadows and forests in a glacial cirque setting. Lower elevations are dominated by mixed conifer forests, characterized by species such as Douglas-fir (*Pseudotsuga menziesii*), white fir (*Abies concolor*), tanoak (*Lithocarpus densiflorus*), Pacific madrone (*Arbutus menziesii*), sugar pine (*Pinus lambertiana*), and bigleaf maple (*Acer macrophyllum*). Riparian areas are dominated by white alder (*Alnus rhombifolia*) and Port Orford cedar (*Chamaecyparis lawsoniana*), a species found almost exclusively in the Klamath-Siskiyou ecoregion (NPS 2022b).

In part because it occurs at low elevations, the Douglas-fir/Oak community (25% of ORCA) is among the driest. It represents the upper bounds of the Mixed Evergreen Zone in Southwest Oregon. White Fir/Douglas-fir communities (32%) occur at middle elevations and on gentle, dry, other than north-facing slopes, while Mesic White Fir/Douglas-fir communities occur at high elevations and on other than south-facing slopes. The White Fir/Herb community occurs at higher elevations on north-facing, often steep slopes. The Big Tree, the largest diameter Douglas-fir in Oregon, is found in the White Fir/Douglas-fir zone which transitions to the highest park areas of the red fir community and sub-alpine meadows (NPS 2016).

The percentage of disjunctive (isolated populations), regionally endemic, and range-limited species is also high and is related to the Siskiyou Mountain's east-west orientation and geographical linkages, great age and moderate elevation, precipitation, productivity, and disturbance regimes. Varied topography, geology, and microclimates contributed to this diversity. The Monument's largest meadow supports perhaps the largest distinct concentration of American saw-wort (*Saussurea americana*) and a saw-wort-willow plant association is listed as rare by Oregon's Natural Heritage Program (NPS 2016).

The forests in this area are dense, dominated by conifer trees, and contain scattered snags throughout forested areas. Some places have over 115 tons per acre of dead and downed fuel (NPS 2016).

Trends: Due to successful fire suppression at and around ORCA, no large fires have burned through the Monument and Preserve in recent history, though multiple large fires have come close in the last five years. The lack of fire has impacted all vegetation communities, in general selecting for more shade-tolerant species, increasing forest densities and regeneration of white fir and Douglas-fir in the subcanopy, shading remnant pines (ponderosa and sugar pine), oaks (Oregon white oak), incense-cedars, and infilling portions of the meadow habitat and forest openings with trees and shrubs.

Wildlife and Wildlife Habitat

High habitat diversity contributes to the impressive number and health of various species and wildlife populations including approximately 50 mammal species, 86 bird species, 11 reptile and amphibian species, 10 bat species, cave-adapted endemic invertebrates, more than 200 arthropod species, 75 butterfly species, over 55 moth species, and eight snail/slug species. This habitat diversity largely results from a high climate and soil diversity due to the region's proximity to oceans and geologically active plate margins for more than half a billion years. Wildlife species endemic to ORCA are part of one of the largest assemblages of single cave endemics in the United States. A high habitat diversity on the surface ensures the successful establishment of migrants (some of which become cave endemics) and offers places to move to and survive climate change (NPS 2022b). Genetic analysis and microscopy studies have also indicated at least 100 different documented species of microbes live in the caves, as well as regionally unique fungi, tissue moths, butterflies, and arachnid communities (NPS 2022b).

Species found above ground include black-tailed deer (*Odocoileus hemionus*), Steller's jay (*Cyanocitta stelleri*), Douglas squirrel (*Tamiasciurus douglasii*), Townsend's chipmunk (*Neotamias townsendii*), American black bear (*Ursus americanus*), mountain lion (*Puma concolor*), northern flying squirrel (*Glaucomys sabrinus*), Pacific giant salamander (*Dicamptodon tenebrosus*), mountain beaver (*Aplodontia rufa*), fishers (*Pekania pennanti*), and northern spotted owl (NPS 2022b).

A high diversity of aquatic invertebrates, and salamanders occurs with physical complexity where coarse woody debris and gravel creates both riffles and deep pools. The mix of old-growth and moderate disturbance produces much woody debris, and in general, the more wood, the higher the biodiversity of stream invertebrates. Abundant gravel and detritus combined with low temperatures in the park's streams enhances diversity.

Few areas have so many different rocks side by side. Springs develop at these contacts and host flatworms, frogs, protists, newts, aquatic beetles, snails and bugs. Both isolated marble and aquatic habitats favor snail evolution. Likewise, moist caves or riparian old-growth harbor certain coastal crickets, rodents, and grylloblatids that occur further north on glaciers. North-facing slopes, high elevation, subsurface streams, and springs in the park allow fairly wide, permanent streams, which harbor coastal tailed frogs (*Ascaphus truei*) and Pacific giant salamanders (NPS 2016).

The old-growth forests of the park constitute ecologically sensitive areas with unique aesthetic and natural resource values. These old-growth forests provide an intact and relatively undisturbed habitat of some flora and fauna that are threatened throughout the Klamath Mountains. Perhaps the greatest threat to the old-growth forests is the unnatural accumulation of ladder fuels due to fire suppression. Some of these areas are critical habitat for such species as northern goshawks (*Accipiter gentilis*), northern flying squirrels, red tree voles (*Arborimus longicaudus*), hermit warblers (*Setophaga occidentalis*), Vaux's swifts (*Chaetura vauxi*), Pacific fishers, clouded salamanders (*Aneides ferreus*), northern pygmy owls (*Glaucidium californicum*), flammulated owls (*Psilosops flammeolus*), wood roaches (*Cryptocercus clevelandi*). The critical habitat of the northern goshawk consists of conifer stands having a high degree of canopy cover and mostly containing large diameter trees (Promessi 2002), a condition that occurs in the park. Fisher habitat includes a multi-story or multi-layered canopy and high diameter trees and down logs (Hiller 2015).

Depending on how old-growth is defined, old-growth forests in the Pacific Northwest comprise about 10-27% of their former extent. The most pristine of those forests (i.e., areas that have had prescribed burns or other burns approximating a natural fire cycle) likely total less than 3% of what once occurred. Therefore, rarity emphasizes the NPS's need to protect and restore old growth habitat.

Trends: Regionally, wildfires are increasingly impacting old growth forests in Northern California and the Pacific Northwest. Wan et al. (2019) found that high-severity fire impacts to northern spotted owl habitat (mature forest) are likely to continue to increase this century. In general, in the Western US, climate change is increasing the spatial extent and occurrence of wildfires (Brown et al. 2021), which would continue to impact vegetation at ORCA. More locally, three large wildfires have threatened ORCA on adjacent lands (within 10 miles or less) since 2017: Miller Complex (34,535 acres, 2017), Natchez Fire (38,134 acres, 2018), and the Slater Fire (157,220 acres, 2020).

Cultural Resources - Archeology

Cultural resource archeological surveys within the Monument and Preserve have primarily been conducted to fulfill requirements set forth in Section 106 of the National Historic Preservation Act (NHPA). The Preserve area was previously managed by the USDA Forest Service (USFS) who conducted archeological surveys for timber sales and thinning projects beginning in 1980 (Bulkin 1982; Phillips 1981; Aubin 1980). The first documented archeological survey conducted by the NPS was in 2000 (Kritzer 2000) with one historic artifact scatter noted within the Oregon Caves Historic District (described in next section). Documented prehistoric resources on park lands are limited and are sensitive in nature (Rohde 2018). The remainder of the sites primarily consist of physical objects reflecting early efforts to develop the caves as a tourist destination including ruins or remains of

historical structures (including roads, trails, and former building locations), associated debris, and trash scatters (Svinarich 2018, 2020, 2019; Peterson 2019; Cheung and Gleason 2020). One site consisting of the ruins of a historical mining ditch was recently recorded that currently is the only example reflecting the significant mining activity that occurred just beyond the park boundary along the Sucker Creek drainage (Svinarich 2020).

Trends: Cultural resources across all disciplines, including archeology, need baseline documentation development to inform parkwide resource management (NPS 2022b). Surveys and protection of resources are completed on a project-by-project basis.

Historic Structures and Landscapes

The Oregon Caves National Historic District comprises five historic structures, and nine associated landscape features. The Oregon Caves Chateau is the centerpiece of the Historic District and was originally designated as a National Historic Landmark in 1987. The other historic structures are the Chalet, Ranger Residence, Guide Dormitory, and Check-in Kiosk (NPS 2022b).

The Historic District, initially listed on the National Register of Historic Places in 1992, was determined to be nationally significant for its association with the development of Oregon Caves National Monument and for its excellent examples of rustic architecture and landscape architecture, constructed mostly by the Civilian Conservation Corps. Its period of significance is 1922–1942. In 2012 the district was expanded to include four historic trails determined to be significant at the state level (NPS 2022b).

The park has one identified cultural landscape, the 14.75-acre Oregon Caves Historic District, which also includes all its historic structures (NPS 2022b). The landscape features are the rock retaining walls of local stone, road system, walkways, trails, parking areas, rock-lined Cave Creek diversion pool system, naturalistic plantings of native vegetation, drywall benches, and peeled-log pole roadway lighting. A historic resource study of the park published in 2006 contextualizes these structures and landscape features (NPS 2006, 2022b). It was documented in 2014 and entered in the NPS Cultural Resource Inventory System – Cultural Landscapes (CRIS) database. The lands of the Preserve, added to the park in 2014, have not yet been inventoried for cultural landscapes.

Trends: Historic structures and cultural landscapes within ORCA generally lack baseline documentation (historic structure report/cultural landscape report and treatment plans) (NPS 2022b). Surveys and protection of resources are completed on a project-by-project basis.

Museum Collections

The park museum and archive collections consist of over 103,000 site-specific objects and specimens from the disciplines of history, biology, paleontology, geology, and archives. Most notable among the specimens are the fossil remains of a nearly complete jaguar skeleton (*Panthera onca*).

The park has a purpose-built onsite curatorial facility in the Headquarters Building. This location is vulnerable to fire especially as there has been a recent trend towards greater frequency and intensity

of wildfires. In 2020, much of the collection was evacuated to temporary storage at Redwood National and State Parks upon the approach of the Slater Fire. Until a permanent low-hazard location is found to house the collection, at least a portion would remain at park headquarters.

Objects are cared for both in storage and on exhibit, including furnishings that are contributing features to the Historic District. The Chateau includes the largest publicly owned collection of Mason Monterey Furniture, a distinctly Western type of furniture and one of two styles that are considered purely American in origin. Although this furniture is not technically part of the museum collection, the pieces are treated as such and managed to retain their historic character while they also serve as functional hotel furniture. For the duration of the Chateau renovation, this collection of furniture is in temporary storage in the Grants Pass area.

There is no museum professional on site. The Crater Lake National Park (CRLA) curator provides formal program oversight and serves as the Museum Property Custodial Officer. The curatorial agreement between CRLA and ORCA stipulates quarterly work trips whereby the curator can provide on-site support.

Trends: As the threat of wildfire trend is increasing, the threat to museum collections housed within the park is increasing accordingly. At the same time, the length of season that the collection is considered safe from wildfire is decreasing. In 2020, the fire threat passed a threshold requiring the movement of the collection offsite and the increasing yearly threat predictions have justified temporarily maintaining it offsite (NPS 2022b).

Geologic Features and Soils

Cave formations include speleothems that result from deposition, bedrock and fill features, and speleogens that result from solution. The wall rock is composed of late Triassic metamorphosed sedimentary rock (mostly marble, with some argillite and metachert). Regionally, metamorphism is low grade (mid-level in greenschist facies). Higher grade metamorphosed sedimentary rocks (evidenced by the presence of garnet, biotite and actinolite) can be seen in the cave near quartz diorite plutons and dikes. A structural alignment between major faults and bedding strike, and a steep hydraulic gradient, enabled ground-water dissolution of the bedrock into one of the few large marble caves in the Pacific Northwest.

The soils of the park are determined largely by geology, elevation, vegetation, slope, aspect, and time. Forty-five percent of soils are classified as Althouse extremely gravelly silt loam, and 17% are Althouse very gravelly silt loam. Both occur primarily on 35-75% slopes and 13% of soils are Woodseye-Rock outcrop complex with 20 - 60% slopes. None of the other eight soil types total more than 5%. Most of the soils over marble, argillite, and metabasalt can be characterized as largely azonal loams with moderate amounts of organics and many rock fragments. Marble, metagabbros, and metachert soils are shallower and contain fewer organics. Soils over portions of the Grayback Pluton are shallow sandy loams low in organics. Those over serpentinite and peridotite have even lower organics and more rock fragments than the other soil types (NPS 2016).

Because of steep slopes, a very small percentage of soils are in wetlands. Rocky soils occur on the metacherts, metabasalts and metagabbros. Thin loamy soils occur on south aspects and lower elevations. Deeper soils of gravelly loam occur near upper and lower Cave Creek and on the argillite soils with north aspects, especially those at the higher elevations, and include windblown dust. According to the USDA Natural Resources Conservation Service (NRCS), there are no soil map units within the study area classified as prime or unique farmland. Quartz diorite and argillite are two prevalent rock types in the area (NPS 2016).

The park has some serpentine soils, including those derived from peridotite and serpentinite rocks. A half-acre of serpentine near the cave entrance is derived from peridotite, a rock type derived from burial 10 miles beneath the Earth's surface. Because the resulting soils are rare globally, most plants have not adapted to its toxic minerals that are often only found on serpentine. This area is easily damaged and slow to recover in terms of vegetation cover from trampling and soil compaction that can occur during fire management.

Trends: Slope movement uphill of the Chateau, a national historic landmark, threatens its long-term stability as well as that of other historic structures and landscape features, and visitor safety. Slope stabilization is a parkwide issue and key concern for visitor safety (NPS 2022b).

Water-Related Resources

ORCA preserves an undeveloped watershed with headwater tributaries of the Wild and Scenic Illinois River. Numerous springs are found in the park with large springs contributing substantially to creek base flows. Perennial subterranean water within Oregon Caves flows through more than three miles of cave passages and includes the Wild and Scenic River Styx. Intermittent surface streams and runoff contribute to this groundwater cave system before drying up during the summer months. Dripping, cave-pool levels, and flows are subsequently higher during the spring runoff and lower in the late summer. However, despite summer-long droughts, the River Styx flows through the cave all year.

The cave formations in Oregon Caves are sensitive to changes in both water quantity and water quality. Analysis of cave waters has shown the water is very close to calcite saturation, meaning that small chemical changes could dip the chemical balance to corrosive dissolution of marble or alkaline deposition of calcite crystals. Tipping it to over-saturation would cause deposition of speleothems and tipping it to under-saturation would cause dissolution of speleothems and enlargement of cave passages. Even slightly less water entering the cave due to higher evapotranspiration from dense tree cover (due to fire suppression) could lead to air bubbles which absorb higher carbon dioxide concentrations. The more acidic water could then enter the cave and continue to dissolve formations where once it was depositing calcite. This may explain why many areas of the cave have partly dissolved flowstone layers. More rain during the winter may accelerate this trend, with greater quantities of calcite-poor water moving into the cave with a capacity to dissolve calcite geologic features.

There are four perennial surface creeks that originate in the park: Cave Creek, Lake Creek, No Name Creek, and Panther Creek, along with two lakes: Upper and Lower Bigelow Lakes, and numerous flows evident after storms and during the spring snowmelt. The closed canopy shading of these park streams contributes important cold water and high-water quality to the downstream rivers important for aquatic ecosystems (NPS 2015c; Dinger 2022). The park streams support a diverse community of aquatic flora and fauna; but no fish are found in the park. Coho salmon are unable to reach the streams due to a plunge waterfall 0.5 miles downstream from the park.

Trends: Threats to water resources in the park and region are acute for this vital resource. Under some of the climate modeled projections for the region, snowpack may continue to decrease and reduce summer streamflow, and the frequency of heavy precipitation events could double. Reduced snowpack may also have significant effects on lakes, streams, and wet meadows. Less water during the summer would alter local hydrology, potentially reducing the duration and depth of standing water, and increasing water temperature. This could affect local distribution and abundance of plant species associated with riparian areas, wetlands, groundwater-dependent systems, as well as aquatic fauna (NPS 2022b).

6 Impact Analysis

Note: Best Management Practices (BMPs) are methods or techniques found to be the most effective and practical in achieving an objective, such as preventing or reducing invasive plant spread, while making optimal use of resources (Cal-IPC 2012).

Alternative 1: No Action

Air Quality Effects

Spatial and Temporal Scale of Effects: Under Alternative 1, the effects of fire suppression and manual fuel treatments within the Monument would extend beyond the limits of the original Monument boundaries to include the Preserve land and the regional airshed. Most adverse effects of smoke on air quality from the limited prescribed fire and pile burning would be relatively short-lived (typically, one day for each burn) and of limited acreage.

Effects on Resource: The amount of smoke expected to be present would not pose a substantial health risk to the visiting public or park staff living at the park. Except for the historic lodge, ranger housing above the Visitor Center, and one ranger house and one duplex a mile distant, there is not any housing within a four-mile radius. Prescribed burning plans would limit the amount of smoke potentially affecting park housing or use areas.

Because fuel treatment activities would be limited to already approved treatment areas within the Monument, no fuel reduction or prescribed fire would be applied to the Preserve land. Although this would reduce the amount of prescribed burning conducted within ORCA, it would leave the Preserve lands more vulnerable to catastrophic wildfires which could result in a more widespread and persistent reduction in local and regional air quality.

Mitigations and BMPs: Prescribed fires and pile burning would be undertaken considering atmospheric stability and associated smoke dispersion characteristics. When conditions are unfavorable for smoke dispersion (and air quality standards would be threatened), ignitions would be postponed and wildland fire use would be limited. All emissions from prescribed burns would occur during spring, fall, or winter when visitation to ORCA, is generally very low. All proposed burn projects must be in conformance with the Clean Air Act, the Oregon State Smoke Management Plan and the Oregon Visibility Protection Plan. If recommended by the Fire Management Officer and approved by the Monument's superintendent, the park may be closed during ignition days to reduce any health effects or discomfort on the part of the public. See Appendix B for a list of BMPs associated with this impact topic.

Trends and Cumulative Effects: The transitory nature of smoke from prescribed fire and pile burning would have no long-term, adverse cumulative effect on local or regional air quality (NPS 2004). In contrast, smoke from uncontrolled, large-scale, long-duration wildfires originating within or outside the park boundaries could adversely affect air quality in sizeable portions of the Monument and Preserve. Large volumes of smoke could adversely impact Cave Junction for extended periods. Both human health and visual standards would likely be exceeded for up to 10 days. The potential for large, high-intensity, long-duration wildland fires would decrease somewhat with implementation of the Alternative 1 fuel management treatments within the Monument but would not reduce wildfire potential, and associated smoke production within the Preserve land .

Non-native or Exotic Species Effects

Spatial and Temporal Scale of Effects: The effects of implementing Alternative 1 on non-native or exotic plant species would be largely contained within the original Monument boundaries and would be long-term in nature. However, invasion of non-native and invasive species could extend to the adjacent Preserve land if contaminated vehicles and equipment pass between the two areas.

Effects on Resource: Previous prescribed burns have resulted in an increase in non-native bull thistle (*Cirsium vulgare*) within the Monument (an adverse effect). However, post-fire monitoring studies at another park found no measurable increases in invasive plant species resulting from burns (NPS 2004). Consequently, no long-term adverse effects are anticipated. Instead, proper use of prescribed fire, and post-burn monitoring and control of invasive species that may occur on the treated sites would result in an overall, long-term improvement of desired-species health and resilience to invasion by non-native and exotic species.

Mitigations and BMPs: Regardless of fire management activities, whether prescribed fires, suppressing wildfires, or post-burn restoration, ORCA staff would follow guidelines that would prevent the spread of *Phytophthora* or other non-native species into or within ORCA. See Appendix B for a list of BMPs associated with this impact topic.

Trends and Cumulative Effects: Any increase in invasive and exotic plant species in treated areas within the Monument portion of the park would be mitigated by post-treatment restoration actions. The cumulative effect of implementing the Alternative 1, combined with ORCA's ongoing non-

native plant species control program, would have a long-term cumulative effect of reducing non-native plant species and restoring native biodiversity to the treated sites within the Monument. However, because treatments would be limited to the Monument, the surrounding Preserve land would not benefit from the control of invasive and exotic species resulting from prescribed burning and subsequent restoration and maintenance actions.

Species of Special Concern or Their Habitat Effects

Spatial and Temporal Scale of Effects: The effects of implementing Alternative 1 on species of special concern and their habitat would largely be contained within the Monument portion of the park, thus limiting the long-term beneficial effects to the park as a whole.

Effects on Resource: One of the key goals of fuels management is to protect Endangered Species Act (ESA) listed species, native habitats, and other sensitive plants and wildlife from destructive wildfires and therefore preserve or enhance populations. A short-term potentially adverse effect of the proposed treatments is the temporary reduction of habitat canopy cover and forage, and the immediate negative (or positive) change in wildlife distribution within the burned areas. As the vegetation canopy recovers after a low-intensity burn, habitat function and structure would return to being more resilient to wildfire (typically the following year). However, under Alternative 1, the beneficial effects of the proposed treatments would be limited to the original Monument land, and exclude the adjacent Preserve land. Species of special concern and their habitat in the adjacent Preserve land would not benefit from the fuel reduction activities and would continue to be at high risk of catastrophic wildfires.

As noted in the 2004 FMP EA, most of sensitive wildlife species in the park are transient, or highly mobile, and therefore not likely to be adversely affected either by fire management actions or non-actions and the resulting change in vegetation types (NPS 2004). Additionally, prescribed burns conducted near cave entrances appear to have had little effect on hibernating bats within the caves (Caviness 2003).

Habitats of the tailed frog and Pacific giant salamander (all riparian); red tree voles (top canopy); northern goshawk, fisher and longhorn beetles (old-growth); Del Norte salamander (*Plethodon elongatus*) (talus); clouded salamander (large down logs); and bats (caves and large old-growth snags) would not be affected in the short term by any of the alternatives. In general, Alternative 1 would have a long-term beneficial effect on vegetation structure and biodiversity in the treated areas within the Monument, but would provide no benefit to adjacent Preserve land.

Although ORCA has potential habitat and/or critical habitat for several federally listed wildlife species (see Affected Environment section, above), none are known to be residents within the park. No spotted owl resident pairs or nests have been detected in the park since 2015. No federally listed plant species are found in the park. The park would follow BMPs listed in Appendix B to survey according to protocol and consult with US Fish and Wildlife Service (USFWS) or National Marine Fisheries Service (NMFS) following a detection listed species.

By removing understory, prescribed fires within the Monument should increase foraging access for the northern goshawk. Removal of coarse woody debris by prescribed fire would not be so complete as to eliminate squirrel habitat, but it would reduce it from current levels. The low and moderate severity portions of those fires would retain and preserve overstory canopy while removing understory trees. The moderate and high-severity patches of those fires should create coarse woody debris and aid squirrel habitat. No benefits to these species would accrue on the Preserve land, which would not be treated under Alternative 1.

Fire, even when operating within its bounds as a natural process, has the potential to degrade habitat for northern spotted owls, particularly if high-severity fire occurs on a wide scale. One study in Washington (Gaines et al. 1997) suggested that owls continued to forage in light- to moderate-severity patches created by wildfire, but only unburned nest sites continued to be used. The proposed prescribed burns within the Monument are likely to increase truffles, the main food of the northern flying squirrel, which in turn is about half of the spotted owl prey biomass in the area. However, these benefits would be restricted to the Monument as the Preserve land would not be treated under Alternative 1.

A slight increase in dry forest types from prescribed burning in the Monument may slightly reduce the habitat of fishers (and potentially martens if found) since they avoid dry forests. Prescribed natural fires tend to be patchy in terms of fire severity. This characteristic has been associated historically with habitat improvement for mesocarnivores and would likely be associated with habitat maintenance for them in the future. Under Alternative 1, high burn-severity patches would create prey concentration areas, moderate severity patches would create coarse woody debris, and unburned patches mixed with low burn-severity fire patches would most likely provide complex forest structure for these animals. These beneficial effects would be limited to treatment sites within the Monument.

Mitigations and BMPs: Under Alternative 1, all wildlife species of special concern would be avoided during prescribed fire operations spatially and/or temporally. All plant species of special concern would be avoided during prescribed fire operations, unless it is identified that burning enhances a particular species. Before implementation, each individual project within the Monument would complete ESA surveys, be approved by the park's Resource Management Program Lead, and through consultation with the USFWS/NMFS under Section 7 of the ESA. See Appendix B for a list of BMPs associated with this impact topic.

Federally Listed Wildlife Species

Northern Spotted Owl: (threatened). Prescribed fire would not be used during spotted owl nesting season near unsurveyed areas or areas occupied by nesting birds. Where spotted owls are detected, thinning work would be excluded for 0.25 miles and burning operations would be excluded for 1 mile unless further consultation is conducted with USFWS (NPS 2022c).

Franklin's Bumble Bee: (endangered). Burning (piles or prescribed) would not occur in meadows from May 15 to September 30. If detected, consultation with USFWS would be reinitiated.

Pacific Coastal Marten: (threatened). If detected, further consultation with USFWS would be reinitiated (NPS 2022c).

Oregon Spotted Frog: (threatened). All potential habitat, including lakes and potential wetlands, would have sediment protection zones for no mechanical equipment operations that extend 200 feet, with only shrub and small diameter (<8-inch Diameter at Breast Height [DBH]) manual thinning allowed within 100 feet, and no treatment allowed within 50 feet of Oregon spotted frog habitat. All burning in riparian areas would be low intensity. If detected, consultation with USFWS would be reinitiated (NPS 2022c).

Oregon Coast Coho Salmon: (threatened). All potential habitat, including ephemeral, intermittent, and perennial streams along with lakes and potential wetlands, would have sediment protection zones for no mechanical equipment operations that extend 200 feet, with only shrub and small diameter (<8-inch DBH) manual thinning allowed within 100 feet, and no treatment allowed within 50 feet unless part of public development area like Cave Creek Campground. All burning in riparian areas would be low intensity. If detected, consultation with NMFS would be reinitiated (NPS 2022d).

Trends and Cumulative Effects: Under Alternative 1, application of prescribed fire and manual fuel reduction treatments to Monument land, combined with other park actions to improve wildlife habitat, would have the cumulative, long-term, beneficial effect of restoring biotic communities to pre-European settlement conditions more quickly, and increase their resilience to destruction by uncontrolled wildfire, but only within the Monument; adjacent Preserve land would not be treated. This increases the risk of harm to species of concern and their habitats both within the untreated Preserve land, and the treated Monument land, should a large-scale wildfire start on Preserve land and burn across both portions of the park.

Native Vegetation Effects

Spatial and Temporal Scale of Effects: The primary direct effect of implementing Alternative 1 would be on native vegetation within the original Monument boundaries; no treatments would be conducted within the Preserve. Although limited to prior planned treatment areas, the treatments and follow-up maintenance would have long-term, beneficial effects on the health and productivity of native vegetation within the Monument.

Effects on Resource: The adverse effects of the removal of plant canopy (by fire or manual removal) would be short term and recovery would be quick under low-intensity prescribed fire conditions. The vascular plant species within the Monument most at risk of extirpation from climate change would not be affected by the prescribed burns because they occur at the mid elevations of the park, mostly in meadows that need fire to maintain their areal extent.

Vertical stratification on trees includes certain epiphytes (alectorioid lichens at top, cyanolichens and certain mosses in the middle, and other mosses below), insects, spiders, and mites. Some of those species on the lower parts of trees would be killed. Decreased shading from shrubs and increased dispersal from higher winds, however, likely would allow an accelerated recovery of epiphytes on the lower parts of trees. The greatest variety of epiphytes occurs on the largest trees. The prescribed

burns within the Monument would kill few of these trees. By killing small trees and shrubs that compete for water and nutrients, prescribed fires are likely to slightly accelerate old-growth and increase the likelihood of establishing old-growth epiphytic obligates.

Previous monitoring of fire effects for one pre-burn year and three post-burn years at the Monument showed an increase in vanilla leaf (*Achlys triphylla*), twinflower (*Linnaea borealis*), whipple vine (*Whipplea modesta*) (one plot), prince's pine (*Chimaphila menziesii*), lotus (*Lotus crassifolius*), and a decrease in tanoak (*Lithocarpus densiflorus*), Oregon grape (*Berberis nervosa*), and whipple vine (one plot). These results largely conform to the goal of establishing a burn-affected ground cover, and reducing the number of small trees (especially tanoaks) and shrubs such as Oregon grape. It is anticipated that Alternative 1 would have similar beneficial effects on these species within the Monument. However, the untreated Preserve land would not be affected.

Of the eight species of vascular plants that apparently have been extirpated from the Monument because of shading from fire suppression, two have returned to past burn areas (*Arnica viscosa* and *Erythronium citrinum*) (NPS 2004). At least two species of burn-adapted macro-fungi have been found on charcoal or on bare ground adjacent to many pieces of charcoal in a prescribed burn area in the park. Consequently, it is expected that in the long term, the number of these and other fire-adapted species would increase with implementation of Alternative 1. Destruction of naturally occurring chemicals in the soils that inhibit germination likely would allow increased reestablishment by both natives and non-natives, although present non-native invasions rely more on these chemicals than do natives, a common trait among species that colonize burn areas or similar areas of disturbance.

Single fires separated by decades and those of low severity tend to result in Douglas-fir establishment, while ecosystems with fire closely spaced in time or severe fires have often favored knobcone pine (*Pinus attenuata*), madrone, oak, or shrub species (Agee 1991). The limited use of prescribed burning specified under Alternative 1 would not allow the fire frequency needed to manage preferred tree species, and would have no beneficial effect on Preserve land, which is excluded in Alternative 1.

Mitigations and BMPs: Broadcast prescribed burning within the Monument would be conducted primarily during the season when most natural fire occurred (April through October). This would be in alignment with native species phenology and life histories; i.e., it would be the type of fire they most likely have adapted to. Soils would be dry and lethal temperatures in dry soils rarely penetrate deeper than 16 cm, while those in wet soils may reach as deep as 50 cm (DeBano et al. 1998). Through manual wood removal and careful prescriptions, burns within the Monument would generally be of low intensity and slow rate of spread, giving animals the amount of time, they would normally would have had to evade the fire. See Appendix B for a list of BMPs associated with this impact topic.

Trends and Cumulative Effects: Since Alternative 1 would treat very limited areas of the Monument (and none on the Preserve), fuels would continue to build up, especially ground and ladder fuels that increase the possibility of catastrophic crown fires. As Douglas-firs continue to die

from a combination of drought stress, old age, and dwarf mistletoe (*Arceuthobium* spp.) infestation, the composition of most of the forest in the park is changing to one dominated by true firs. Dwarf mistletoe would continue to spread because tree density is higher than it was in pre-suppression times. Water competition stress may make the trees more susceptible to infestation. Sugar pines would continue to die due to water competition stress. As a result of fire suppression, shade-tolerant Pacific silver fir (*Abies amabilis*) and grand fir (*Abies grandis*) has likely increased and this in turn is likely to lead to increased damage to fir by balsam woolly adelgid (*Chermes piceae*) (McCullough et al. 1998; NPS 2004).

Wildlife and Wildlife Habitat Effects

Spatial and Temporal Scale of Effects: The effects of implementing Alternative 1 would be focused on wildlife and wildlife habitat within the Monument portion of the park, though, because of the migratory nature of some species of wildlife, would ultimately benefit Preserve and off-park wildlife as well.

Effects on Resource: The diversity of birds, web-spinner spiders, and certain other arthropods correlates with structurally complex vegetation in Western Oregon, with Douglas-fir and noble fir having the most structure compared to several other trees. Under Alternative 1, vertical complexity, described as distinct herb, shrub, small tree, and large tree layers, might be somewhat reduced within the Monument prescribed burn areas for at least a few years. This is likely to be compensated for in terms of maintaining or increasing the number of species by an increase in horizontal complexity. There would be an increase in the structurally more complex species of Douglas-firs, oaks, and madrone compared to white firs and Port Orford cedar. Increased structural complexity would provide refuge for a greater diversity of animal species, a beneficial effect to wildlife. Certain species of mites, spiders, ants, and other groups of arthropods and pioneer species prefer the moderate reversal of succession caused by low-intensity fires. Several groups of beetles (*Agonum* sp., *Harpalus* sp., and certain buprestids) are attracted to burn sites by smell or by detecting sources of infrared light. An invasion of destructive beetles would have an adverse effect on certain tree species. However, results of studies examining fire effects on abundance of carabid beetles are equivocal (McCullough et al. 1998; NPS 2004). Any benefits to wildlife and wildlife habitat within the park would be limited due to the restriction of treatments to pre-determined sites within the Monument. The elevated risk of habitat-altering or destroying wildfire would largely remain, and no habitat protection or improvement would be afforded to Preserve land.

Mitigations and BMPs: Alternative 1 would include prescriptions that minimize potential harm to wildlife and their habitats within the Monument treatment sites. Most adverse effects (removal of plant canopy and cover) would be short-term and, once the plant canopy recovers, would be followed by improved habitat and forage conditions. To protect migratory and other bird species, vegetation trimming and removal would be scheduled outside of peak breeding season (May 1 to June 15) to the maximum extent practicable. All areas would be spot surveyed immediately prior to vegetation removal and all bird nests would be avoided. See Appendix B for a list of BMPs associated with this impact topic.

Trends and Cumulative Effects: The implementation of Alternative 1, combined with other regional fire and fuels management activities would have a small cumulative beneficial effect of reducing the risk of catastrophic wildfires within the region in general and the Monument in particular. However, limiting treatments to the Monument would not meet the overall goals of improving wildlife habitat and protecting it from catastrophic fire across all portions of the park.

Cultural Resources - Archeology

Spatial and Temporal Scale of Effects: The effects of Alternative 1 on cultural resources are limited to areas within the Monument; no treatments would be applied to the adjacent Preserve land. Potential adverse effects, including damage to archeological sites by prescribed fire or fuels removal treatments, would be long-term in the sense that damage could be permanent. The anticipated beneficial effects of the treatments would also be long-term in nature, to include the required cultural resource survey of planned treatment sites (increasing likelihood of discovering new artifacts and features), and the increased protection of known and unknown cultural sites from catastrophic wildfires.

Effects on Resource: Lightly burned sites have little effect on stone artifacts, while heavily burned sites, such as log corridors, would affect 40-50 percent of the stone artifacts; mostly by soot but also spalling (Lentz et al. 1996). Therefore, the prescribed burns planned under Alternative 1 would reduce the potential long-term adverse effects on cultural artifacts caused by high-intensity wildfires. However, this benefit would be limited due to the relatively small number of acres to be treated under Alternative 1.

Mitigations and BMPs: Under Alternative 1, pre-burn surveys of treatment areas within the Monument would identify cultural resources in a planned, orderly manner, providing for protection of those resources. Prior to prescribed fire operations, surveys would be conducted, and concurrence would be obtained from the State Historic Preservation Office (SHPO). All known sites would be avoided, and any sites discovered during operations would be protected. Sites would also be protected during wildland fire operations. See Appendix B for a list of BMPs associated with this impact topic.

Trends and Cumulative Effects: Under Alternative 1, prescribed burn treatments within the Monument would have a limited effect on the protection of cultural resources from destructive wildfires within the park as a whole (since no treatments would be conducted on the Preserve portion of the park). Alternative 1 treatments would not contribute significantly to the long-term protection of cultural resources on the park.

Historic Structures and Landscapes Effects

Spatial and Temporal Scale of Effects: The effects of Alternative 1 on historic structures and landscapes are limited to areas within the Monument as no treatments would be conducted on Preserve land. Potential adverse effects of not reducing fuel loads and the risk of fire near historic structures would be long-term and permanent should wildfire destroy the structures.

Effects on Resource: No adverse effects of the prescribed burning and fuels reduction actions are expected under the planned conditions within the Monument. Smoke from prescribed fire and pile burning, near to the Historic District, is unlikely to damage historic building materials or furnishings (NPS 2022b). Stone benches along trails and all structures outside the Historic District currently being evaluated for potential historic listing would be protected from prescribed burns.

Mitigations and BMPs: Prior to prescribed fire operations within the Monument, archeological surveys would be conducted and concurrence with the SHPO would be obtained. All known sites would be avoided, and any sites discovered during operations would be protected. Sites would also be protected during wildland fire operations. Nevertheless, there is always a risk of a prescribed fire becoming an uncontrolled fire which could potentially damage or destroy historic structures and landscapes.

Nevertheless, a key purpose of Alternative 1 is to reduce fuels loads near to historic structures and landscapes. Where prescribed fire cannot be conducted with complete control, an emphasis would be placed on manual removal of fuels in vulnerable areas. Potential harm to the historic structures would be mitigated by using only the appropriate treatment methods near the Historic District. See Appendix B for a list of BMPs associated with this impact topic.

Trends and Cumulative Effects: The long-term beneficial effect of fuel reduction near to the Historic District within the Monument, would be to greatly reduce the risk of uncontrolled wildfires that could completely destroy the historic buildings and landscapes. Combined with other NPS actions to make historic structures more fire resistant, Alternative 1 would have the cumulative effect of greatly reducing the likelihood of the buildings being destroyed by catastrophic wildfires.

Museum Collections Effects

Spatial and Temporal Scale of Effects: The effects of Alternative 1 on museum collections are limited to the Headquarters Building and the Chateau (located within the Historic District of the Monument). These collections are at risk of long-term (permanent) damage or destruction should the buildings be destroyed by uncontrolled wildfire.

Effects on Resource: Only the manual fuel reduction treatments of Alternative 1 would be conducted near to buildings containing museum collections. No adverse effects of the prescribed burning and fuels reduction actions are expected under the planned conditions. Smoke from prescribed fire and pile burning, near to buildings housing museum collections is unlikely to damage the buildings or the collections (NPS 2022b).

Mitigations and BMPs: Any prescribed fire conducted under the Alternative 1 would be properly planned to ensure buildings housing museum collections are avoided and protected. See Appendix B for a list of BMPs associated with this impact topic.

Trends and Cumulative Effects: Combined with other NPS actions to make ORCA structures more fire resistant, Alternative 1 would have the cumulative effect of greatly reducing the likelihood of the buildings and the museum collections they contain being destroyed by catastrophic wildfires.

Geologic Features and Soils Effects

Spatial and Temporal Scale of Effects: The effects of Alternative 1 would be limited to geologic features and soils within the Monument portion of the park. Any adverse effects would likely be short-term and limited in areal extent, while the ultimate beneficial effects of improving watershed conditions through systematic use of prescribed fire would be long-lasting.

Effects on Resource: Recent dissolution of flowstone in the Caves may be the result of fire suppression and/or human or naturally caused drought. Two monthly analyses of various types of waters in the Cave over a three-year period indicate that most of the various types of cave water throughout much of the year is close to calcite saturation. This means that a change in water chemistry could tip the pH balance between acid and alkaline.

The effect of prescribed burning within the Monument is likely to be minor or negligible on cave water mineralogy. The higher concentrations of ash under the burning of wood piles might have very local effects from changes in pH and available nutrients from the resulting wood ash. Under Alternative 1, reduction of standing fuels (live plants) would have the long-term beneficial effect of reducing evapotranspiration from the treated sites (and increasing runoff), although the limited number of acres to be treated would likely not change the overall hydrology of the park.

Granitic soils within the park are highly erosive. Debris flows occur at the start of drainages probably every hundred or few hundred years. Mersereau and Dyrness (1972) reported that after slash burning in Western Oregon, rates of soil movement increased, especially on slopes unprotected by organic debris. During the first growing season after burning, soil movement was greatest on steeper slopes, on south aspects, and in areas having little plant cover. By the second season, rapid vegetation establishment had essentially halted soil movement on all slopes except extremely stony talus areas. Low-severity fires do not generally increase soil erosion (Wells et al. 1979). In a 25-year study in Western Washington and Oregon, Kraemer and Hermann (1979) found that revegetation of plots had apparently replenished the organic matter lost through burning. The prescribed burns conducted as part of Alternative 1, are similarly expected to have negligible adverse impact on geologic processes and soil erosion within the Monument.

Mitigations and BMPs: Standard erosion protection BMPs and restriction of treatments to less-than 30% slopes, incorporated in the treatment plans would minimize this temporary adverse effect of vegetation removal on soil erosion. Potential erosion would be limited by leaving a mosaic of unburned islands throughout each burn area. Burning would be conducted to increase grass and forb cover. Fire severity would be managed to avoid consuming deep soil organic layers. Prescribed fire plans would primarily utilize natural barriers and roads for control lines. Any constructed control lines within the Monument would be limited in width and depth to the minimum necessary to ensure control of the burn.

It is unlikely that the final number of fire lines would substantially affect infiltration or erosion rates. Careful attention would be paid to avoiding these potential problems during the placement of such lines and revegetation would be conducted, where necessary, after the burns. Particular attention would be given to preventing or mitigating erosion on the most erodible soils on the Monument. Fire

lines would be located to take advantage of natural barriers, rock outcroppings and trails. When fire lines approach road corridors available for visitor vehicle travel, they would be curved so as not to present a straight line away from the road. See Appendix B for a list of BMPs associated with this impact topic.

Trends and Cumulative Effects: Implementation of Alternative 1 would have a limited cumulative beneficial effect on stream flow and water chemistry, with the prospective of maintaining geologic processes and feature within the caves at their optimal balance. These benefits would be limited to the Monument portion of the park. Fuels treatments would reduce the risk of catastrophic, high-intensity wildfires within the Monument, events which could cause massive shifts in stream and cave chemistry as well as destructive levels of soil erosion and sedimentation across large areas. However, because Alternative 1 does not treat any portions of the Preserve land, the threat that high-severity wildfires is not substantially reduced even on the Monument. A catastrophic wildfire that burns the upper watershed within the Preserve could alter the chemistry of runoff contributing to streamflow within the caves, as well as increase erosion and sedimentation from the burned sites.

Water-Related Resources Effects

Spatial and Temporal Scale of Effects: Based on the limited treatments proposed for Alternative 1, the effects on water-related resources would be limited to the treatment areas within the Monument, and would not extend to downstream watersheds. Any adverse effects caused by low-intensity prescribed fire would be localized and last only a season or two until the treated vegetation recovers. By contrast, uncontrolled, catastrophic wildfires on ORCA have the potential to cause large-scale erosion, sedimentation, and flooding, that could adversely affect water quality, aquatic species (e.g., coho salmon), and aquatic habitat downstream from the park.

Effects on Resource: The proposed treatments would avoid short-term adverse effects on treated watersheds, WSR River Styx, other WSR eligible creeks, and potential wetlands, by using conservative, established buffers that prevent the reduction of canopy cover adjacent to riparian areas, and reduce the potential for downstream flooding and sedimentation. Once ground cover of the treated site recovers, the additive erosion risk is further eliminated, and the normal hydrologic function of the site is restored. Also, by reducing the biomass of trees on the treated site, evapotranspiration is reduced and more water is available to contribute to groundwater infiltration, local streamflow, and downstream aquatic habitats. Despite these benefits, under Alternative 1, only a limited number of acres within the Monument would be treated, with no treatment applied to the Preserve land, thus not producing park-wide improvements to watershed condition.

Studies of mountain watersheds indicate that increased streamflow might not occur in the year immediately following fire in systems that are dominated by subsurface-water flow (Flerchinger and Clark 2003), as is case of the park's marble areas. These systems might show flow increases of as much as 25%, however, in the second year following fire (Flerchinger and Clark 2003; NPS 2004). It is expected that Alternative 1 prescribed fire treatments would have a similar beneficial, though limited, effect on Monument stream flows and groundwater recharge.

Compared to Alternatives 2 and 3, implementation of Alternative 1, would allow for more fuel accumulation across the park that could ultimately lead to large, high-intensity wildland fires. These fires would remove vegetation from large areas, resulting in increased overland flow and flooding during high-intensity, warm precipitation-over-snow events during winter months. Overland flow could create rills and gullies and deliver sediment to streams, degrading water quality. The increased overland flow and sediment could cause large pulses of sediment and debris input to streams. While some sediment influx maintains diatoms as a food source, too much sediment input over time adversely affects all aquatic species. Flood flows from severely burned watersheds could also destroy park infrastructure (pipes, pumps, reservoirs, water treatment plants, etc.) that delivers potable water to the public.

Mitigations and BMPs: Under Alternative 1, potential erosion and sediment delivery to streams would be mitigated by ensuring that only appropriate-sized portions of a watershed are burned in any given year. A mosaic of vegetation would be left immediately adjacent to streams. Revegetation of burned areas would be evaluated prior to burning additional portions of the watershed. Care would be taken not to damage water supply infrastructure during reduction of fire fuels. See Appendix B for a list of BMPs associated with this impact topic.

Trends and Cumulative Effects: Implementation of Alternative 1, because of the limited areal extent (and only on the Monument) would lead to increased risk of large, high-intensity wildland fires on ORCA, which likely could cause large pulses of sediment and debris input to streams. While some sediment influx maintains diatoms as a food source, too much sediment input over time affects all aquatic species. The long-term beneficial impacts to water-related resources would be minimal under Alternative 1 and would not achieve the desired watershed or water-related resources conditions.

Alternative 2: Manual Treatments

Air Quality Effects

Spatial and Temporal Scale of Effects: Under Alternative 2, the effects of fire suppression and manual fuel treatments within the Monument and Preserve would extend beyond the limits of park boundaries to include the regional airshed. Most adverse effects of smoke from prescribed fire and pile burning would be relatively short-lived (typically, one day for each burn) and limited in extent.

Effects on Resource: The amount of smoke expected to be present would not pose a substantial health risk to the visiting public or park staff living at the park. Except for the historic lodge, ranger housing above the Visitor Center and one ranger house and one duplex a mile distant, there is not any housing within a four-mile radius. Prescribed burning plans would limit the amount of smoke potentially affecting park housing or use areas.

Mitigations and BMPs: Prescribed fires and pile burning would be undertaken considering atmospheric stability and associated smoke dispersion characteristics. When conditions are unfavorable for smoke dispersion (and air quality standards would be threatened) ignitions would be

postponed and wildland fire use would be limited. All emissions from prescribed burns would occur during spring, fall, or winter when visitation to ORCA is generally very low. All proposed burn projects must be in conformance with the Clean Air Act, the Oregon State Smoke Management Plan and the Oregon Visibility Protection Plan. If recommended by the Fire Management Officer and approved by the Monument's superintendent, the park may be closed during ignition days to reduce any health effects or discomfort on the part of the public. See Appendix B for a list of BMPs associated with this impact topic.

Trends and Cumulative Effects: The transitory nature of smoke from prescribed fire and pile burning would have no long-term, adverse cumulative effect on local or regional air quality (NPS 2004). In contrast, smoke from uncontrolled large-scale, long-duration wildfires originating within or outside the park boundaries could adversely affect air quality in sizeable portions of the Monument and Preserve. Large volumes of smoke could adversely impact Cave Junction for extended periods. Both human health and visual standards would likely be exceeded for up to 10 days. The potential for large, high-intensity, long-duration wildland fires would decrease with implementation of the proposed fuel management treatments.

Non-native or Exotic Species Effects

Spatial and Temporal Scale of Effects: The effects of implementing Alternative 2 on non-native or exotic plant species would be largely contained within ORCA's boundaries and would be long-term in nature.

Effects on Resource: Previous prescribed burns have resulted in an increase in non-native bull thistle (*Cirsium vulgare*) within the Monument (an adverse effect). However, post-fire monitoring studies at another park found no measurable increases in invasive plant species resulting from burns (NPS 2004). This is likely true for the combined Monument and Preserve lands that now comprise the park. Consequently, no long-term adverse effects are anticipated. Instead, proper use of prescribed fire, and post-burn monitoring and control of invasive species that may occur on the treated sites would result in an overall, long-term improvement of desired-species health and resilience to invasion by non-native and exotic species.

Mitigations and BMPs: Regardless of fire management activities, whether prescribed fires, suppressing wildfires, or post-burn restoration, ORCA staff would follow guidelines that would prevent the spread of *Phytophthora* or other non-native species into or within ORCA. See Appendix B for a list of BMPs associated with this impact topic.

Trends and Cumulative Effects: Any increase in invasive and exotic plant species in treated areas would be mitigated by post-treatment restoration actions. The cumulative effect of implementing the Alternative 2, combined with ORCA's ongoing non-native plant species control program, would have a long-term cumulative effect of reducing non-native plant species and restoring native biodiversity to the treated sites.

Species of Special Concern or Their Habitat Effects

Spatial and Temporal Scale of Effects: The effects of implementing Alternative 2 on species of special concern and their habitat would largely be contained within ORCA's boundaries and would have long-term beneficial effects by improving habitat and reducing the risk of high-severity wildfire.

Effects on Resource: A short-term adverse effect of the proposed treatments is the temporary reduction of habitat canopy cover and forage, and the immediate change in wildlife distribution within the burned areas. As the vegetation canopy recovers after a low-intensity burn (typically the following year), habitat function and structure would return to being more resilient to wildfire.

Under Alternative 2, the treatment area within the Monument would be increased, and treatments would also be applied to the Preserve, thus applying the benefits noted in Alternative 1 to all portions of the park (refer to Alternative 1). In general, Alternative 2 would have a long-term beneficial effect on vegetation structure and biodiversity in the treated areas, which would benefit wildlife species dependent on those habitats.

As noted above, although ORCA has potential habitat for several federally listed wildlife species, none are known to be present within the park. No spotted owl resident pairs or nests have been detected in the park since 2011. No federally listed plant species are found in the park.

Mitigations and BMPs: Under Alternative 2, all wildlife species of special concern would be avoided during prescribed fire operations spatially and/or temporally. All plant species of special concern would be avoided during prescribed fire operations, unless it is identified that burning enhances a particular species. Before implementation, each individual project within the park would complete ESA surveys, be approved by the park's Resource Management Program Lead and through consultation with the USFWS/NMFS under Section 7 of the ESA. See Appendix B for a list of BMPs associated with this impact topic.

Federally Listed Wildlife Species

Northern Spotted Owl: (threatened). Prescribed fire would not be used during spotted owl nesting season near unsurveyed areas or areas occupied by nesting birds. Where spotted owls are detected, thinning work would be excluded for 0.25 miles and burning operations would be excluded for 1 mile unless further consultation is conducted with USFWS. Any work that generates noise above ambient sound levels would not occur within 0.25 miles of a northern spotted owl detection site during the spotted owl noise restriction period (March 1–September 30). If a spotted owl activity center is found to have chicks, then no tree removal would occur during the period March 1–September 30 within the activity center stand, within 0.50 miles of an activity center or according to further consultation with USFWS (NPS 2022c).

Franklin's Bumble Bee: (endangered). Burning (piles or prescribed) would not occur in meadows from May 15 to September 30. If detected, consultation with USFWS would be reinitiated (NPS 2022c).

Pacific Coastal Marten: (threatened). If detected, consultation with USFWS would be reinitiated (NPS 2022c).

Oregon Spotted Frog: (threatened). All potential habitat, including lakes and potential wetlands, would have sediment protection zones for no mechanical equipment operations that extend 200 feet, with only shrub and small diameter (<8-inch DBH) manual thinning allowed within 100 feet, and no treatment allowed within 50 feet. All burning in riparian areas would be low intensity. If detected, consultation with USFWS would be reinitiated (NPS 2022c).

Oregon Coast Coho Salmon: (threatened). All potential habitat, including ephemeral, intermittent, and perennial streams along with lakes and potential wetlands, would have sediment protection zones for no mechanical equipment operations that extend 200 feet, with only shrub and small diameter (<8-inch DBH) manual thinning allowed within 100 feet, and no treatment allowed within 50 feet unless part of public development area like Cave Creek Campground. All burning in riparian areas would be low intensity. If detected, consultation with NMFS would be reinitiated (NPS 2022d).

Trends and Cumulative Effects: Under Alternative 2, application of prescribed fire and manual fuel reduction treatments to more areas of ORCA (relative to the Alternative 1), combined with other park actions to improve wildlife habitat, would have the cumulative, long-term, beneficial effect of restoring biotic communities to pre-European settlement conditions more quickly, and increase their resilience to destruction by uncontrolled wildfire.

Native Vegetation Effects

Spatial and Temporal Scale of Effects: The primary direct effect of implementing Alternative 2 would be on native vegetation within ORCA's boundaries (both Monument and Preserve lands). The treatments and follow-up maintenance would have long-term, beneficial effects on the health and productivity of native vegetation.

Effects on Resource: The adverse effects of the removal of plant canopy (by fire or manual removal) would be short term and recovery would be quick under low-intensity prescribed fire conditions. The vascular plant species on the park most at risk of extirpation from climate change would not be affected by the prescribed burns because they occur at the mid elevations of the park, mostly in meadows that need fire to maintain their areal extent. The effect on various species of trees and associated flora would be the same as noted in Alternative 1, above, but would be applied to treatment areas throughout the park.

Single fires separated by decades and those of low severity tend to result in Douglas-fir establishment, while ecosystems with fire closely spaced in time or severe fires have often favored knobcone pine (*Pinus attenuata*), madrone, oak, or shrub species (Agee 1991). It is likely that the anticipated levels of funding under Alternative 2 would allow fires somewhere in between these frequencies. This would increase Douglas-fir but perhaps not by the number of Douglas-fir that likely existed in the past few thousand years on the park. This is in part because many of these trees became established during the cooler, wetter Little Ice Age climatic conditions not currently present. Conversely, knobcone pine, madrone, and oak may increase greater than what occurred

prehistorically but, considering the total acreage involved, is not likely to be a significant adversely impact on park resources.

Mitigations and BMPs: Through manual wood removal and careful prescriptions, burns in the park would generally be of low intensity and a slow rate of spread, causing only temporary damage to the plant canopy. Broadcast prescribed burning within the park (both Monument and Preserve lands) would be conducted primarily during the season when most natural fire occurred (April through October). This would be in alignment with native species phenology and life histories; i.e., it would be the type of fire they most likely have adapted to and under appropriate soil conditions (to prevent heat damage to soils). See Appendix B for a list of BMPs associated with this impact topic.

Trends and Cumulative Effects: Increased low-severity prescribed burns within the park, combined with prescribed burns by other agencies would greatly reduce potential for large, high-severity wildland fires. These burns would also increase herbaceous density, reducing overland flow associated with intense precipitation events. Each acre treated according to the Alternative 2 treatments would have a cumulative beneficial effect in restoring the Monument and Preserve to its prehistoric fire cycle. Scenic vistas would be eventually restored. Reducing the amount of shrubs and small trees would accelerate the production of large snags and down logs that are a host for a variety of species, including the wood roach. Increased burns by other agencies and ownerships would complement the reduction in large-scale, high-intensity wildland fires.

Wildlife and Wildlife Habitat Effects

Spatial and Temporal Scale of Effects: The effects of implementing Alternative 2 would be focused on wildlife and wildlife habitat within park boundaries (including both the Monument and Preserve portions of the park), though, because of the migratory nature of some species of wildlife, would ultimately benefit off-park wildlife as well.

Effects on Resource: The wide diversity of wildlife species and complexity of their habitats within the Monument (described in the Alternative 1 section above), applies to the Preserve portions of the park as well. Increased structural complexity would provide refuge for a greater diversity of animal species, a beneficial effect to wildlife. Under Alternative 2, treatments for fuels reduction and prescribed fire would be planned to optimize habitat conditions for park wildlife.

Mitigations and BMPs: Alternative 2 would include prescriptions that minimize potential harm to wildlife and their habitats in all portions of the park. Potential adverse effects (removal of plant canopy and cover) would be short-term and, once the plant canopy recovers, would be followed by improved habitat and forage conditions. To protect migratory and other bird species, vegetation trimming and removal would be scheduled outside of peak breeding season (May 1 to June 15) to the maximum extent practicable. All areas would be spot surveyed immediately prior to vegetation removal and all bird nests would be avoided. See Appendix B for a list of BMPs associated with this impact topic.

Trends and Cumulative Effects: The implementation of Alternative 2, combined with other regional fire and fuels management activities would have the cumulative beneficial effect of reducing

the risk of catastrophic wildfires within the region in general as well as within all portions of ORCA. The implementation of this alternative, which includes follow-on maintenance of treated areas, would also have the cumulative beneficial effect of restoring and enhancing pre-settlement ecosystems to the benefit of plant and wildlife species.

Cultural Resources - Archeology

Spatial and Temporal Scale of Effects: The effects of Alternative 2 on cultural resources are limited to areas within the ORCA boundaries. Potential adverse effects, including damage to archeological sites by prescribed fire or fuels removal treatments, that would be long-term in the sense that damage could be unrepairable. (but prevented by mitigation). The anticipated beneficial effects of the treatments would also be long-term in nature, to include the required cultural resource survey of planned treatment sites (increasing likelihood of discovering new artifacts and features), and the increased protection of known and unknown cultural sites from catastrophic wildfires.

Effects on Resource: Lightly burned sites have little effect on stone artifacts, while heavily burned sites, such as log corridors, would affect 40-50 percent of the stone artifacts; mostly by soot but also spalling (Lentz et al. 1996). Therefore, the prescribed burns planned under Alternative 2 would reduce the potential long-term adverse effects on cultural artifacts caused by high-intensity wildfires.

Mitigations and BMPs: Under Alternative 2, pre-burn surveys would identify cultural resources in a planned, orderly manner, providing for protection of those resources. Prior to prescribed fire operations, surveys would be conducted, and concurrence would be obtained from the SHPO. All known sites would be avoided, and any sites discovered during operations would be protected. Sites would also be protected during wildland fire operations. See Appendix B for a list of BMPs associated with this impact topic.

Trends and Cumulative Effects: Increased prescribed burns by other agencies and land owners would complement the reduction in large-scale, high-intensity wildland fire produced by Alternative 2, leading to an overall beneficial cumulative impact on the protection of ORCA cultural resources. Conversely, not implementing Alternative 2 (i.e., only implementing Alternative 1, No Action), would not contribute significantly to regional efforts at wildfire management and put ORCA and adjacent land's cultural resources at greater risk.

Historic Structures and Landscapes Effects

Spatial and Temporal Scale of Effects: The effects of Alternative 2 on historic structures and landscapes are limited to areas within the ORCA boundaries, and primarily within the Monument portion of the park. Potential adverse effects of not reducing fuel loads and the risk of fire near historic structures would be long-term and permanent should fire destroy the structures.

Effects on Resource: No adverse effects of the prescribed burning and fuels reduction actions are expected under the planned conditions. Smoke from prescribed fire and pile burning, near to the Historic District is unlikely to damage historic building materials or furnishings (NPS 2022b). Stone

benches along trails and all structures outside the Historic District currently being evaluated for potential historic listing would be protected from prescribed burns.

Mitigations and BMPs: Prior to prescribed fire operations, surveys would be conducted and concurrence with the SHPO would be obtained. All known sites would be avoided, and any sites discovered during operations would be protected. Sites would also be protected during wildland fire operations. Nevertheless, there is always a risk of a prescribed fire becoming an uncontrolled fire which could potentially damage or destroy historic structures and landscapes.

As with Alternative 1, a key purpose of Alternative 2 is to reduce fuels loads near to historic structures and landscapes. Where prescribed fire cannot be conducted with complete control, an emphasis would be placed on manual removal of fuels in vulnerable areas. Potential harm to the historic structures would be mitigated by using only the appropriate treatment methods near the Historic District. See Appendix B for a list of BMPs associated with this impact topic.

Trends and Cumulative Effects: The long-term beneficial effect of fuel reduction near to the Historic District, as well as outside the District, would be to greatly reduce the risk of uncontrolled wildfires that could completely destroy the historic buildings and landscapes. Combined with other NPS actions to make historic structures more fire resistant, Alternative 2 would have the cumulative effect of greatly reducing the likelihood of the buildings being destroyed by catastrophic wildfires.

Museum Collections Effects

Spatial and Temporal Scale of Effects: The effects of Alternative 2 on museum collections are limited to the Headquarters Building and the Chateau (located within the Historic District of the Monument). These collections are at risk of long-term (permanent) damage or destruction should the buildings be destroyed by uncontrolled wildfire.

Effects on Resource: Only the manual fuel reduction treatments of Alternative 2 would be conducted near to buildings containing museum collections. No adverse effects of the prescribed burning and fuels reduction actions are expected under the planned conditions. Smoke from prescribed fire and pile burning, near to buildings housing museum collections is unlikely to damage the buildings or the collections (NPS 2022b).

Mitigations and BMPs: Any prescribed fire conducted under the Alternative 2 would be properly planned to ensure buildings housing museum collections are avoided and protected.

Trends and Cumulative Effects: Combined with other NPS actions to make ORCA structures more fire resistant, Alternative 2 would have the cumulative effect of greatly reducing the likelihood of the buildings and the museum collections they contain being destroyed by catastrophic wildfires.

Geologic Features and Soils Effects

Spatial and Temporal Scale of Effects: The effects of Alternative 2 would be limited to geologic features and soils within ORCA boundaries. Any adverse effects would likely be short-term and

limited in areal extent, while the ultimate beneficial effects of improving watershed conditions through systematic use of prescribed fire would be long-lasting.

Effects on Resource: As described in the Alternative 1 section, above, changes in watershed condition caused by wildfire or prescribed fire, could alter the chemistry of water that flows into the Cave system. Because most of the watershed contributing to surface flow to the Caves is within the Monument portion of the park, alterations to the Preserve watersheds should not affect geologic processes within the Caves. The effect of prescribed burning is likely to be minor or negligible on cave water mineralogy.

Although the granitic soils within the park are highly erosive, the low-severity fires should not substantially increase soil erosion from the treated sites. The prescribed burns conducted as part of Alternative 2, including post-fire restoration and maintenance, is expected to have negligible adverse impact on geologic processes and soil erosion.

Mitigations and BMPs: Standard erosion protection BMPs and restriction of treatments to less-than 30% slopes, incorporated in the Alternative 2 treatment plans, would minimize this temporary adverse effect of vegetation removal on soil erosion. Potential erosion would be limited by leaving a mosaic of unburned islands throughout each burn area. Burning would be conducted to increase grass and forb cover. Fire severity would be managed to avoid consuming deep soil organic layers. Prescribed fire plans would primarily utilize natural barriers and roads for control lines. Any constructed control lines would be limited in width and depth to the minimum necessary to ensure control of the burn.

With the application of standard BMPs, it is unlikely that the final number of fire lines would adversely affect such processes as infiltration or erosion. Careful attention would be paid to avoiding these potential problems during the placement of such lines and revegetation would be conducted, where necessary, after the burns. Particular attention would be given to preventing or mitigating erosion on the most erodible soils on ORCA. Fire lines would be located to take advantage of natural barriers, rock outcroppings and trails. When fire lines approach road corridors available for visitor vehicle travel, they would be curved so as not to present a straight line away from the road. See Appendix B for a list of BMPs associated with this impact topic.

Trends and Cumulative Effects: Implementation of Alternative 2, combined with long-term site maintenance and restoration actions would have a cumulative beneficial effect on stream flow and water chemistry, with the prospective of maintaining geologic processes and feature within the caves at their optimal balance. Fuels treatments would reduce the risk of catastrophic, high-intensity wildfires on ORCA, events which could cause massive shifts in stream and cave chemistry as well as destructive levels of soil erosion and sedimentation across large areas.

Water-Related Resources Effects

Spatial and Temporal Scale of Effects: The effects of Alternative 2 on water-related resources, including WSR River Styx, WSR-eligible Lake Creek and upper Cave Creek, and wetlands, would be restricted within park boundaries in accordance with the treatment design criteria. The potential

adverse effects of low-intensity prescribed burning on runoff and sedimentation would be localized to the treatment area, and last only a season or two until the treated vegetation recovers. This is in contrast to the long-term adverse effects of uncontrolled wildfires, which can burn across multiple watersheds and damage terrestrial and aquatic resources for years afterward. Uncontrolled wildfires within the park have a high potential to adversely affect downstream aquatic species (e.g. coho salmon).

Effects on Resource: The proposed treatments would avoid short-term adverse effects on treated watersheds, and Wild and Scenic Rivers, with conservative, established buffers that prevent the reduction of canopy cover adjacent to riparian areas, and prevent potential downstream flooding and sedimentation. Alternative 2 would have similar effects on water-related resources as described in the Alternative 1 section, above, but would extend to both Monument and Preserve lands. It is expected that Alternative 2 prescribed fire treatments would have an overall long-term beneficial effect on local stream flows and groundwater recharge.

Mitigations and BMPs: Potential erosion and sediment delivery to streams would be mitigated by ensuring that only appropriate-sized portions of a watershed or watersheds are burned in any given year. A mosaic of vegetation would be left immediately adjacent to streams. Revegetation of burned areas would be evaluated prior to burning additional portions of the watershed. Care would be taken not to damage water supply infrastructure during reduction of fire fuels. See Appendix B for a list of BMPs associated with this impact topic.

Trends and Cumulative Effects: Implementation of Alternative 2, combined with similar fuel reduction strategies by other local agencies, would greatly reduce potential for large, high-severity wildland fires, resulting in a long-term beneficial effect to ORCA. This would also increase herbaceous density, reducing overland flow associated with intense precipitation events.

Alternative 3 Manual & Mechanical Treatments (Preferred Alternative)

Alternative 3, the Manual & Mechanical treatments incorporates all the treatments described in Alternative 2 (Manual Treatments alternative) combined with the use of certain mechanized treatments that would allow for more cost-effective and rapid fuel reduction on areas with slopes less than 30%, including roadside treatments, shaded fuel breaks, and specific forest types. The heavy equipment to be used in this option would include feller bunchers, masticators, tracked chippers, mini excavators, and similar tracked machines.

Air Quality Effects

Spatial and Temporal Scale of Effects: Same as for Alternative 2.

Effects on Resource: Implementation of Alternative 3 would include all the effects on air quality identified for Alternative 2, with the added, adverse effect of increased hydrocarbon emissions caused by the use of gasoline/diesel powered equipment. The anticipated emissions would be of short-term and of limited area, and would be a very minor addition to emissions caused by prescribed or pile burning planned for this alternative.

Mitigations and BMPs: In addition to applying Alternative 2 mitigation measures for prescribed fire, Alternative 3 would emphasize the use of standard vehicle emission controls to minimize any effect on workers or local wildlife. See Appendix B for a list of BMPs associated with this impact topic.

Trends and Cumulative Effects: The cumulative adverse effect of equipment emissions on ORCA and regional air quality would be negligible. The reduction of risk of large-scale wildfires on ORCA would have a cumulative, beneficial, long-term effect on park and regional air quality.

Non-native or Exotic Species Effects

Spatial and Temporal Scale of Effects: Like Alternative 2, the effects of implementing the Alternative 3 treatments on non-native or exotic plant species would be largely contained within ORCA's boundaries and would be long-term in nature.

Effects on Resource: There is a potential for mechanized equipment to transfer non-native plant and *Phytophthora* propagules from an infested area of ORCA to a previously un-infested area during the treatment process. This would be avoided by following strict equipment cleaning and inspection protocols prior to moving equipment to a new site.

Mitigations and BMPs: The inadvertent transfer of non-native and *Phytophthora* propagules would be avoided by following strict equipment cleaning and inspection protocols prior to moving equipment to a new site. With the proper safeguards in place, the use of equipment, in addition to the manual treatments, would have no additional effect on spreading non-native or exotic species within ORCA. See Appendix B for a list of BMPs associated with this impact topic.

Trends and Cumulative Effects: By improving the health and resilience of vegetation through fuels and fire management, native habitats would be more resistant to invasion or infection by non-native or exotic species, providing a cumulative, long-term, beneficial effect. Under Alternative 3, the use of mechanized equipment to expedite vegetation removal from the treatment areas would hasten these beneficial effects.

Species of Special Concern or Their Habitat Effects

Spatial and Temporal Scale of Effects: Same as for Alternative 2.

Effects on Resource: Implementing Alternative 3 could have additional short-term, adverse effects on species of special concern and their habitats within ORCA. Heavy equipment may disturb wildlife species and temporarily displace them from their habitat. If used near streams, heavy equipment could damage stream banks, increase sediment to the water body, and lower the water quality for aquatic species. However, the use of mechanized equipment to facilitate and expedite fuels reduction and to support prescribed fire activities, has a long-term beneficial effect of hastening improvements to watershed condition, and consequently to improving aquatic habitat quality. (Refer to Alternative 1 and 2 discussions, above, for more information).

Mitigations and BMPs: Under Alternative 3, all wildlife species of special concern would be avoided during prescribed fire operations spatially and/or temporally. Terrestrial and aquatic species and habitats would be protected by prohibiting use of heavy equipment in sensitive areas, and limiting their use to certain periods avoiding potential effects to sensitive wildlife species. All plant species of special concern would be avoided during prescribed fire operations, unless it is identified that burning enhances a particular species. Before implementation, each individual project within the park would complete ESA surveys, be approved by the park's Resource Management Program Lead, and through consultation with the USFWS/NMFS under Section 7 of the ESA. See Appendix B for a list of BMPs associated with this impact topic.

Federally Listed Wildlife Species

Northern Spotted Owl: (threatened). Prescribed fire would not be used during spotted owl nesting season near unsurveyed areas or areas occupied by nesting birds. Where spotted owls are detected, thinning work would be excluded for 0.25 miles and burning operations would be excluded for 1 mile unless further consultation is conducted with USFWS. Any work that generates noise above ambient sound levels would not occur within 0.25 miles of a northern spotted owl detection site during the spotted owl noise restriction period (March 1–September 30). If a spotted owl activity center is found to have chicks, then no tree removal would occur during the period March 1–September 30 within the activity center stand, within 0.50 miles of an activity center or according to further consultation with USFWS (NPS 2022c).

Franklin's Bumble Bee: (endangered). Burning (piles or prescribed) would not occur in meadows from May 15 to September 30. Mechanical equipment would not be used within 300 feet of any meadow areas at any time of the year. If detected, consultation with USFWS would be reinitiated (NPS 2022c).

Pacific Coastal Marten: (threatened). If detected, consultation with USFWS would be reinitiated (NPS 2022c).

Oregon Spotted Frog: (threatened). All potential habitat, including lakes and potential wetlands, would have sediment protection zones for no mechanical equipment operations that extend 200 feet, with only shrub and small diameter (<8-inch DBH) manual thinning allowed within 100 feet, and no treatment allowed within 50 feet of Oregon spotted frog habitat. All burning in riparian areas would be low intensity. If detected, consultation with USFWS would be reinitiated (NPS 2022c).

Oregon Coast Coho Salmon: (threatened). All potential habitat, including ephemeral, intermittent, and perennial streams along with lakes and potential wetlands, would have sediment protection zones for no mechanical equipment operations that extend 200 feet, with only shrub and small diameter (<8-inch DBH) manual thinning allowed within 100 feet, and no treatment allowed within 50 feet unless part of public development area like Cave Creek Campground. All burning in riparian areas would be low intensity. If detected, consultation with NMFS would be reinitiated (NPS 2022d).

Trends and Cumulative Effects: As with Alternative 2, Alternative 3 treatments would have a long-term beneficial effect by enhancing, increasing, and maintaining habitats for species of concern.

Combined with other ORCA actions to protect wildlife habitat, and regional efforts in fire management, the implementation of Alternative 3 would have a cumulative beneficial effect on species of concern and their habitats.

Native Vegetation Effects

Spatial and Temporal Scale of Effects: Same as for Alternative 2.

Effects on Resource: Under Alternative 3, the addition of mechanical treatments to the manual treatments would allow more efficient fuel reduction on certain areas of ORCA where slope and other conditions are amenable to the use of heavy equipment.

Mitigations and BMPs: Application of equipment BMPs, including any necessary post-treatment site restoration, would reduce the short-term damage to understory vegetation. See Appendix B for a list of BMPs associated with this impact topic.

Trends and Cumulative Effects: Implementation of Alternative 3 and follow-up maintenance would have long-term, beneficial effects on the health and productivity of native vegetation. Combined with other ORCA actions to protect native vegetation, Alternative 3 would enhance fuel reduction efforts and would have a cumulative beneficial effect on native vegetation management within ORCA.

Wildlife and Wildlife Habitat Effects

Spatial and Temporal Scale of Effects: Same as for Alternative 2.

Effects on Resource: As with Species of Special Concern (see section, above), the use of mechanized equipment on certain treatment areas could cause local wildlife to temporally disperse to unaffected areas (due to excessive noise and activity), and cause stress to species that are unable to avoid the activity. The direct adverse impact to wildlife would be short-term, as would the potential indirect adverse impact to their habitat caused by ground cover disturbance. The use of mechanized equipment, to support manual treatments, would accelerate site treatment and bring about the desired conditions quicker than manual treatment alone.

Mitigations and BMPs: Under Alternative 3, treatment plans would be designed to avoid or minimize these potential adverse effects, such as during bird nesting season. Post-treatment actions would also be used to restore habitat damaged by equipment. See Appendix B for a list of BMPs associated with this impact topic.

Trends and Cumulative Effects: Combined with other ORCA wildlife and habitat management actions, the implementation of Alternative 3 would have a cumulative, long-term, beneficial effect on local wildlife and their habitat.

Cultural Resources - Archeology

Spatial and Temporal Scale of Effects: Same as for Alternative 2.

Effects on Resource: Potential adverse effects of implementing Alternative 3 include damage to archeological sites by mechanized equipment, which would likely be permanent and unreparable. However, the anticipated benefit of using mechanized equipment to supplement manual fuels reduction would be long-term in nature, to include the required cultural resource survey of planned treatment sites (increasing likelihood of discovering and preserving new artifacts and features), and the increased protection of known and unknown cultural sites from catastrophic wildfires.

Mitigations and BMPs: Pre-treatment archeological surveys would identify areas to be avoided for either manual or mechanical treatments. See Appendix B for a list of BMPs associated with this impact topic. By facilitating the removal of hazardous fuels adjacent to sensitive cultural sites, Alternative 3 would have the long-term beneficial effect of reducing the risk of catastrophic wildfires that could destroy the sites.

Trends and Cumulative Effects: Combined with other ORCA actions to protect cultural resources, the implementation of Alternative 3 mechanized treatments would have a cumulative, long-term beneficial effect on protecting and maintaining cultural resources within ORCA.

Historic Structures and Landscapes Effects

Spatial and Temporal Scale of Effects: Same as for Alternative 2.

Effects on Resource: Within the Monument, mechanical treatment areas would focus on roadside (within 200 feet of road) and infrastructure protection, with hand treatments in other areas (e.g., hand retreatment of Horseshoe Shaded Fuel Breaks [SFBs], Cave Creek, and mid-slope units). No mechanical equipment would be used off road surfaces within the Historic District which includes the area immediately around the historic structures and the trail surface of the No Name, Cliff Nature, Lake Mountain and Big Tree trails. A 10-foot no equipment buffer would be used on these trails along with Limestone Trail. Use or travel of equipment on all park trails would require rehabilitation.

Mitigations and BMPs: Potential adverse effects of the use of mechanized equipment within the Monument would be avoided or mitigated through the treatment planning process and BMPs. See Appendix B for a list of BMPs associated with this impact topic.

Trends and Cumulative Effects: Combined with other NPS actions to make historic structures more fire resistant, Alternative 3 would have the cumulative effect of greatly reducing the likelihood of the buildings or historic landscape features being destroyed by catastrophic wildfires

Museum Collections Effects

Spatial and Temporal Scale of Effects: Same as for Alternative 2.

Effects on Resource: Only the manual fuel reduction treatments of Alternative 3 would be conducted near to buildings containing museum collections. No adverse effects of the prescribed burning and fuels reduction actions are expected under the planned conditions. Smoke from

prescribed fire and pile burning, or emissions from mechanical equipment, near to buildings housing museum collections is unlikely to damage the buildings or the collections (NPS 2022b).

Mitigations and BMPs: Where prescribed fire cannot be conducted with complete control, an emphasis would be placed on manual removal of fuels in vulnerable areas. Potential harm to the historic structures would be mitigated by using only the appropriate treatment methods near the Historic District. See Appendix B for a list of BMPs associated with this impact topic.

Trends and Cumulative Effects: The long-term beneficial effect of fuel reduction near to the Historic District, as well as outside the District, would be to greatly reduce the risk of uncontrolled wildfires that could completely destroy the historic buildings and landscapes. Combined with other NPS actions to make historic structures more fire resistant, Alternative 3 would have the cumulative effect of greatly reducing the likelihood of the buildings, and the museum collections they contain, being destroyed by catastrophic wildfires.

Geologic Features and Soils Effects

Spatial and Temporal Scale of Effects: Same as for Alternative 2.

Effects on Resource: The added vegetation fuel reduction afforded by use of mechanized equipment would promote more rapid treatment of areas within ORCA, relative to the manual treatments alone. The long-term beneficial effect of this would be to further lower the risk of catastrophic wildfires that could adversely impact cave water chemistry, and cause widespread soil erosion and sedimentation.

Mitigations and BMPs: Because mechanized equipment can cause substantial ground disturbance in some situations, the areas where it would be used are limited by slope (<30% slopes) and adjacency to sensitive areas like streams and wetlands. On areas where mechanized equipment would be used, the adverse impacts of soil erosion and sedimentation would be mitigated by use of established BMPs. See Appendix B for a list of BMPs associated with this impact topic.

Trends and Cumulative Effects: Combined with other regional efforts to reduce the risk of catastrophic wildfires, implementation of Alternative 3 would have a long-term, beneficial effect geologic features (and processes) and soil protection within ORCA.

Water-Related Resources Effects

Spatial and Temporal Scale of Effects: Same as for Alternative 2.

Effects on Resource: The effects of Alternative 3 treatments on water-related resources, including Wild and Scenic Rivers within and downstream from ORCA, would be substantially the same as Alternative 2, manual treatments. The primary difference would be that the use of mechanized equipment would accelerate the fuel reduction treatments.

Mitigations and BMPs: Use of mechanized equipment has the added risk of releasing hazardous materials to the soil and streams by leaks or spillage of lubricants, hydraulic-fluids, and fuels. This would be prevented or minimized by applying standard BMPs to use of mechanized equipment.

Likewise, the adverse effects of soil erosion and stream sedimentation, caused by mechanized equipment, would be minimized by restriction of equipment to slopes less than 30%, conservative buffer zones around all riparian and wetland resources, and application of other BMPs. See Appendix B for a list of BMPs associated with this impact topic.

Trends and Cumulative Effects: Implementation of Alternative 3, combined with similar fuel reduction strategies by other local agencies, would greatly reduce potential for large, high-severity wildland fires. The long-term cumulative effect of these actions would be to improve watershed conditions within ORCA, and restore downstream flows and aquatic habitats to a more functional condition.

Table 2. Summary of Impacts

Issue	Alternative 1: No Action	Alternative 2: Manual Treatments	Alternative 3: Manual & Mechanical Treatments (Preferred Alternative)
Air Quality	Increased risk of catastrophic wildfires resulting in long-term, adverse impact to resource within the Monument and (untreated) Preserve. The limited use of prescribed fire within the Monument would have a negligible impact on local and regional air quality.	Reduced risk of catastrophic wildfires; enhanced protection and resilience of resource within the Monument and Preserve. The use of prescribed fire within the Monument and Preserve would have a negligible impact on local and regional air quality.	Expands and accelerates beneficial effects of Manual Treatments on resource protection and resilience within the Monument and Preserve. The use of prescribed fire within the Monument and Preserve would have a negligible impact on local and regional air quality.
Non-native or Exotic Species	Increased risk of catastrophic wildfires resulting in long-term, adverse impact to resource within the Monument. Implementation of invasive plant species BMPs and post-treatment maintenance would prevent spread of non-native or exotic species within the Monument.	Reduced risk of catastrophic wildfires; enhanced protection and resilience of resource within the Monument and Preserve. Implementation of invasive plant species BMPs and post-treatment maintenance would prevent spread of non-native or exotic species within the Monument and Preserve.	Expands and accelerates beneficial effects of Manual Treatments on resource protection and resilience within the Monument and Preserve. Implementation of invasive plant species BMPs and post-treatment maintenance would prevent spread of non-native or exotic species within the Monument and Preserve.
Species of Special Concern or Their Habitat	Increased risk of catastrophic wildfires resulting in long-term, adverse impact to resource both within the Monument and the (untreated) Preserve. Treatments would be planned and BMPs implemented to avoid adverse impact to species of special concern (including federally protected species) and their habitat within the Monument.	Reduced risk of catastrophic wildfires; enhanced protection and resilience of resource in the Monument and Preserve. Treatments would be planned and BMPs implemented to avoid adverse impact to species of special concern (including federally protected species) and their habitat within the Monument and Preserve.	Expands and accelerates beneficial effects of Manual Treatments on resource protection and resilience within the Monument and Preserve. Treatments would be planned and BMPs implemented to avoid adverse impact to species of special concern (including federally protected species) and their habitat within the Monument and Preserve.

Issue	Alternative 1: No Action	Alternative 2: Manual Treatments	Alternative 3: Manual & Mechanical Treatments (Preferred Alternative)
Native Vegetation.	Increased risk of catastrophic wildfires resulting in long-term, adverse impact to resource within both the Monument and (untreated) Preserve. Treatments would be planned and BMPs implemented to avoid adverse impact to native vegetation within the Monument.	Reduced risk of catastrophic wildfires; enhanced protection and resilience of resource within the Monument and Preserve. Treatments would be planned and BMPs implemented to avoid adverse impact to native vegetation within the Monument and Preserve.	Expands and accelerates beneficial effects of Manual Treatments on resource protection and resilience within the Monument and Preserve. Treatments would be planned and BMPs implemented to avoid adverse impact to native vegetation within the Monument and Preserve.
Wildlife and Wildlife Habitat	Increased risk of catastrophic wildfires resulting in long-term, adverse impact to resource within the Monument and (untreated) Preserve. Treatments would be planned and BMPs implemented to avoid adverse impact to wildlife and wildlife habitat within the Monument.	Reduced risk of catastrophic wildfires; enhanced protection and resilience of resource within the Monument and Preserve. Treatments would be planned and BMPs implemented to avoid adverse impact to wildlife and wildlife habitat within the Monument and Preserve.	Expands and accelerates beneficial effects of Manual Treatments on resource protection and resilience within the Monument and Preserve. Treatments would be planned and BMPs implemented to avoid adverse impact to wildlife and wildlife habitat within the Monument and Preserve.
Cultural Resources (Archeology)	Increased risk of catastrophic wildfires resulting in long-term, adverse impact to resource within the Monument and (untreated) Preserve. Pre-treatment surveys would be conducted to identify and avoid cultural resources within the Monument.	Reduced risk of catastrophic wildfires; enhanced protection and resilience of resource within the Monument and Preserve. Pre-treatment surveys would be conducted to identify and avoid cultural resources within the Monument and Preserve.	Expands and accelerates beneficial effects of Manual Treatments on resource protection and resilience within the Monument and Preserve. Pre-treatment surveys would be conducted to identify and avoid cultural resources within the Monument and Preserve.
Historic Structures and Landscapes	Increased risk of catastrophic wildfires resulting in long-term, adverse impact to resource within the Monument and (untreated) Preserve. Treatments would be planned to avoid adverse impact to historic structures and landscapes within the Monument.	Reduced risk of catastrophic wildfires; enhanced protection and resilience of resource within the Monument and Preserve. Treatments would be planned to avoid adverse impact to historic structures and landscapes within the Monument and Preserve.	Expands and accelerates beneficial effects of Manual Treatments on resource protection and resilience within the Monument and Preserve. Treatments would be planned to avoid adverse impact to historic structures and landscapes within the Monument and Preserve.

Issue	Alternative 1: No Action	Alternative 2: Manual Treatments	Alternative 3: Manual & Mechanical Treatments (Preferred Alternative)
Museum Collections	Increased risk of catastrophic wildfires resulting in long-term, adverse impact to resource within the Monument. Treatments would be planned to avoid adverse impact to museum collections housed in buildings within the Monument.	Reduced risk of catastrophic wildfires; enhanced protection and resilience of resource within the Monument. Treatments would be planned to avoid adverse impact to museum collections housed in buildings within the Monument.	Expands and accelerates beneficial effects of Manual Treatments on resource protection and resilience within the Monument. Treatments would be planned to avoid adverse impact to museum collections housed in buildings within the Monument.
Geologic Features and Soils	Increased risk of catastrophic wildfires resulting in long-term, adverse impact to resource within the Monument and (untreated) Preserve. Treatments would be planned and BMPs implemented to avoid adverse impact to geologic features and soils within the Monument.	Reduced risk of catastrophic wildfires; enhanced protection and resilience of resource within the Monument and Preserve. Treatments would be planned and BMPs implemented to avoid adverse impact to geologic features and soils within the Monument and Preserve.	Expands and accelerates beneficial effects of Manual Treatments on resource protection and resilience, within the Monument and Preserve. Treatments would be planned and BMPs implemented to avoid adverse impact to geologic features and soils within the Monument and Preserve.
Water-Related Resources	Increased risk of catastrophic wildfires resulting in long-term, adverse impact to resource within the Monument and (untreated) Preserve. Treatments would be planned and BMPs implemented to avoid adverse impact to water-related resources within or downstream from the Monument.	Reduced risk of catastrophic wildfires; enhanced protection and resilience of resource within the Monument and Preserve. Treatments would be planned and BMPs implemented to avoid adverse impact to water-related resources within or downstream from the Monument and Preserve.	Expands and accelerates beneficial effects of Manual Treatments on resource protection and resilience. Treatments would be planned and BMPs implemented to avoid adverse impact to water-related resources within or downstream from the Monument and Preserve.

7 Consultation and Coordination

ORCA consults with federally recognized tribes, the Oregon State Historic Preservation Office, the US Fish and Wildlife Service, and the National Marine Fisheries Service (NMFS) before making decisions or undertaking activities that may affect federally recognized tribes, cultural resources, or species protected by the Endangered Species Act. For this FMP update EA, informal consultation was initiated in February – March 2022, with a summary of the proposed action and an invitation to the public scoping meeting held in April 2022.

National Historic Preservation Act Section 106 compliance consultation was conducted with Oregon SHPO and six federally recognized tribes in accordance with 36 CFR Section 800.8(a)(1). The federally recognized tribes consulted with include: The Confederated Tribes of Siletz Indians, Cow Creek Band of Umpqua Tribe of Indians, Tolowa Dee-ni' Nation, Karuk Tribe, The Confederated Tribes of the Grand Ronde Community of Oregon, and Quartz Valley Indian Community of the Quartz Valley Reservation of California. The plan goals, objectives, and the planning effort's progress were discussed during the SHPO-NPS biennial meeting held in September 2022. When finalized, the park will send the Draft EA for review, continue further consultation, and document the key findings, stipulations and effects in the decision document for this EA.

Endangered Species Act Section 7 compliance consultation was conducted with USFWS and NMFS in accordance with 16 U.S.C 1531-1544. A species list was obtained directly from each agency office which indicated that consultation for northern spotted owl (*Strix occidentalis caurina*), Franklin's bumble bee (*Bombus franklini*), Pacific coastal marten (*Martes caurina*), and Oregon coast coho salmon (*Oncorhynchus kisutch*) and associated habitat was needed. When finalized, the park will continue further consultation, send USFWS and the NMFS the Draft EA for review, and document the key findings, mitigations and effects in the decision document for this EA.

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Appendix A:
PROPOSED FIRE MANAGEMENT TREATMENTS

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APPENDIX A - PROPOSED FIRE MANAGEMENT TREATMENTS

The following is text from the National Park Service (NPS) Oregon Caves National Monument and Preserve (ORCA, or Monument and Preserve, or “park”) Fire Management Plan (FMP) draft update (2022, Unpublished Draft).

1 GOALS OF THE FIRE MANAGEMENT PLAN

The goals of this fire management plan are to protect life and property, prevent catastrophic wildfire, reduce fuels, restore plant communities to their natural range of variation, and increase ecological resistance and resilience.

Fire suppression would be used to protect infrastructure, high visitor-use areas, and natural and cultural resources. Management of wildland fires would include resource benefit objectives and return of fire to its natural role on the landscape where identified risk is manageable and acceptable. Proposed fire management would include a combination of manual and mechanical treatments.

Note: all references to tree diameter in the discussion below refer to “diameter breast height” (DBH), the diameter of the tree measured 4.5 feet above ground level or from the upslope side of the tree.

2 PAST AND FUTURE TREATMENT AREAS

Past ORCA Fuels Treatments (2005-2021 Plan)

The NPS implemented fuels treatment projects in ORCA in the past. The following section highlights those past projects, several of which would be maintained by future fuel management projects.

Descriptions of Previously Planned Fuels Projects

Figure A-1 shows the location and completion dates of past ORCA fuels management treatments (2005 to 2021). These areas would remain in the current plan for re-treatment as needed (generally 3 to 10-year interval).

The previously planned fuels projects include the following:

Bigelow Lake: This is a thinning and handpile unit, followed by pile burning to reduce conifer and shrub encroachment and reduce fuels that accumulated from fire exclusion.

Campground: 300-feet buffer around Cave Creek Campground sites.

Caves Creek 1, 2, 3, 4, 5, 6, 7, 8, 9: These are maintenance thinning and handpile projects, followed by pile burning. These units have been treated in past years and the objective is to maintain past treatment investments. These units are located adjacent the Oregon Caves Historic District.

Caves Highway, Escape Route, and Upper Roadside Fuel Breaks: Shaded fuel breaks along roads within the preserve within 200 feet of the road.



Past Oregon Caves Treatments 2005-2021 (Burn Year Shown)

Map Does Not Include Visitor Center Treatments

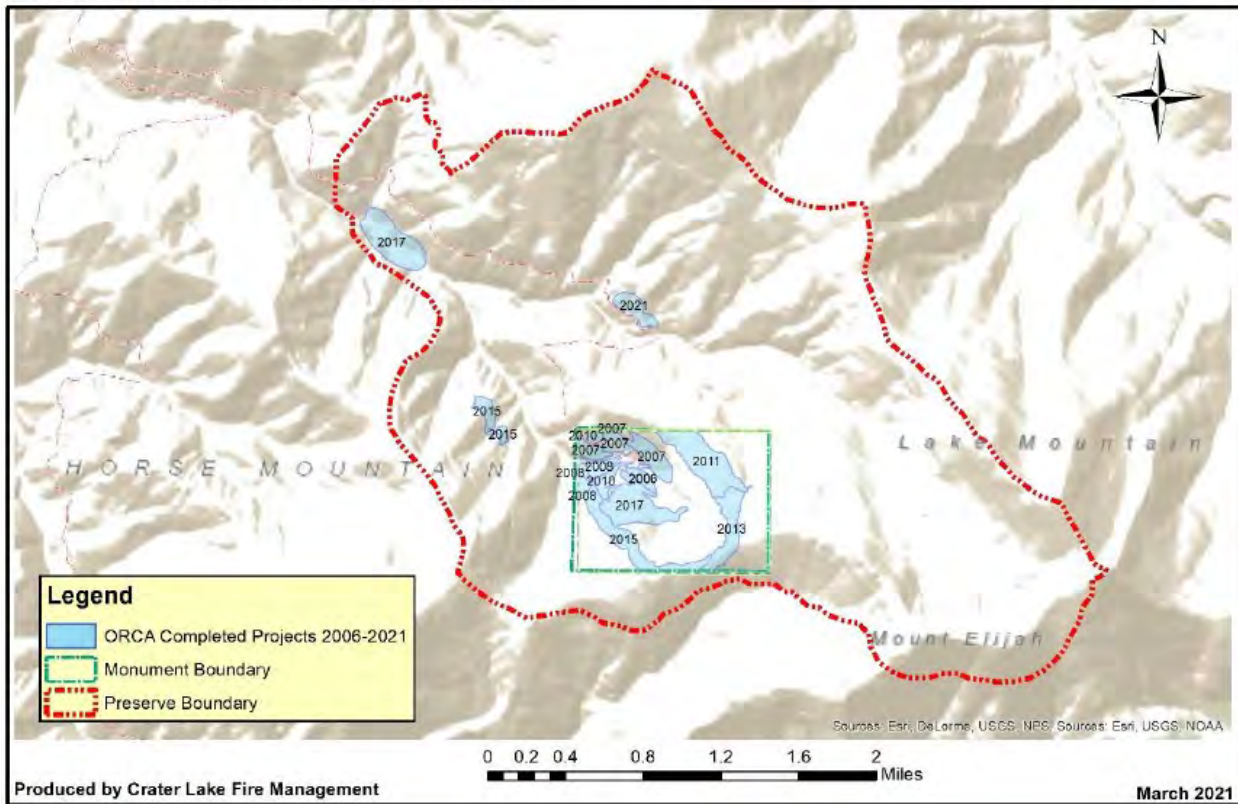


Figure A-1. Previous fuels treatments 2005-2021.

Headquarters Units: Thinning, piling, and pile burning around the headquarters area to aid in structural defense.

Horseshoe Shaded Fuel Break: These projects continue the shaded fuel break along ridge tops to create a tactical anchor for wildland fires. It is designed to protect the Oregon Caves Historic District from fires originating outside of the Monument and also protect National Forest lands from fires originating within the Monument. The project would include manual thinning, hand piling, and pile burning.

Midslope 1, 2, 3: Thinning above the Cave Creek units and below the Horseshoe Shaded Fuel Break units.

No Name: Thinning, piling, and pile burning along the No Name Trail and Creek below the original Monument Boundary to reduce fuels below the Historic District.

Upper Lake: These units thin areas with past logging activities on south to southwest slopes.

The 2022-2025 plan includes re-treatment (cut and pile burn) of the Campground Roadside, Headquarters units, Cave Creek and Mid-Slope units, Horseshoe Shaded Fuelbreaks, as well as new

treatments including Escape Route (NPS-960 Road), the Caves Highway (HWY 46), the Upper Roadside, Upper Lake plantation areas, and extensions of Horseshoe Shaded Fuelbreaks (HSFB4 and HSFB5).

These projects and associated acreages are subject to change. Factors that would cause change include, but are not limited to, the following:

- Wildland fires that may burn units or portions of units prior to this schedule.
- Wildland fires in close proximity to other fuels treatment units that may provide opportunities to treat adjacent units prior to the schedule date.
- Funding and/or staffing unavailable to accomplish projects or planning.
- Opportunities to accomplish cooperative projects with adjacent landowners and/or agencies in a year other than when the unit is scheduled.
- Opportunities to accomplish additional projects in a given calendar year due to favorable conditions or available resources.
- Diminished opportunities to accomplish proposed targets due to weather, air quality, or resource availability constraints.
- National or Regional preparedness levels that preclude the use of prescribed fire.
- Socio-political or administrative concerns that preclude the use of prescribed fire.
- Cultural or natural resource impacts that cannot be avoided or mitigated.
- Trends from monitoring effects of treatments indicating a change is needed.
- Changes in federal and/or National Park Service fire management policies.
- Updated research that may help guide the treatment schedule.
- Access to project areas due to road closures or snow conditions.
- Exotic plants, disease, or insect issues.
- Priority changes with inventories and/or the development of a new fire management plan.

Examples of Previously Treated Areas

The following figures (photos) illustrate typical forest conditions along the NPS-960 Road Escape Route.

Figure A-2 shows an area of previously logged plantation. This area has a moderate to high density of hardwood and conifers less than 6-inch diameter, minor shrub component of road edge, and an intermittent overstory of 12 to 24-inch diameter trees. The objective for this area would be to thin 6-inch diameter trees, brush road edge, and limb larger trees within 200 feet of road, pile and burn slash, or chip where feasible.



Figure A-2. Area of previously logged plantation (example 1).

Figure A-3 is another example of a previously logged plantation of high-density Douglas-fir, with mature overstory above dense pole canopy. The objective for this area would be to thin trees 10 inches and smaller, limb larger trees, and pile and burn slash.



Figure A-3. Area of previously logged plantation (example 2).

Figure A-4, depicts the Horseshoe Shaded Fuel Break 4 (HSFB4). The primary objectives in this area would be to reduce surface and ladder fuels along the ridgeline, with a secondary objective of restoring small forest openings (rocky openings with grass, white oak, and incense cedar) and provide growing space for remnant pine species (ponderosa and sugar pine). Refer to the

Environmental Assessment (EA) Appendix B - Best Management Practices (BMPs) for restrictions of maximum gap size for spotted owls and meadow restrictions for Franklin's bumble bee. The photo depicts remnant large live and dead sugar pine with a dense forest structure of younger white fir. The proposed treatment is to thin trees <12-inch diameter and pile outside of dripline of remnant pines. The treatments would be maintained with broadcast burning in future years.



Figure A-4. Horseshoe Shaded Fuel Break 4 (HSFB4).

Figure A-5 shows another example of HSFB4. Moderate density of 6 to 10-inch diameter white fir, moderate load dead and down fuels. The treatment would thin <10 inch trees, pile burn, and maintain with broadcast prescribed burn in future years.



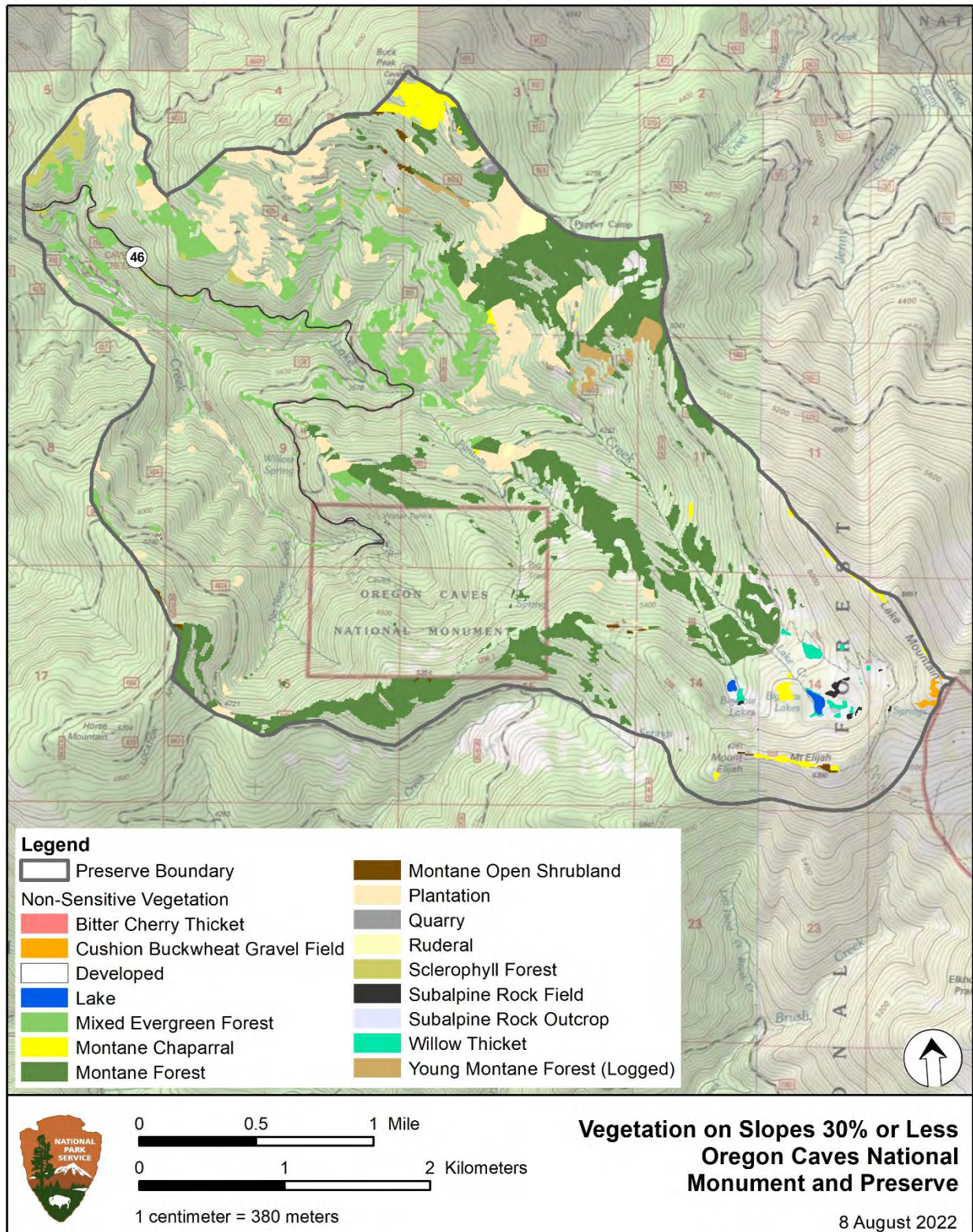
Figure A-5. Horseshoe Shaded Fuel Break 4 (moderate density).

Future ORCA Fuels Treatments (2022-2025 Plan)

Mechanical fuels treatments on ORCA would be constrained by topographic limits. Figure A-6 shows sensitive vegetation types on areas of less than 30% slope. Mechanical treatments can be applied to these areas.

Figure A-7 shows the delineation of previous and proposed fuels treatment areas.

Figure A-8 shows the current planned fuels treatments for the period 2022-2025. These areas would be a combination of hand thinning, pile and burn, and mechanical treatments in those areas where sensitive resources and steep slopes could be avoided, and efficiencies gained.



Data Source: ORCA, Esri Online Maps; 2022

Produced for NPS by GeomorphIS, LLC

Figure A-6. Areas of Potential Mechanical Treatments on slopes less than 30% slope by vegetation type (765 acres of potential future projects).

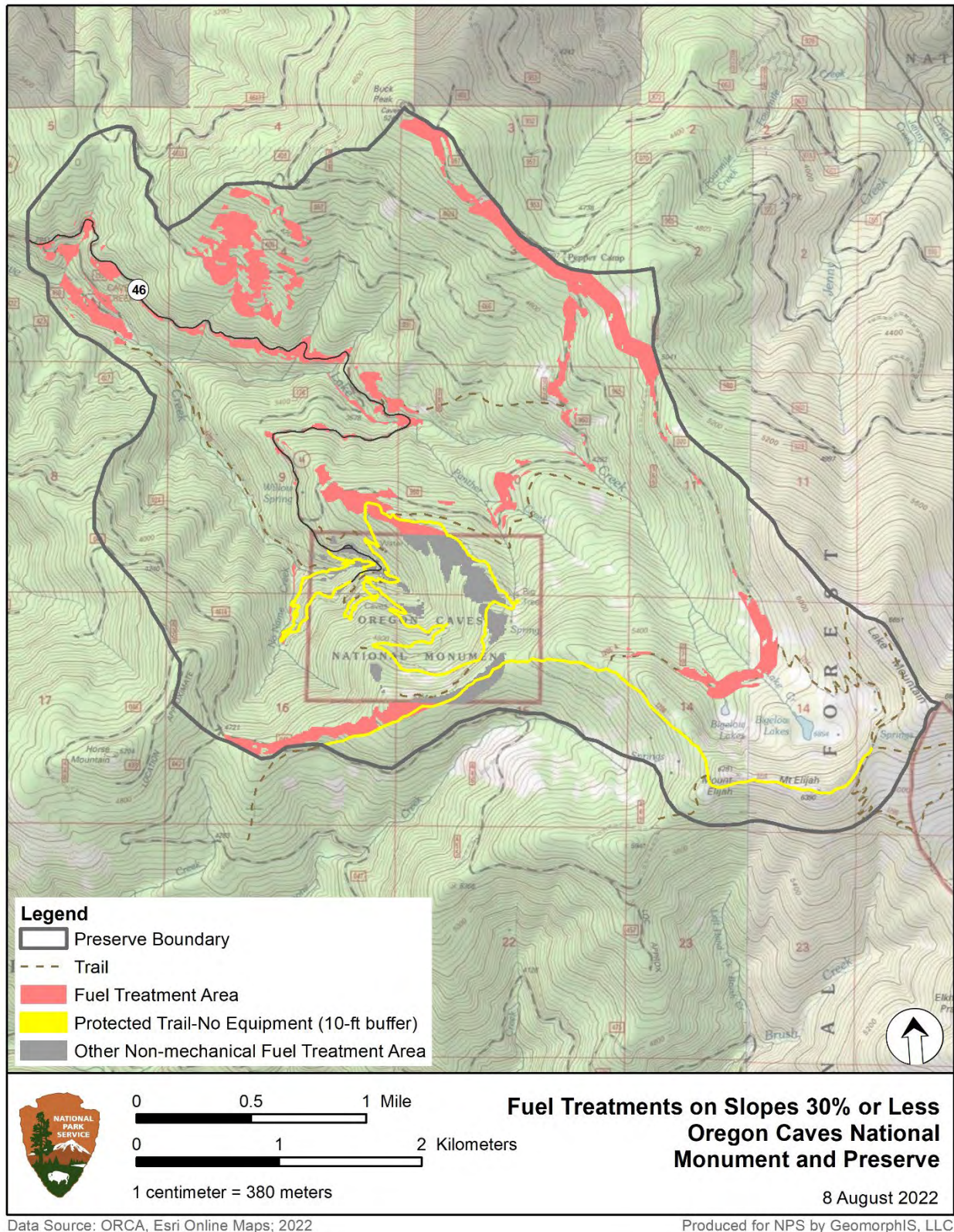
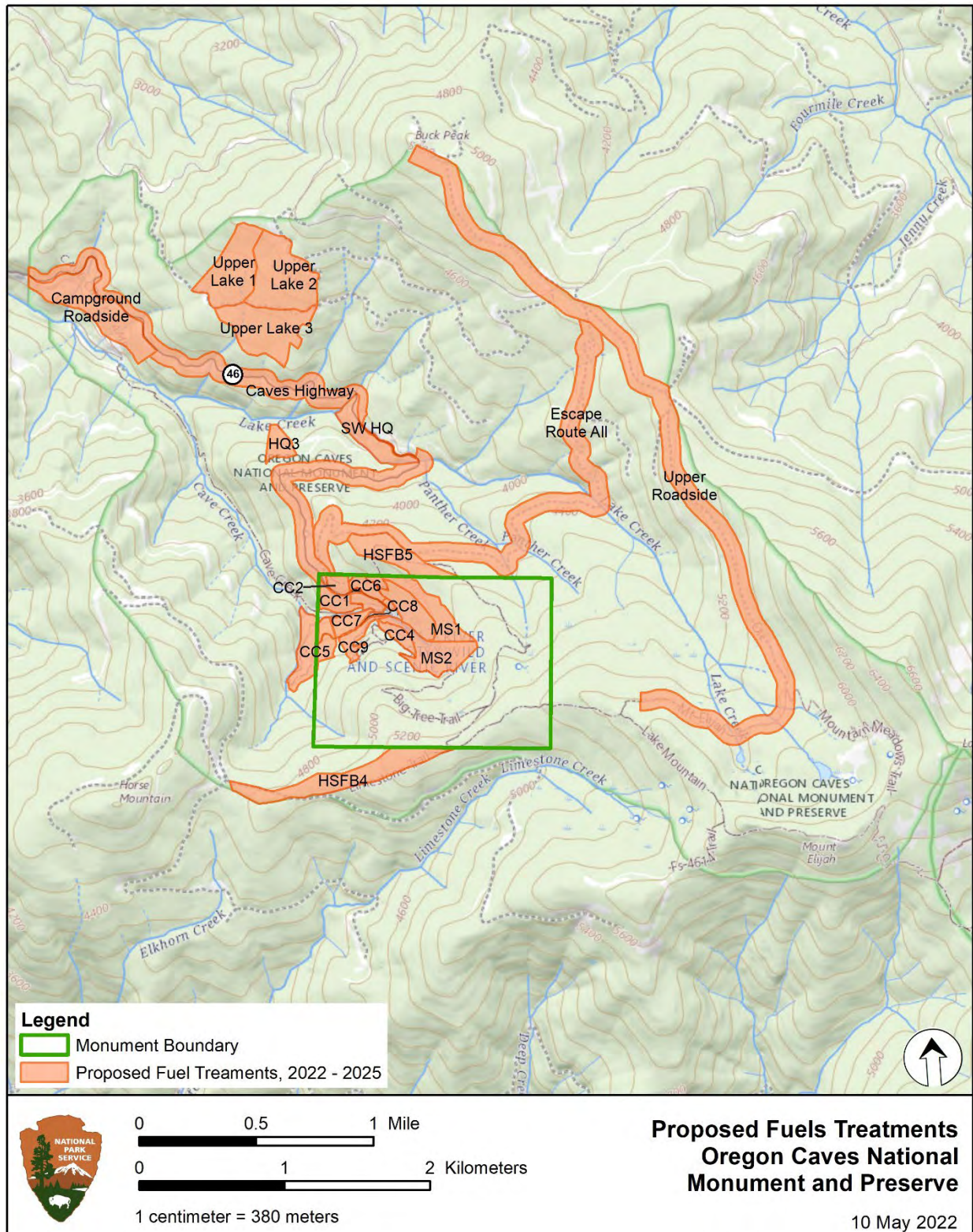


Figure A-7. Areas of potential mechanical treatments areas in previous and proposed fuels treatment areas (pink areas = 649 acres)



Data Source: ORCA, Esri Online Maps; 2022

Produced for NPS by GeomorphIS, LLC

Figure A-8. Current planned fuels treatments 2022-2025. The acres shown here plus the acres shown in Figure A-1 depict the total 1,073 acres of previous and currently planned fuels treatment projects.

3 FIRE MANAGEMENT TREATMENTS

Manual Treatments – Including Hand and Prescribed Fire Fuels Treatments (Non-Mechanical)

ORCA would utilize hand thinning and prescribed fire (broadcast and pile burning) to alter fuel conditions around interface and developed areas, in strategic locations of potential control locations, to protect public and staff ingress and egress, to restore fire as an ecosystem process, and to increase forest resiliency in light of changing climates and fire regimes. Projects may be re-treated to control re-sprouting vegetation and maintain previous treatments as needed, generally on a 3 to 10-year interval depending on abundance of understory shrubs and resprouting hardwoods, aspect, and elevation. There are approximately 1,073 acres of previous treatment areas and currently planned fuels treatment projects (See Figures A-1 and A-8, above). Mechanical equipment may also be considered in these treatment areas, limited to areas that meet criteria described in the Mechanical Treatments section, below.

Priorities for hand and prescribed fire treatments include the following:

1. Roadside shaded fuel breaks: 200 feet, as measured horizontally from the road centerline, of fuel reduction work on each side of two critically important emergency evacuation routes, Caves Hwy 46, and NPS-960 Rd, as well as, Upper Roadside Fuel Break extending across the northern boundary (See Figure A-8, above). Includes thinning of up to 12-inch diameter trees, maintaining at least 70% canopy cover of overstory trees, and pile or broadcast burning, chipping or similar slash disposal methods. Piles would be burned during wet portions of the fall, winter, and spring months using an approved burn plan and smoke management plan. Less common tree species would be retained (e.g., sugar pines, deciduous oaks), while a majority of thinned trees would be shade-tolerant conifers and hardwoods that have regenerated during the fire suppression era.
2. The creation of 300 feet of defensible space around all structures, including thinning from below, piling and burning, broadcast burning, chipping, and limbing to increase canopy base heights, reduce surface fuel connectivity, and increase clearance around structures. Hand and machine piles would be burned during wet portions of the fall, winter, and spring months using an approved burn plan and smoke management plan; 70% canopy cover would be maintained where present.
3. Hazardous fuel reduction work beneath selected forest stands by thinning from below while maintaining 70% canopy cover where it exists. Up to 12-inch diameter trees followed by pile or broadcast burning. Selected larger size classes of dead trees up to 16-inch diameter may be removed in pockets of heavy fuels with an abundance of insect and disease-killed overstory trees, as approved by Resource Management Program Lead. Predominant vegetation types would include the mixed evergreen forest, montane forest, plantation, young montane logged forest, and montane open shrubland and chaparral vegetation types.
 - In most cases the majority of trees removed would be pole-sized below 8 to 10-inch diameter to increase canopy base-heights and reduce potential for crown fire, but up to 12-inch diameter trees may need to be thinned in dense stands of long-unburned or

plantation areas to reduce crown density and increase canopy base heights. This work may occur in all previous treatment areas in addition to those sites identified in the 2022-2025 workplan (See Figure A-8, above). Fuels may be piled and burned, chipped, lopped and scattered, or removed by mechanical means in areas that meet specifications for mechanical equipment use. Hand and machine piles would be burned during wet portions of the fall, winter, and spring months using an approved burn plan and smoke management plan. Additional sites within similar stand conditions and treatment specifications may be selected at a future date and would be routed through the compliance process in NPS Planning, Environment & Public Comment (PEPC) website to ensure there would be no differences in effects or impacts as analyzed in this EA.

Mechanical Treatments

Priorities for mechanical treatments include the following:

1. Mechanical Treatments would only be used on roadways and on those areas with slopes less than 30%, including the roadside treatments, shaded fuel breaks, and specific forest types. They would include the use of equipment such as tracked machines, feller bunchers, masticators, tracked chippers, and mini excavators. The current fuels treatment areas where mechanical equipment may be utilized to increase efficiency include portions of previous treatment areas (thinning treatments, 2005-2021), as well as projects planned for 2023-2026 within the Monument and Preserve. This would result in the treatment of approximately 649 acres total (See Figure A-7, above), which may be reduced based on project-level limitations and avoidance areas identified during the project layout phase. Within the Monument, mechanical treatment areas would focus on roadside (within 200 feet of road) and infrastructure protection, with hand treatments in other areas (e.g., hand retreatment of Horseshoe Shaded Fuel Breaks [SFBs], Cave Creek, and mid-slope units). No mechanical equipment would be used off road surfaces within the Historic District which includes the area immediately around the historic structures and the trail surface of the No Name, Cliff Nature, Lake Mountain and Big Tree trails. A 10-foot no-equipment buffer would be used on these trails along with Limestone Trail. Use or travel of equipment on all park trails would require rehabilitation.
2. Outside of current and previous planned treatment areas, there is an additional 765 acres less than 30% slope in the mixed evergreen forest, montane forest, plantation, montane chaparral, young montane logged forest, and montane open shrubland vegetation types that could potentially utilize mechanical equipment, and projects may be developed in these areas to reduce fuels and increase forest resiliency following similar specifications (See Figure A-6, above). These areas would need specific projects developed and would likely decrease total acreage based on specific site limitations, and would focus on areas of low suppression difficulty index and potential control locations. Conditions, objectives, and expected impacts would need to be similar to current planned projects; otherwise new project-level National Environmental Policy Act (NEPA) analysis would be required.
3. For roadside shaded fuel breaks, treatments may extend up to 200 feet from center line of the road bed on either side. If portions of the area are greater than 30% slope then hand crews

would implement remainder of fuel break. Where fuel breaks occur in forested sites, a minimum of 70% canopy cover would be retained to limit shrub and understory regeneration, and thinning would be focused on smaller size classes of trees and shrubs to reduce ladder fuels and potential for crown fire (thinning from below).

4. Within the fuels treatment areas where mechanized equipment would be utilized in addition to hand crews, the size class of trees removed would be limited to 12 inches or less, except in areas with jackpots of insect and disease killed trees where select dead trees up to 16 inches could be removed to reduce fire hazard and spotting potential, with approval from ORCA Resource Management Program Lead.
5. Treatments would be fuels-reduction focused and would not include areal logging removal with skylines or other logging layouts. Existing fuels treatments (shaded fuel breaks and forest resiliency projects) would be continued. Generally, thinning from below would be done to reduce ladder fuel connectivity, and piling and burning of biomass and surface fuels and/or chipping or a combination of these.
6. Site surveys for cultural and historic resources and federally listed species would occur prior to project implementation, in order to avoid potential adverse impacts.

Appendix B:
LIST OF BEST MANAGEMENT PRACTICES (BMPs)

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APPENDIX B – BEST MANAGEMENT PRACTICES (BMPs)

The National Park Service (NPS) is considering updating the Fire Management Plan (FMP) for the Oregon Caves National Monument and Preserve (ORCA, or Monument and Preserve, or “park”), Oregon (see the main Environmental Assessment document). The sections below describe Best Management Practices (BMPs) that the NPS would apply to avoid adverse effects of the proposed fire management activities on the park’s natural and cultural resources. These BMPs apply to all proposed alternatives: Alternative 1 (No Action), Alternative 2 (Manual Treatment), and Alternative 3 (Manual & Mechanical Treatment).

Air Quality

- AIRQ 01 Prescribed fires will be conducted in accordance with the Oregon State Smoke Management Plan, operational guidance (<https://www.oregon.gov/ODF/Board/Documents/SMAC/ODF%20Smoke%20Management%20Directive.pdf>) and the Oregon Regional Haze Plan for Implementing Section 308 (40CFR 51.308) of the Regional Haze Rule (<https://www.oregon.gov/deq/aq/Documents/2008-2010RegionalHazeImplPlan.pdf>).
- AIRQ 02 Burn piles would only include vegetation; no trash, garbage, metal, carcasses, roofing, glass, insulation, hazardous materials, construction materials, plastic or petrochemical products, or other materials not allowed by air regulatory agencies. Piles may include lumber that has not been treated and does not include paint, stain, oils, creosote, glues, plastics, laminates, tar paper or other human made additives.

Non-native or Exotic Species

- NNES 01 Actions to prevent invasive plant spread would be included in all levels of fire and fuel planning documents, where appropriate, using an NPS interdisciplinary team. Invasive plant awareness, prevention, and procedures would be incorporated in fire and fuel management training to all personnel. All vehicles, equipment, and materials utilized in this project would be clean and weed-free prior to entering the park, or moving between areas, to prevent transmission of non-native invasive plants or forest pathogens. Firelines, pile-burns and other activities would actively locate, manage, and avoid invasive weeds.

Species of Special Concern or Their Habitats

- SSCH 01 Surveys for spotted owls, following established regulatory protocols, have or would be conducted in all areas containing suitable habitat within 1 mile of proposed work areas to prevent disruption or disturbance.
- SSCH 02 Where spotted owls are detected, thinning work would be excluded for 0.25 miles and burning operations would be excluded for 1 mile unless further consultation is conducted with US Fish and Wildlife Service (USFWS). Any work that generates

noise above ambient sound levels would not occur within 0.25 miles of a northern spotted owl detection site during the spotted owl noise restriction period (March 1 to September 30). If a spotted owl activity center is found to have chicks, then no tree removal would occur during the period March 1–September 30 within the activity center stand, within 0.50 miles of an activity center or according to further consultation with USFWS.

- SSCH 03 Burning (piles or prescribed) would not take place within 1 miles of any active spotted owl nest patch or un-surveyed suitable habitat between March 1 and September 30.
- SSCH 04 All snags greater than 16-inch diameter breast height (DBH), live trees greater than 12-inch DBH, and trees/snags with mistletoe brooms or other potential nesting sites preferred by spotted owls, would be retained for habitat.
- SSCH 05 Gaps (openings) created in any treatments would maintain a 70% canopy cover where present, and would not increase an existing opening to more than 0.25 acre in size, including landings. Individual thinning and burning projects within spotted owl nesting, roosting and foraging habitat would be separated spatially and temporarily to provide adjacency of high-quality habitat for prey species.
- SSCH 06 All trees would be retained on unstable and potentially unstable areas (e.g., landslide features) regardless of slope steepness and within the 50-foot-wide zone that surrounds the feature. Park staff would identify and delineate such unstable and potentially unstable areas on the ground.
- SSCH 07 Prescribed fire (piles and broadcast) treatments would require an appropriate complexity burn plan and be conducted during the fall, winter, and spring months depending on rainfall, air quality, fuel moisture, Threatened and Endangered (T&E) species restrictions, and burn window availability. A smoke management plan may be required dependent on size and number of piles, and would be coordinated and approved by local air quality management district.
- SSCH 08 To protect Endangered Franklin’s bumble bee during peak flight period, burning (piles or prescribed) would not occur in meadows from May 15 to September 30. Mechanical equipment would not be used within 300 feet of meadow areas at any time of the year, to preserve Franklin’s bumble bee habitat and any identified nest would be avoided completely by 200 feet unless there is further consultation with USFWS.
- SSCH 09 To protect migratory and all bird species, vegetation trimming and removal would be scheduled outside of peak breeding season (May 1 to June 15) to the maximum extent practicable. All areas will be spot surveyed immediately prior to vegetation removal and all bird nests would be avoided.
- SSCH 10 To protect Threatened Oregon Coast coho salmon, all riparian areas, including ephemeral, intermittent, and perennial streams along with lakes and potential wetlands, would have sediment protection zones for no mechanical equipment

operations extending 200 feet, with only shrub and small diameter (<8-inch DBH) manual thinning allowed within 100 feet, and no treatment allowed within 50 feet unless part of public development area like Cave Creek Campground. Additionally, all burning in riparian areas would be low intensity.

Native Vegetation

See BMPs for Species of Special Concern or Their Habitats.

Wildlife and Wildlife Habitat

See BMPs for Species of Special Concern or Their Habitats.

Cultural Resources - Archeology

- CULT 01 Archeological surveys would be completed prior to implementation of all individual fuel treatment projects, and would be submitted to SHPO for concurrence.
- CULT 02 Fuel reduction would proceed in consultation with an NPS archaeologist to delineate exclusion zones to avoid impacts to known sites for burn piles and crew/equipment operation/staging, to conduct surveys, and to determine specific monitoring requirements.
- CULT 03 NPS Project managers, NPS staff, and contractors would incorporate cultural resource sensitivity training and follow protocols for reporting any cultural finds.
- CULT 04 If unknown archeological resources are encountered during the project activities, all work would stop in the vicinity of the resource, and all necessary steps would be taken to protect them. An NPS archeologist would be consulted to evaluate the resource in accordance with 36 CFR 800.13.

Historic Structures and Landscapes

- HSLA 01 In collaboration with park cultural resource specialists, fire staff would utilize defensive and point protection tactics to prevent damage to identified threatened and vulnerable historic structures and landscapes in fuels treatment areas.

Museum Collection

See BMPs for Historic Structures and Landscapes.

Geologic Features and Soils

- GEOS 01 In areas where soil erosion might affect streams, and where soil compaction is likely, project work would not be allowed during rainy season (approx. October 15 to June 1). If more than 0.5 inch of rain is forecast, project operations would temporarily cease, and sites would be winterized. If periods of dry weather are predicted after October 15, additional work would be permitted if it can be completed within the window of predicted dry weather.

GEOS 02 Tire tracks, ruts and other depressions and surface irregularities from heavy equipment operations would be smoothed and rehabilitated to pre-disturbance surface condition. Erosion control measures such as water bars and slash placement on equipment paths and disturbed soils where the potential for erosion and delivery of sediment to waterbodies, floodplains, and wetlands exists, would be implemented.

Water-Related Resource

WATR 01 In areas where soil erosion would adversely affect streams, or where unstable slopes could erode, work would be restricted to certain seasons, days, or hours of the day.

WATR 02 For all riparian areas, including ephemeral, intermittent, and perennial streams along with lakes and potential wetlands, sediment protection zones for no mechanical equipment operations would extend 200 feet, with only shrub and small diameter (<8-inch DBH) manual thinning allowed within 100 feet, and no treatment allowed within 50 feet unless part of public development area like Cave Creek Campground. All prescribed burning in riparian areas would be low intensity.

WATR 03 Mechanical equipment use off established roads would only be possible where slopes are 30% or less, vegetation type indicates need for use, and where located more than 200 feet from any riparian area including potential wetlands.

WATR 04 Equipment, both hand tools and heavy equipment, would be inspected daily to check for leaks. Equipment that may leak lubricants or fuels would not be used until leaks are repaired. All equipment would be stored, serviced and fueled outside of riparian areas and away from stream crossings. Fuel trucks would transport fuel for the equipment to the project site. Fuel would be stored on-site. A spill plan and materials for spill containment would be required.