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BUREAU OF LAND MANAGEMENT

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Draft Programmatic EIS for Fuel Breaks in the Great Basin

Volume 3: Appendices B through M

Estimated Lead Agency Total Costs Associated with Developing and Producing this EIS

$2,100,000

The Bureau of Land Management's multiple-use mission is to sustain the health and productivity of the public lands for the use and enjoyment of present and future generations. The Bureau accomplishes this by managing such activities as outdoor recreation, livestock grazing, mineral development, and energy production, and by conserving natural, historical, cultural, and other resources on public lands.

Appendix B

Acronyms and Abbreviations, Literature Cited, and Glossary

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Appendix B. Acronyms and Abbreviations, Literature Cited, and Glossary

B.1 Acronyms and Abbreviations

Acronyms and Abbreviations	Full Phrase
ACHP	Advisory Council on Historic Preservation
AIM	Assessment, Inventory, and Monitoring
AML	appropriate management level
BCR	bird conservation region
BLM	Bureau of Land Management
BSU	biologically significant unit
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
DDT	dichlorodiphenyltrichloroethane
DNA	determination of NEPA adequacy
DOI	Department of Interior
EA	environmental assessment
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FIAT	Fire and Invasives Assessment Tool
FLPMA	Federal Land Policy and Management Act
GHMA	general habitat management area
HMA	herd management area
IBA	important bird area
IHMA	important habitat management area
IM	Instruction Memorandum
ITA	Indian Trust Asset
MBTA	Migratory Bird Treaty Act
MOU	memorandum of understanding
$MtCO_{2e}$	metric tons of carbon dioxide equivalent
NAAQS	National Ambient Air Quality Standard
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NIFC	National Interagency Fire Center
NRHP	National Register of Historic Places
NWCG	National Wildfire Coordination Group

OHMA	other habitat management area
OHV	off-highway vehicle
PAC	priority area for conservation
PEIS	programmatic environmental impact statement
PHMA	priority habitat management area
PILT	payment in lieu of taxes
PM_{10} and $PM_{2.5}$	particulate matter, 10 and 2.5 microns or smaller
PFYC	Potential Fossil Yield Classification
RMP	resource management plan
RMPA	resource management plan amendment
ROS	Recreation Opportunity Spectrum
ROW	right-of-way
RSC	Recreation Setting Characteristics
SHPO	State Historic Preservation Office
SRP	special recreation permit
TCP	Traditional Cultural Property
USFWS	United States Fish and Wildlife Service
WEG	wind erodibility group
WFM	wildland fire management
WUI	wildland-urban interface

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B.3 GLOSSARY

Advancing fire—A fire spreading or set to spread with the wind. Also called: head fire.

Airshed—A geographic area that, because of topography, meteorology, or climate, is frequently affected by the same air mass.

Analysis area—A subset of the project area boundary. It is defined, on the broad scale, by the current and historical presence of sagebrush on BLM-administered lands within the project area boundary. The analysis area was further refined by excluding riparian conservation areas; Wilderness areas; Wilderness Study Areas; lands with wilderness characteristics that are managed to maintain or enhance those characteristics; Areas of Critical Environmental Concern; Visual Resource Management Class I areas; areas within a quarter-mile of a Wild and Scenic River (including rivers found eligible and/or suitable); National Scenic and Historic Trails; areas within mapped Canada lynx distribution and wolverine primary habitat; and native, sparsely vegetated areas or sparsely vegetated areas dominated by low sagebrush

species (See **Section 2.2.1**). The analysis area covers approximately 38 million acres on BLM-administered lands within the project area boundary.

Anchor point—An advantageous location, usually a barrier to fire spread, from which to start constructing a fire line. Used to minimize the chance of being flanked by the fire while the line is being constructed (NWCG 2018).

Annual—A plant whose entire life cycle occurs within 1 year.

Adaptive management—A system of management practices based on clearly defined outcomes, monitoring to determine if management actions are meeting outcomes, and, if not, facilitating management changes that will best ensure that outcomes are met or re-evaluated. (BLM 2008).

Bearing tree—A marked tree used as a corner accessory; its distance and direction from the corner being recorded. Bearing trees are identified by prescribed marks cut into their trunks; the species and sizes of the trees are also recorded.

Biological soil crust—(Also known as cryptogamic, microbiotic, cryptobiotic, or microphytic crusts). Communities of organisms living on the surface of the soil and are composed of cyanobacteria, blue-green algae, microfungi, mosses, liverworts, and lichens (Rosentreter et al. 2007).

Class I area—Defined by the Clean Air Act (see **Appendix C**), federal Class I areas include national parks larger than 6,000 acres and national wilderness areas larger than 5,000 acres that were in existence when the Clean Air Act was amended in 1977, national monuments, and wildlife refuges that have since been designated by federal regulation. All areas of the United States that are not designated as Class I are considered Class II.

Cooperating agency—Any federal, state, or local government agency or Native American tribe that enters into formal agreement with the lead federal agency to help develop an environmental analysis. Cooperating agencies and tribes work with the BLM, sharing knowledge and resources, to achieve desired outcomes for public lands and communities within statutory and regulatory frameworks.

Crown fire—A fire that advances from top to top of trees or shrubs more or less independent of a surface fire. Crown fires are sometimes classed as running or dependent to distinguish the degree of independence from the surface fire (NWCG 2018).

Ethnographic—Relating to the scientific study and description of peoples and cultures with their customs, habits, and mutual differences.

Ethno-habitat—The set of cultural, religious, subsistence, educational, and other services provided by intact, functioning ecosystems and landscapes.

Fire frequency—A general term referring to the recurrence of fire in a given area over time

Fire intensity—Refers to the rate at which a fire produces heat at the flaming front and should be expressed in terms of temperature or heat yield

Fire regime—Describes the role of fire in ecosystems and categorizes patterns of fire ignition, seasonality, frequency, type (crown, surface, or ground fire), severity, intensity, and spatial continuity (pattern and size) that occur in a particular area or ecosystem. Classifications are based on fire return interval patterns and fire severity.

Fire-return interval—The number of years between two successive fires for a given area

Fire severity—The effect of fire on the dominant overstory vegetation.

Flame length—The distance between the flame tip and the midpoint of the flame depth at the base of the flame (generally ground surface); it is an indicator of fire intensity (NWCG 2018).

Flanking fire—Rate or spread and intensity of a fire usually falling somewhere in between advancing and backing with spread lateral to the main direction of fire travel. Also called: lateral fire.

Fuel break—A strip or block of land on which the vegetation, debris and detritus have been reduced and/or modified to control or diminish the risk of the spread of fire crossing the strip or block of land (NRCS 2005). NWCG also defines a fuel break system as "[a] natural or manmade change in fuel characteristics which affects fire behavior so that wildfires burning into them can be more readily controlled" and as "[a] series of modified strips or blocks tied together to form continuous strategically located fuel breaks around land units" (NWCG 2018).

Fuel model—Simulated fuel complex for which all fuel descriptors required for the solution of a mathematical rate of spread model have been specified (NWCG 2018).

Fuels reduction—Manipulation, including combustion, or removal of fuels to reduce the likelihood of ignition and to lessen potential damage and resistance to control (NWCG 2018).

General habitat management area (GHMA)—BLM-administered greater sage-grouse habitat that is occupied seasonally or year-round and is outside priority habitat management areas.

Greenhouse gases—Compounds in the atmosphere that absorb infrared radiation from the earth's surface and radiate a portion of it back to the surface.

Historic properties — Cultural resources that are archaeological sites, districts, or Traditional Cultural Properties (TCPs) that are known to have or suspected to have significance for listing on the National Register of Historic Places (NRHP), as defined in 36 CFR 63. TCPs as defined in National Register Bulletin 38.

Head fire—A fire spreading or set to spread with the wind. Also called: advancing fire.

Hotshot crew—A team of the most highly trained firefighters in the country. They often respond to large, high-priority fires and are trained and equipped to work in remote areas for extended periods of time with little logistical support.

Important habitat management area (IHMA)—BLM-administered land in Idaho that provides a management buffer for and that connects patches of PHMAs. IHMAs encompass areas of generally

moderate to high habitat value or populations but that are not as important as priority habitat management areas.

Invasive plant species—Plants that are not part of (if exotic),or are a minor component of (if native), the original plant community or communities that have the potential to become a dominant or co-dominant species on the site if their future establishment and growth is not actively controlled by management interventions, or are classified as exotic or noxious plants under state or federal law. Species that become dominant for only one to several years (e.g. short-term response to drought or wildfire) are not invasive plants (BLM 2008).

Jackpot burn— A prescribed fire to deliberately burn natural or modified concentrations (jackpots) of wildland fuels under specified environmental conditions, which allows the fire to be confined to a predetermined area and produces the fireline intensity and rate of spread required to attain planned resource Management Objectives (NWCG 2018).

Ladder fuel—Live or dead vegetation that allows a fire to climb up from the ground into the tree or shrub canopy.

Lateral fire—Rate or spread and intensity of a fire usually falling somewhere in between advancing and backing with spread lateral to the main direction of fire travel. Also called: flanking fire.

Manual treatment—The use of hand tools and hand-operated power tools to cut, clear, or prune herbaceous and woody species.

Mean fire return interval—The average period between fires under the presumed historical fire regime in a designated area.

Mechanical treatment—The use of mechanized tools and equipment to cut, clear, or prune herbaceous and woody species.

Modified fuel breaks—Also known as mowed linear fuel breaks, this type of fuel break is used to compact and limit the vertical extent of the fuel bed, which may contain patches of intact sagebrush that can be retained. Vegetation is thinned such that fuel load is reduced without complete removal of vegetation. Such fuel breaks require regular mowing or targeted grazing to maintain the desired fuel height (Shinneman et al. 2018).

Native plant species—Species that historically occurred or currently occur in a particular ecosystem and were not introduced.

Nonnative plant species—Plant species that are introduced to an area by humans either intentionally or unintentionally and compete with resident native (indigenous) species. These plants are also known as alien, exotic, introduced, and non-indigenous.

Noxious weed—A plant species designated by federal or state law as generally possessing one or more of the following characteristics: aggressive and difficult to manage; parasitic; a carrier or host of serious insects or disease; or non-native, new, or not common to the United States (BLM 2008).

Old growth pinyon and juniper woodlands—A forest that has achieved great age or maturity and thereby exhibits unique ecological features. In the Great Basin, old growth pinyon-juniper woodlands include trees established prior to 1870, prior to Eurasian settlement. As juniper and pinyon age, canopy morphology shifts from cone shaped to a rounded top. As age advances, the tree may also develop a combination of the following characteristics: broad nonsymmetric tops, deeply furrowed bark (primarily juniper), twisted trunks or branches, dead branches and spike tops, large lower limbs, trunks containing narrow strips of cambium (strip-bark) (mostly in juniper), hollow trunks (rare in pinyon), large trunk diameters relative to tree height (in wester juniper), and branches covered with a bright yellow green lichen (*Letharia* spp.) in both juniper and pinyon. Western and Utah junipers can exceed 1,000 years in age and pinyon can exceed 600 years (Miller et al. 1999). For photos and physical characteristics of old growth pinyon and juniper, see also Sink (2003).

Other habitat management area (OHMA)—BLM-administered land in Nevada and Northeastern California, identified as unmapped greater sage-grouse habitat that contains seasonal or connectivity habitat areas.

Paleontological resources—The remains, imprints, or traces of once-living organisms preserved in rocks, sediments, and caves that are of scientific interest and that provide information about the history of life. Also described as "fossils".

Particulate matter—A mixture of microscopic solids and liquid droplets suspended in the air.

Perennial—A plant that lives more than 1 year.

Permitted grazing—The BLM issues permits and leases to public land ranchers to graze livestock on BLM-administered lands that has been divided into allotments. The permits and leases include terms and conditions for livestock grazing and generally cover a 10-year period. Permits and leases are renewable if the BLM determines that the terms and conditions of the expiring permit or lease are being met.

Pinyon-juniper successional phases—(see also Pyke et al. 2018 for phases of pinyon-juniper in-filling of sagebrush shrublands based on tree characteristics)

> **Phase I –** Trees are present but shrubs and grasses are the dominant vegetation that influence ecological processes (hydrologic, nutrient, and energy cycles) on the site (Tausch et. al 2009). Trees make up less than 10 percent of the canopy cover.
>
> **Phase II –** Trees are co-dominant with shrubs and herbs, and all three vegetation layers influence ecological processes on the site (Tausch et. al 2009). Trees makes up 10 to 30 percent of the canopy cover.
>
> **Phase III –** Trees are the dominant vegetation and the primary plant layer influencing ecological processes on the site. Shrubs no longer dominate the understory (Tausch et. al 2009). Tree canopy cover is over 30 percent.

Potential Treatment Area—A "potential treatment area" was defined for each action alternative and is a subset of the analysis area.

The potential treatment area for Alternative B consists of a 500 ft corridor of existing interstates, state highways, county roads, and BLM-administered roads (Maintenance Level 5 roads) within the analysis area. High resistance and resilience areas are excluded from potential treatment under this alternative. The potential treatment area covers 529,000 acres for Alternative B.

The potential treatment area for Alternative C consists of a 500 ft corridor of existing interstates, state highways, county roads, BLM-administered roads (Maintenance Levels 3 and 5 roads), and BLM-administered ROWs within the analysis area. Fuel breaks could be constructed in highly resistant and resilient sites with high fire probability or where adaptive management habitat triggers have been tripped but not in other areas with high resistance and resilience. The potential treatment area covers 792,000 acres for Alternative C.

The potential treatment area for Alternative D consists of a 500 ft corridor of existing interstates, state highways, county roads, BLM-administered roads (Maintenance Levels 1, 3, and 5 roads), BLM-administered ROWs, and primitive roads within the analysis area. The potential treatment area covers 1,088,000 acres for Alternative D.

Pre-emergent herbicide—Herbicide that provides control of targeted plant species by inhibiting germination of seeds.

Prescribed fire—The application of fire as an ecological process, under specified conditions, in a designated area to achieve land management objectives. Prescribed fires are defined as any fire intentionally ignited by management action in accordance with applicable laws, policies, and regulations to meet specific objectives. A written approved prescribed fire plan must exist, and NEPA requirements be met, prior to ignition (NWCG 2018).

Primitive road—A linear route managed for use by four-wheel drive or high-clearance vehicles (e.g., two-track road). Primitive roads do not normally meet any BLM road design standards (BLM Manual 9115, Primitive Roads Manual).

Priority area for conservation (PAC)—An area identified in the USFWS Conservation Objectives Team report (USFWS 2013) as essential for greater sage-grouse conservation.

Priority habitat management area (PHMA)—BLM-administered land identified as having the highest habitat value for maintaining sustainable greater sage-grouse populations. PHMAs largely coincide with PACs.

Project Area Boundary—Includes portions of California, Idaho, Nevada, Oregon, Utah, and Washington. It includes all surface management and covers approximately 223 million acres; of these acres, BLM-administered lands cover 90 million acres.

Rate of fire spread—The relative activity of a fire extending horizontally (NWCG 2018). It is expressed as the rate of increase of the total fire perimeter, as the rate of forward fire spread, or as fire intensity (flame length). Usually it is expressed in terms of chains per hour or acres per hour for a specific period in the fire's history.

Recreation—Use of leisure time to freely engage in activities in a variety of settings that provide personal satisfaction and enjoyment and contribute to the renewal and refreshment of one's body, mind, and/or spirit.

Recreation experience—Immediate state of mind resulting from participation in recreation opportunities that result in benefits.

Recreation opportunities—The ability to participate in recreation activities that facilitate experiences and benefits within a specific geographic area.

Recreation setting—The collective distinguishing attributes (recreation setting characteristics) of a landscape

Recreation setting characteristics—Derived from the recreation opportunity spectrum, these characteristics are categorized as physical, social, and operational components and are further subdivided into specific characteristics (attributes). These characteristics are categorized across a spectrum of classes that describe a range of qualities and conditions of a recreation setting, for example primitive to urban.

Replacement fuel breaks—Also known as a green strip, the goal of this type of fuel break is to replace more flammable and contiguous plant communities (particularly those dominated by nonnative annual grasses, such as cheatgrass) with perennial plants that retain moisture later into the growing season, often by using plants that grow as widely spaced, low-statured individuals that result in large, bare interspaces. Vegetation is typically first removed or altered with a plow, harrow, or chain, and often in combination with application of a broadly effective herbicide to control existing vegetation, with additional herbicide treatments to reduce invasive annual grasses. New species are then sown into the prepared strips, with ideal seeded species having relatively deep roots, forming persistent stands that provide some competitive pressure against nonnative annual invasion, and having relatively inexpensive seeds that germinate reliably (Shinneman et al. 2018).

Residence time—The time, in seconds, required for the flaming front of a fire to pass a stationary point at the surface of the fuel. The total length of time that the flaming front of the fire occupies one point (NWCG 2018a).

Resistance—Sites that are able to retain their fundamental structure, processes, and functioning when exposed to stresses, disturbances, or invasive species (Chambers 2014b).

Resilience—Sites that have the capacity to regain their fundamental structure, processes, and functioning when altered by stressors such as drought and disturbances such as inappropriate livestock grazing and altered fire regimes (Chambers 2014b).

Restoration—Implementation of a set of actions that promotes plant community diversity and structure that allows plant communities to be more resilient to disturbance and invasive species over the long term (BLM 2008).

Right-of-way (ROW)—A type of easement granted or reserved over the land for transportation purposes, this can be for a highway, public footpath, rail transport, canal, as well as electrical transmission lines, oil and gas pipelines.

Road—A linear route declared to be a road by the owner. It is managed for use by low-clearance vehicles having four or more wheels and is maintained for regular and continuous use (BLM Manual 1626, Travel and Transportation Management Manual).

> **Maintenance Level 1—**Routes where minimum (low intensity) maintenance is required to protect adjacent lands and resource values. These roads may be impassable for extended periods of time.
>
> **Maintenance Level 3—**Routes requiring moderate maintenance due to low volume use (for example, seasonally or year-round for commercial, recreational, or administrative access). Maintenance Intensities may not provide year-round access but are intended to generally provide resources appropriate to keep the route in use for the majority of the year.
>
> **Maintenance Level 5—**Route for high (maximum) maintenance due to year-round needs, high volume of traffic, or significant use. Also may include route identified through management objectives as requiring high intensities of maintenance or to be maintained open on a year-round basis.

Safe separation distance—The distance between firefighters and flames that is necessary to reduce the risk of burn injury.

Safety zone—An area cleared of flammable materials used for escape in the event the line is outflanked or in case a spot fire causes fuels outside the control line to render the line unsafe. In firing operations, crews progress so as to maintain a safety zone close at hand allowing the fuels inside the control line to be consumed before going ahead. Safety zones may also be constructed as integral parts of fuel breaks; they are greatly enlarged areas which can be used with relative safety by firefighters and their equipment in the event of blowup in the vicinity (NWCG 2018).

Sagebrush obligate—A species that requires sagebrush for at least part of its life cycle.

Soil aggregate—A collection of soil particles that bind to each other more strongly than to adjacent particles.

Soil horizon—A layer, approximately parallel to the surface of the soil, that is distinguishable from adjacent layers by a distinctive set of properties produced by the soil-forming processes. The term layer is used instead of horizon if the properties are inherited from the parent material, such as sedimentary strata. Horizons, in contrast, display the effects of paedogenesis, such as the obliteration of sedimentary strata and accumulation of alluvial clay.

Soil order—A single dominant characteristic affecting soils in a location, such as the prevalent vegetation (Alfisols and Mollisols) and the type of parent material (Andisols and Vertisols), or the climate variables, such as lack of precipitation (Aridisols) or the presence of permafrost (Gelisols). Also

significant is the amount of physical and chemical weathering present (Oxisols and Ultisols) or the relative amount of soil profile development that has taken place (Entisols).

Soil quality—A soil's capacity to function. Healthy soils support plant and animal diversity and productivity, air and water quality, and human health (Soil Quality Institute 2001).

Spotting—Behavior of a fire producing sparks or embers that are carried by the wind and which start new fires beyond the zone of direct ignition by the main fire (NWCG 2018).

Stabilizer species—A grass species cultivated to rapidly establish at revegetation sites. Stabilizers are selected based on their seedling establishment, persistence, and seed production.

Supplemental feed—A feed which supplements the forage available from the public lands and is provided to improve livestock nutrition or rangeland management (43 CFR 4100.0-5).

Targeted grazing—The application of a specific species, class, and age of livestock to graze vegetation at a specific season, duration, and intensity to accomplish predefined vegetation objectives (Launchbaugh and Walker 2006).

Tilling—A generic term for a type of mechanical treatment that involves the use of angled disks (disk tilling) or pointed metal-toothed implements (chisel plowing) to uproot, chop, and mulch vegetation. Tilling clears most, if not all, existing vegetation from a fuel break footprint. Tilling is usually done with a brushland plow, which consists of a single axle with an arrangement of angle disks that covers about 10-foot swaths. An offset disk plow, consisting of multiple rows of disks set at different angles to each other, is pulled by a crawler-type tractor or a large rubber tire tractor. This method is often used for removal of sagebrush and similar shrubs. It works best on areas with smooth terrain, and deep, rock-free soils. Chisel plowing can be used to break up soils such as hardpan (BLM Handbook 1740-02 2008).

Tribal resources— A broad term for important historic or traditional places, landscapes, sacred sites, religious practices, natural resource gathering locations, or resources with significance to Native American tribal and other cultural groups, according to regulations and guidance discussed in BLM Manuals and Handbooks 8100 and 1780.

Unvegetated fuel break—Also known as a brown strip, an unvegetated fuel break is a linear fuel break that is devoid of vegetation. It is typically installed along major thoroughfares (for example, paved highways) using a harrow or plow to clear or completely remove vegetation (that is, all fuels) down to bare mineral soil, typically in widths of 3– 6 m (and sometimes wider) (Shinneman et al. 2018).

Vegetation condition class (VCC)—A discrete metric that quantifies the amount of departure from the simulated historical vegetation reference conditions (historical fire regimes).

Volatilization—The evaporation or sublimation of a compound or chemical.

Wet line—A line of water, or water and chemical retardant, sprayed along the ground, that serves as a temporary control line from which to ignite or stop a low-intensity fire.

Wildland-urban interface (WUI)—The WUI is defined in the National Wildfire Coordinating Group (NWCG) Glossary as "the line, area, or zone where structures and other human development

meet or intermingle with undeveloped wildland or vegetative fuels." It describes an area in or next to private and public property where mitigation actions can prevent damage or loss from wildfire (NWCG 2018). WUI communities are the following (Forest Service et al. 2001):

Interface community—Exists where structures directly abut wildland fuels. There is a clear line of demarcation between residential, business, and public structures and wildland fuels. Wildland fuels do not generally continue into the developed area. The development density for an interface community is usually three or more structures per acre, with shared municipal services. Fire protection is generally provided by a local government fire department, with the responsibility to protect the structure from both an interior fire and an advancing wildland fire. An alternative definition of the interface community emphasizes a population density of 250 or more people per square mile.

Intermix community—Exists where structures are scattered throughout a wildland area. There is no clear line of demarcation; wildland fuels are continuous outside and in the developed area. The development density in the intermix ranges from those structures that are very close together to there being one structure per 40 acres. Fire protection districts funded by various taxing authorities normally provide life and property fire protection and may also have wildland fire protection responsibilities. An alternative definition of intermix community emphasizes a population density of between 28 and 250 people per square mile.

Occluded community—Generally exists in a situation, often in a city, where structures abut an island of wildland fuels, such as a park or open space. There is a clear line of demarcation between structures and wildland fuels. The development density for an occluded community is usually similar to those found in the interface community, but the occluded area is usually less than 1,000 acres. Fire protection is normally provided by local government fire departments.

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Appendix C

Major Authorizing Laws and Regulations

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Appendix C. Major Authorizing Laws and Regulations

Below is a list of major authorizing laws and regulations relevant to this PEIS. Note this is not a complete list and sources not listed may also be appropriate to reference.

C.1 Laws and Executive Orders

American Indian Religious Freedom Act of 1978—Protects the rights of Native Americans to exercise their traditional religions by ensuring access to sites, use and possession of sacred objects, and the freedom to worship through ceremonials and traditional rites.

Archaeological Resources Protection Act of 1979—Provides for civil and criminal penalties for knowing excavation, removal, damage alteration or defacement of an archeological resource on public or Indian lands and on non-federal lands.

Clean Air Act of 1970—The primary authority for regulating and protecting air quality in the United States. Requires the Environmental Protection Agency to set health-based standards for ambient air quality, sets deadlines for the achievement of those standards by state and local governments, and requires the Environmental Protection Agency to set national emission standards for large or ubiquitous sources of air pollution, including motor vehicles, power plants, and other industrial sources. In addition, the Act mandates emission controls for sources of hazardous air pollutants, requires the prevention of significant deterioration of air quality in areas with clean air, requires a program to restore visibility impaired by regional haze in Class I areas (such as national parks and wilderness areas), and implements the Montreal Protocol to phase out most ozone-depleting chemicals. The Clean Air Act requires each state to identify areas that have ambient air quality in violation of national standards, using monitoring data collected through state monitoring networks. Areas that violate standards are in nonattainment for the relevant criteria air pollutants; areas that comply with standards are in attainment. For nonattainment areas, state air quality agencies must develop comprehensive plans to reduce pollutant concentrations to meet the standards.

Clean Air Act Amendments of 1990—Changes to the Act in 1990 included provisions to (1) classify most nonattainment areas according to the extent to which they exceed the standard, tailoring deadlines, planning, and controls to each area's status; (2) tighten auto and other mobile source emission standards; (3) require reformulated and alternative fuels in the most polluted areas; (4) revise the air toxics section, establishing a new program of technology-based standards and addressing the problem of sudden, catastrophic releases of toxics; (5) establish an acid rain control program, with a marketable allowance scheme to provide flexibility in implementation; (6) require a state-run permit program for the operation of major sources of air pollutants; (7) implement the Montreal Protocol to phase out most ozone-depleting chemicals; and (8) update the enforcement provisions so that they parallel those in other pollution control acts, including authority for the Environmental Protection Agency to assess administrative penalties.

Clean Water Act of 1972—Includes provisions which authorize federal financial assistance for municipal sewage treatment plant construction and establishes regulatory requirements that apply to industrial and municipal dischargers. Enforcement emphasis includes controlling discharges of conventional pollutants (e.g., suspended solids or bacteria that are biodegradable and occur naturally in the aquatic environment) and control of toxic pollutant discharges.

Endangered Species Act of 1973, as amended—The purpose of the Endangered Species Act is to ensure that federal agencies and departments use their authorities to protect and conserve endangered and threatened species. Section 7 of the Endangered Species Act requires that federal agencies prevent or modify any projects authorized, funded, or carried out by the agencies that are "likely to jeopardize the continued existence of any endangered species or threatened species, or result in the destruction or adverse modification of critical habitat of such species."

Federal Land Policy and Management Act of 1976—States that "the public lands will be managed in a manner that protect the quality scientific, scenic, historic, ecological, environmental, air and atmospheric, water resource, and archeological values; that, where appropriate, will preserve and protect certain public lands in their natural conditions that will provide food and habitat for fish and wildlife and domestic animals; and that will provide for outdoor recreation and human occupancy and use."

Fish and Wildlife Conservation Act of 1980—Authorizes financial and technical assistance to the States for the development, revision, and implementation of conservation plans and programs for nongame fish and wildlife.

Healthy Forests Restoration Act of 2003—Contains a variety of provisions aimed at expediting the preparation and implementation of hazardous fuels reduction projects on federal land and assisting rural communities, States and landowners in restoring healthy forest and watershed conditions on state, private and tribal lands. The Healthy Forests Restoration Act focuses on four types of land:

- The wildland-urban interfaces of at-risk communities,
- At-risk municipal watersheds,
- Where threatened and endangered species or their habitats are at-risk to catastrophic fire and where fuels treatment can reduce those risks, and
- Where windthrow or insect epidemics threaten ecosystem components or resource values.

Migratory Bird Treaty Act of 1918, as amended, and Executive Order 13186 (2001)—These federal laws identify the responsibilities of the federal agencies to protect migratory birds. In 2010, the BLM and US Fish and Wildlife Service signed BLM MOU-WO-230-2010-04 to promote the conservation of migratory birds. Specifically, the purpose is to strengthen migratory bird conservation by implementing strategies that promote conservation and avoid or minimize adverse impacts on migratory birds through enhanced collaboration between the parties: state, tribal and local governments. Among other commitments, the BLM shall "At the project level evaluate the effects of the BLM's actions on migratory birds during the NEPA process, if any, and identify where take reasonably attributable to agency actions may have a measurable negative effect on migratory bird populations, focusing first on species of concern, priority habitats, and key risk factors." Where the BLM finds negative impacts, it will implement approaches to lessen such take.

National Environmental Policy Act of 1970—Established a national policy for the protection and maintenance of the environment. It guides the broad planning process that requires all federal agencies to ensure that the federal agency has considered the effects of its actions (including any action involving federal funding or assistance) on the environment before deciding to fund and implement a proposed action; and to make available environmental information to public officials and citizens before making decisions and undertaking actions. NEPA directs the federal agencies to thoroughly assess the environmental consequences of "major federal actions significantly affecting the environment."

National Historic Preservation Act of 1966, as amended—Section 106 directs all federal agencies to take into account the impacts of their undertakings (actions and authorizations) on properties listed on or eligible for listing on the National Register of Historic Places. Eleven BLM states comply with section 106 according to a 1997 national programmatic agreement with the Advisory Council on Historic Preservation Office and National Conference of State Historic Preservation Officers. Section 110 of the National Historic Preservation Act sets inventory, nomination, protection, and preservation responsibilities for federally owned cultural properties.

Native American Graves Protection and Repatriation Act of 1990—Provides for the ownership or control of Native American cultural items (human remains and objects) excavated or discovered on Federal or tribal lands.

Paleontological Resources Preservation Act of 2009—Serves to preserve, manage, and protect paleontological resources on lands administered by the Bureau of Land Management, the Bureau of Reclamation, the National Park Service, and the U.S. Fish and Wildlife Service and ensure that these federally owned resources are available for current and future generations to enjoy as part of America's national heritage.

Public Rangelands Improvement Act of 1978—Established and reaffirmed the national policy and commitment to inventory and identify current public rangeland conditions and trends; manage, maintain and improve the condition of public rangelands so that they become as productive as feasible for all rangeland values in accordance with management objectives and the land use planning process; charge a fee for public grazing use which is equitable; continue the policy of protecting wild free-roaming horses and burros from capture, branding, harassment, or death, while at the same time facilitating the removal and disposal of excess wild free-roaming horses and burros which pose a threat to themselves and their habitat and to other rangeland values.

Reciprocal Fire Protection Act of 1955—Provides authority for Federal agencies to enter into mutual assistance agreements with foreign, State and local governments for combatting wildfires, and to provide emergency assistance when no agreement exists.

Regional Haze Rule of 1999—Promulgated by the EPA to protect and improve visual range in Class 1 areas. Without the effects of human-made air pollution, a natural visual range would be nearly 140 miles in the western United States; the current visual range is 35 to 90 miles (EPA 2018d). The law calls on states to establish goals for improving visibility in mandatory Class I areas and to develop long-term strategies for reducing emissions of air pollutants that impair the visibility in these areas.

Taylor Grazing Act of 1934—Provides for regulated grazing on federal public lands (exclusive of Alaska) to improve range conditions and stabilize the livestock industry in the American West.

Timber Protection Act of 1922—Authorizes the Secretary of Interior to protect timber on lands under the Department of Interior's jurisdiction from fire, disease and insects.

Wild Free-Roaming Horse and Burro Act of 1971—Provides legislation to protect wild horses and burros. The Act prohibits the use of a motor vehicle to hunt, for the purpose of capturing or killing, any wild horse, mare, colt, or burro running at large on public lands. The Act also prohibited the pollution of watering holes on public lands for the purposes of trapping, killing, wounding, or maiming any of these animals.

Wilderness Act of 1964—Directs the Secretary of the Interior, within 10 years, to review every roadless area of 5,000 or more acres and every roadless island (regardless of size) within National Wildlife Refuge and National Park Systems and to recommend to the President the suitability of each such area or island for inclusion in the National Wilderness Preservation System, with final decisions made by Congress. The Secretary of Agriculture was directed to study and recommend suitable areas in the National Forest System. In 1976, Congress directed the BLM to evaluate all of its land for the presence of wilderness characteristics, and identified areas became Wilderness Study Areas. The establishment of a Wilderness Study Area served to identify areas for Congress to consider for addition to the National Wilderness Preservation System.

Executive Order 12898 – Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations—To the greatest extent practicable and permitted by law, and consistent with the principles set forth in the report on the National Performance Review, each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States and its territories and possessions, the District of Columbia, the Commonwealth of Puerto Rico, and the Commonwealth of the Mariana Islands.

Executive Order 13175 – Consultation and Coordination With Indian Tribal Governments—Aims to strengthen the United States government-to-government relationships with Indian tribes. It establishes regular and meaningful consultation and collaboration with tribal officials in the development of Federal policies that have tribal implications. The BLM coordinates with all tribal governments, associated native communities, native organizations, and tribal individuals whose interests might be directly and substantially affected by activities on public lands.

Executive Order 13007 Indian Sacred Sites—Designed to protect and preserve Indian religious practices, this EO directs each federal agency that manages federal lands to "(1) accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners and (2) avoid adversely affecting the physical integrity of such sacred sites." This Executive Order also directs each federal agency to report to the President on "procedures implemented or proposed to facilitate with appropriate Indian tribes and religious leaders."

C.2 HANDBOOKS

BLM Handbook H-1740-2 – Integrated Vegetation Management—Provides guidance on implementation of vegetation management planning and treatment activities to achieve the objectives set forth for the updated manual, 1740 Renewable Resource Improvements and Treatments.

BLM Handbook H-1742-1 – Burned Area Emergency Stabilization and Rehabilitation Handbook—Provides specific guidance for policies, standards, and procedures used in the Burned Area Emergency Stabilization and Rehabilitation programs.

BLM Handbook – H-6250 – National Scenic and Historic Trail Administration—Provides the BLM policy and program guidance on administering congressionally designated National Trails as assigned by the Department of the Interior within the National Landscape Conservation System and this manual describes the BLM's roles, responsibilities, agency interrelationships, and policy requirements for National Trail Administrators.

BLM Handbook H-8140 – Protecting Cultural Resources—Provides general guidance for protecting cultural resources from natural or human-caused deterioration; for making decisions about recovering significant cultural resource data when it is impossible or impractical to maintain cultural resources in a nondeteriorating condition; for protecting cultural resources from inadvertent adverse effects associated with BLM land use decisions, and for controlling unauthorized uses of cultural resources.

BLM Handbook H-8160-1 – General Procedural Guidance for Native American Consultation—Native American consultation is undertaken to give tribes a reasonable opportunity to identify significant places and resources that may be impacted by proposed undertakings and to propose mitigative actions to minimize those impacts.

BLM Handbook H-8320-1 – Planning for Recreation and Visitor Services—Assists in the planning and management of recreation and visitor services on public lands and adjacent waters. This handbook provides planning guidance at the land use plan and implementation level.

BLM Handbook H-8342 – Travel and Transportation Handbook—Provides specific guidance for preparing, amending, revising, maintaining, implementing, monitoring, and evaluating BLM land use and travel management plans.

BLM Handbook H-9200 – Fire Program Management—Provides consistent fire program management direction and guidance to BLM users and managers. The objective of this direction and guidance is to guide the philosophy, direction and implementation of fire management planning, activities and projects on BLM lands, and to ensure compliance with Federal wildland fire management policy.

BLM Handbook H-9211-1 – Fire Planning Handbook—Provides guidance on how to meet the requirements of Federal Wildland Fire Management Policy, as well as BLM regulations and policy. It contains guidance on how to meet planning requirements and how to prepare fire management plans. This handbook recommends a course of action for accomplishing landscape-level fire planning and provides guidance supplemental to the BLM NEPA Handbook (H-1790-1) for fire management actions.

C.3 MANUALS

BLM Manual 1740 – Renewable Resource Improvements and Treatments—The purpose of this updated manual is for identifying objectives, policies and standards that are common and apply to planning, analyzing, constructing, maintaining, replacing and or modifying renewable resource improvements and treatments for the forestry, range management, riparian management, soil, water, air, fish, wildlife, threatened and endangered species, wild horse and burro, invasive species, hazardous fuels

reduction, emergency stabilization, and burned area rehabilitation programs to achieve management objectives on BLM managed lands.

BLM Manual 6100 – National Landscape Conservation System (NLCS)—Provides general policy to BLM personnel on managing public lands in the National Landscape Conservation System. The NLCS was established in order to "conserve, protect, and restore nationally significant landscapes that have outstanding cultural, ecological, and scientific values for the benefit of current and future generations." NLCS units are to be managed "in a manner that protects the values for which the components of the system were designated." Section 1.8 of this manual lists the designations identified in the Act as components of the NLCS. The BLM has additional manuals addressing policy specific to National Monuments, National Conservation Areas and Similar Designations, Wilderness, Wilderness Study Areas, Wild and Scenic Rivers, and National Scenic and Historic Trails.

BLM Manual 6280 – Management of National Scenic and Historic Trails and Trails Under Study or Recommended as Suitable for Congressional Designation—This manual provides policy for the management of National Scenic and Historic Trails.

BLM Manual 6330 – Management of BLM Wilderness Study Areas—This manual provides policy on the non-impairment standard to BLM personnel for use when managing Wilderness Study Areas.

BLM Manual 6400 – Wild and Scenic Rivers—Provides the line manager and program staff professional with policies and program guidance for conducting wild and scenic rivers studies within the land use planning process, environmental analysis, and legislative reporting and provides other related information. It also sets forth requirements for designated rivers, as well as river segments determined eligible or suitable for inclusion in the National Wild and Scenic Rivers System. It also expands upon the US Department of the Interior - US Department of Agriculture Final Revised Guidelines for Eligibility, Classification, and Management of River Areas.

BLM Manual 6840 – Special Status Species Management—This manual establishes policy and guidance for management of species listed or proposed for listing pursuant to the Endangered Species Act and Bureau sensitive species which are found on BLM-administered lands.

BLM Manual 8270—General Procedural Guidance for Paleontological Resource Management—This manual provides uniform policy and direction for the BLM's Paleontological Resources Management Program. Its purpose is to assure adequate and appropriate consideration and protection of paleontological resources on the public lands.

C.4 OTHER

Interim Air Quality Policy on Wildland and Prescribed Fires (EPA 1999)—Calls on states to develop smoke management programs and for federal land managers to participate in these programs (EPA 1998). Smoke management programs are intended to accomplish the following:

- Prevent the deterioration of air quality and the exceedance of national ambient air quality standards
- Address visibility impacts on Class I areas
- Mitigate nuisance and public safety impacts of prescribed fires

Appendix D
Design Features

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Appendix D. Design Features

Table D-1
Fuel Breaks PEIS
Design Features by Alternative

[1] Resource codes:

GEN: General design feature that would benefit all resources
AIR: Air quality
CULT: Cultural, paleontological, and tribal resources
FF: Fire and fuels
FW: Fish and wildlife
LG: Livestock grazing
REC: Recreation
SD: Special designations
SOIL: Soil resources
SSS: Special status species
TM: Travel management
VEG: Vegetation resources
VIS: Visual resources
WR: Water resources
WHB: Wild horses and burros

#	Design Feature	Applicable Alternatives	Applicable Resources[1]
GENERAL			
1.	Where feasible, place equipment (e.g., vehicles and mechanical treatment equipment) in previously disturbed areas.	All action alternatives[2]	GEN
2.	When applicable, monitor to determine if objectives are being met for any affected resources.	All action alternatives	GEN
3.	Consider the maintenance or rehabilitation of existing fuel breaks before new fuel breaks are constructed.	All action alternatives	GEN

#	Design Feature	Applicable Alternatives	Applicable Resources[1]
4.	Apply restrictions and design features in applicable land use plans and land use plan amendments. Develop resource-specific buffer distances and apply seasonal restrictions based on site-specific conditions, best available science, applicable land use plan guidance, and professional judgement. If any design features in this PEIS conflict with state or local guidance, defer to state or local guidance.	All action alternatives	GEN
5.	Use best available science when designing and implementing fuel breaks.	All action alternatives	GEN
6.	As feasible to achieve objectives, keep disturbance commensurate with the scope of the fuel break.	All action alternatives	GEN
7.	Where feasible, fuel breaks would be constructed where vegetation disturbance by wildland fire or surface-disturbing activities has already occurred.	All action alternatives	GEN

#	Design Feature	Applicable Alternatives	Applicable Resources[1]
8.	Fuel breaks would be constructed in locations determined through interdisciplinary dialogue (including consultation and coordination with adjacent landowners), to best meet the goals of the local fire management plan, and can be effectively monitored and maintained. They would be placed in a way that is strategically appropriate for fire suppression, while minimizing short- and long-term impacts on other resources.	All action alternatives	GEN
9.	All project personnel would be required to attend an environmental training prior to initiating Project construction. The training would address environmental concerns and stipulations and requirements for compliance with the project.	All action alternatives	GEN
10.	Signs would be installed in treatment areas during activities for public safety.	All action alternatives	AIR, REC, TM
11.	During times of high fire danger, all equipment would be equipped with a functional spark arrestor. Operators would be required to have, at a minimum, a shovel and a working fire extinguisher on hand.	All action alternatives	FF
12.	During fuel break design and implementation, the location, such as topography for project screening, minimal disturbance, and consideration of visual contrasts with the surrounding landscapes, would be considered. For example, vegetation may be drill seeded in a serpentine pattern or using drill modifications, such as minimum-or-no-till drills, slick discs, and drag chains, so that drill rows are not apparent.	All action alternatives	SD, VIS
PRESCRIBED FIRE			
13.	Prescribed fire operations would be conducted by qualified personnel when prescription parameters as defined in the burn plans are met.	C, D	GEN
14.	Debris piles created during fuel break implementation would be ignited when prescription burn conditions are appropriate—that is, when soils are either wet or frozen.	C, D	AIR, SD
15.	The BLM would comply with their respective state department of environmental quality or other state air monitoring group to ensure that smoke emissions from treatments remain below National Ambient Air Quality $PM_{2.5}$ thresholds for sensitive receptors.	C, D	AIR, SD
16.	Signs would be posted on primary roads accessing the area being burned to alert drivers of the potential for reduced visibility due to smoke.	C, D	AIR
17.	Ensure atmospheric conditions are within prescriptions when a prescribed burn is ignited and monitor smoke throughout the fire.	C, D	AIR
18.	If smoke threatens unacceptable impacts on transportation safety or communities, ignition should cease, provided control of the burn is not compromised.	C, D	AIR

#	Design Feature	Applicable Alternatives	Applicable Resources[1]
TARGETED GRAZING			
19.	Before targeted grazing begins, complete a targeted grazing plan that optimizes successful reduction of the target species, while avoiding damaging desired plants. The plan would include the following: 1. Objectives that specify target species, grazing duration, intensity, stocking level, type of livestock, and measurable outcomes 2. A monitoring plan 3. Stipulations, including the following: ● To minimize the risk of introducing or spreading invasive plant species through livestock manure, a quarantine period may be needed before livestock are turned out into an area for targeted grazing and when they are removed from such an area. ● Coordinate with applicable permittees, state agencies, or other landowners in advance of targeted grazing treatment. This is to identify and minimize any potential conflicts of targeted grazing with regularly permitted livestock grazing. In case-specific situations, rest from regularly permitted grazing may be necessary in order to accomplish targeted grazing objectives (Hendrickson and Olson 2006). ● Construct all fencing using proper wildlife specifications contained in BLM handbook 1741-1 Fencing and applicable approved land use plans. ● Consider on a project-by-project basis potential impacts on cultural resources from targeted grazing, including fences, corrals, and watering sites, per Section 106 of the NHPA and other cultural resource authorities. Compliance may include tribal and SHPO consultations, an archaeological inventory, and mitigation. ● Use of domestic sheep or goats for targeted grazing would be avoided within 30 miles of bighorn sheep habitat. If targeted grazing is desired within this area, BLM would prepare a separation and response plan, included in the targeted grazing plan, coordinated with the appropriate state agency to provide sufficient separation to minimize the risk of contact and disease transmission of domestic sheep or goats from bighorn sheep. USFWS would be consulted if listed bighorn sheep may be affected. ● Annually target-graze sites that are dominated by invasive annual grasses. Where there are substantial areas of desirable perennial herbaceous species, consider targeted grazing strategies that would maintain perennial plant vigor. ● Carefully consider using supplements for livestock during targeted grazing during site-specific planning. Supplements would be nontoxic to wildlife and would be placed to minimize impacts on wildlife or native vegetation. ● Install wildlife escape ramps in temporary tanks to facilitate the use of and escape from livestock watering troughs by greater sage-grouse and other wildlife.	C, D	FW, LG, SD, SOIL, SSS, VEG

#	Design Feature	Applicable Alternatives	Applicable Resources[1]
20.	Provide adequate rest from livestock grazing: to allow desired vegetation to recover naturally; in suitable habitat for threatened and endangered plants; and for seeded species in treated areas to successfully become established. All new seedings of grasses and forbs should not be grazed until, at least, after the end of the second growing season, or when fuel break objectives are met to allow plants to mature and develop robust root systems. This would stabilize the site, compete effectively against cheatgrass and other invasive annuals, and remain sustainable under long-term grazing management. Adjust other management activities to meet project objectives.	C, D	FW, LG, SD, SOIL, SSS, VEG
21.	Manage targeted grazing to conserve suitable habitat conditions for special status species, while implementing rangeland health standards and guidelines (BLM 2014).	C, D	SSS
22.	A Graduated Use Plan is included after this table.	C, D	FW, LG, SD, SOIL, SSS, VEG
SURVEY REQUIREMENTS AND RESOURCE PROTECTION			
VEGETATION AND INVASIVE AND NOXIOUS WEEDS			
23.	All prescribed soil disturbance would need to incorporate noxious and invasive weed management, including pre-work evaluation or avoidance.	All action alternatives	CULT, FW, SD, SSS, VEG
24.	Noxious weeds and invasive plants would be monitored to track changes in populations over time, and corrective action would be prescribed where needed, in accordance with local weed programs. Thresholds and responses for noxious weeds and invasive plants (particularly invasive annual grasses) will be included in fuel break implementation and monitoring plans.	All action alternatives	CULT, FW, SD, SSS, VEG
25.	Mowed fuel breaks would be re-mowed when grass has reached a height between 1 and 2 feet or exceeds the Tons Per Acre of the Grass Fuel Model 2 (GR2), as described in Standard Fire Behavior Fuel Models: A Comprehensive Set for Use with Rothermel's Surface Fire Spread Model (Scott and Burgan 2005).	All action alternatives	FF
26.	Locally adapted or genetically appropriate perennial forbs and grasses would be applied at jackpot and pile burn sites when appropriate to facilitate establishment of vegetation.	All action alternatives	SD, VEG, VIS
CULTURAL, TRIBAL, AND PALEONTOLOGICAL RESOURCES			
27.	Cultural and paleontological inventories and consultations appropriate to the scale and level of disturbance would occur in advance of project activities; the results would be used early in project planning to determine the need for project redesign or other mitigation.	All action alternatives	CULT

#	Design Feature	Applicable Alternatives	Applicable Resources[1]
28.	Potential adverse effects on historic properties[3] would be avoided during ground-disturbing activities. A cultural resource specialist would identify avoidance areas before treatment begins, including subsequent retreatments. If protection of resources compromises the effectiveness of a given treatment and life, safety, or other resources are threatened, flexibility would be maintained to allow for project redesign, while protecting cultural resources. If historic properties could not be avoided without significantly compromising the success of a treatment, the effects would be minimized, in consultation with SHPO, ACHP, tribes, or interested members of the public.	All action alternatives	CULT
29.	Consult with potentially affected tribes, according to guidance set forth in BLM Manual and Handbook 1780, and relevant authorities listed therein, before herbicide spraying or other treatments begin that are likely to affect the access or availability of resources or locations important to traditional lifeways, including subsistence, economy, ritual, and religion.	All action alternatives	CULT
30.	Potentially affected tribes would be consulted before herbicides are sprayed or other treatments are used that are likely to affect the access or availability of resources or locations important to traditional lifeways, examples of which are subsistence, economy, ritual, and religion.	All action alternatives	CULT, VEG
31.	The need for a paleontological inventory would be determined based on criteria set forth in BLM Instruction Memorandum (IM) 2016-124, using potential fossil yield classification, if available, or geologic characteristics and previous study data, if not. Ground-disturbing and chemical treatments in areas with paleontological resources would be addressed on a site-by-site basis. Project activities at significant paleontological sites would be coordinated with the regional BLM paleontologist to determine mitigation or monitoring needs in areas with a high potential for fossil resources. This would be done to minimize adverse effects.	All action alternatives	GEN
32.	If cultural or paleontological resources are encountered during project implementation, all ground-disturbing activity in the vicinity of the find must cease until the resource is evaluated by an appropriate BLM resource specialist. The BLM would follow the procedures outlined in 36 CFR 800. If human remains or objects covered by the Native American Graves Protection and Repatriation Act are encountered, all work would cease and the BLM Authorized Officer would be contacted immediately by phone, with written follow-up, and other guidelines set forth in 43 CFR 10 would be followed. Archaeological inventories and assessments of potential significance under the National Historic Preservation Act (NHPA) would be conducted in accordance with the National Programmatic Agreement between the Advisory Council of Historic Preservation (ACHP) and BLM, state protocol agreements with respective State Historic Preservation Offices (SHPOs), guidelines set forth in the BLM 8100 Manual and Handbook, and according to other relevant authorities listed in the above documents, including Section 106 of the NHPA.	All action alternatives All action alternatives	CULT CULT

#	Design Feature	Applicable Alternatives	Applicable Resources[1]
SOIL AND WATER RESOURCES			
33.	Minimize ground-disturbing treatments in areas with highly erosive soils (see **Chapter 3** for highly erosive soil criteria).	All action alternatives	FW, SD, SOIL, SSS, VEG, WR
34.	Avoid or minimize ground-disturbing activities when soils are saturated.	All action alternatives	SSS
35.	Use best management practices and soil conservation practices during project design and implementation to minimize sediment discharge into streams, lands, and wetlands from such treatments as mowing, disking, and seeding. This is to protect designated beneficial uses.	All action alternatives	FW, SSS
36.	Soils, site factors, and timing of application must be suitable for any ground-based equipment used for creating a fuel break. This is to avoid excessive compaction, rutting, or damage to the soil surface layer. Equipment would be used on the contour, where feasible.	All action alternatives	SD, SOIL, VIS
37.	For safety and to protect site resources, treatment methods involving equipment generally would not be applied on slopes exceeding 35 percent.	All action alternatives	SD, SOIL
38.	Bare soil (disked) portions of fuel breaks adjacent to roadways would not exceed 25 feet on either side of the roadway.	All action alternatives	SSS
WILDLIFE AND SPECIAL STATUS SPECIES (WILDLIFE AND PLANTS)			
39.	If special status plant or animal populations and their habitats occur in a proposed treatment area, assess the area for habitat quality and base the need for treatment on special status species present. Conduct appropriately timed surveys within suitable or potential habitats for federally listed, proposed, and BLM special status species prior to treatment. Federally listed species and BLM special status species with the potential to occur in the project area are presented in **Appendix J**.	All action alternatives	SSS
40.	Implement restrictions and conservation strategies for special status species, including federally listed, proposed, candidate, and BLM sensitive species, as contained in approved recovery and conservation plans, cooperative agreements, and other instruments in whose development the BLM has participated. If none are available, coordinate with the USFWS and/or state wildlife agencies to develop appropriate restrictions.	All action alternatives	SSS
41.	Avoid all treatments within 400 meters from the edge of bonytail chub, Colorado pikeminnow, humpback chub, razorback sucker, June sucker critical habitat or occupied habitat and Lahontan cutthroat trout occupied habitat.	All action alternatives	SSS
42.	No targeted grazing would be allowed within grizzly bear habitat	All action alternatives	SSS
43.	Vegetation treatments would be designed and implemented to minimize noise disturbance or habitat modifications within one mile of wolf dens or rendezvous sites from mid-April until the end of June.	All action alternatives	SSS
44.	Prohibit fuel break construction and maintenance in sage-grouse breeding habitat during the breeding season.	Alternative B	SSS

#	Design Feature	Applicable Alternatives	Applicable Resources[1]
45.	In sage-grouse Biologically Significant Units occurring within Priority and Important Habitat Management Areas, ensure that sagebrush treatments do not lead to a soft or hard habitat trigger trip.	All action alternatives	SSS
46.	Restrict activities in big game habitat during the following periods, unless short-term exemption is granted by the BLM field office manager, in coordination with the appropriate state wildlife agency (dates may be determined based on local conditions): big game wintering; elk/deer calving/fawning; pronghorn calving/fawning; and bighorn sheep lambing.	All action alternatives	FW
47.	Manage domestic sheep grazing to minimize contact between domestic sheep and desert and Rocky Mountain bighorn sheep, using the currently accepted peer-reviewed modeling techniques and best available data, such as the Bighorn/Domestic Sheep Risk of Contact Model, in accordance with BLM Manual 1730, Management of Domestic Sheep and Goats to Sustain Wild Sheep.	All action alternatives	FW, SSS
48.	Treatments in mule deer winter range would not reduce the total area having shrub cover suitable for browse below 70% of site-specific winter range areas (Cox et al. 2009).	All action alternatives	FW
49.	Complete surveys for migratory bird and raptor nesting activity and establish a seasonal buffer around raptor nests. Avoid fuel break construction and maintenance during the peak of the local nesting season in the project area for priority migratory land bird species (e.g., Birds of Conservation Concern, BLM sensitive species). Specific dates and buffer distances for the seasonal restrictions may be determined in coordination with the USFWS Migratory Bird Division and/or state wildlife management agency, and should be based on species, variations in nesting chronology of particular species locally, topographic considerations, such as an intervening ridge between the treatment activities and a nest, or other factors that are biologically reasonable.	All action alternatives	FW, SSS
50.	Aerial seeding treatments and aerial application of herbicides would be avoided within 0.5 miles to one mile of active American bald and golden eagle nests during the nesting season. Avoidance distances would be determined by the amount of screening provided by vegetation or topographic features.	All action alternatives	SSS
51.	On-the-ground vegetation treatments would be avoided within 0.5 mile of direct line of sight or within 0.25 miles of bald eagle winter concentration sites during the winter roosting season.	All action alternatives	SSS
52.	Aerial treatment applications will be avoided within 0.5 mile of bald eagle winter concentration sites during the winter roosting season.	C, D	SSS

#	Design Feature	Applicable Alternatives	Applicable Resources[1]
53.	Aerial application of chemicals would not occur during the yellow-billed cuckoo nesting season (June 1 – August 31) or within 0.5 miles of suitable or proposed critical yellow-billed cuckoo habitat. Specific dates and buffer distances for the seasonal restrictions may be determined in coordination with the USFWS Migratory Bird Division and/or state wildlife management agency, and should be based on species, variations in nesting chronology of particular species locally, topographic considerations, such as an intervening ridge between the treatment activities and a nest, or other factors that are biologically reasonable. Further, suitable yellow-billed cuckoo habitat will be determined using the Utah Field Office August 2017 Guidelines for the identification and evaluation of suitable habitat for the western yellow-billed cuckoo.	All action alternatives	SSS
54.	Mechanical treatments, ground-based broadcast application of herbicides, or cutting of noxious or invasive woody species would not occur during the yellow-billed cuckoo nesting season within 0.25 mile of suitable or proposed critical yellow-billed cuckoo habitat; suitable yellow-billed cuckoo habitat will be determined using the Utah Field Office August 2017 Guidelines for the identification and evaluation of suitable habitat for the western yellow-billed cuckoo.	All action alternatives	SSS
55.	Prescribed fire would not be used within 0.5 miles of suitable or proposed critical yellow-billed cuckoo habitat; suitable yellow-billed cuckoo habitat will be determined using the Utah Field Office August 2017 Guidelines for the identification and evaluation of suitable habitat for the western yellow-billed cuckoo.	All action alternatives	SSS
56.	Proposed treatments within suitable Utah prairie dog habitat would be surveyed in accordance with USFWS protocols or in coordination with USFWS prior to implementation.	All action alternatives	SSS
57.	All staging areas (e.g. vehicles, trailers, and materials) would be located outside of a 350-foot buffer of areas that were identified as mapped Utah prairie dog habitat.	All action alternatives	SSS
58.	Project related vehicles would not exceed a speed of 15 miles per hour within mapped Utah prairie dog habitat.	All action alternatives	SSS
59.	A qualified Utah prairie dog biologist, approved by BLM, would be required to be on-site during all work within mapped Utah prairie dog habitat. The biologist would document compliance with design features and any take that may occur and would have the authority to halt activities which may be in violation of these stipulations.	All action alternatives	SSS

#	Design Feature	Applicable Alternatives	Applicable Resources[1]
60.	All vehicle maintenance activities shall be conducted in maintenance facilities or in the event of emergency vehicle maintenance at least 350 feet from mapped Utah prairie dog habitat in previously disturbed areas. Precautions shall be taken to ensure that contamination of maintenance sites by fuels, motor oils, grease, etc. does not occur and that such materials are contained and properly disposed of off-site. Inadvertent spills of petroleum based or other toxic materials shall be cleaned up and removed immediately or upon completion of the project. Habitat treatments within occupied Utah prairie dog habitat would occur during the extended active season (April 1st – September 30th) unless otherwise determined in coordination with USFWS and Utah Division of Wildlife Resources.	All action alternatives	SSS
61.	All Project employees shall be informed of the occurrence of the Utah prairie dog in the general area, and of the threatened status of the species. They shall be advised as to the definition of "take", and the potential penalties (up to $200,000 in fines and one year in prison) for taking a species listed under the ESA. Project personnel will not be permitted to have firearms or pets in their possession while on the Project site. The rules on firearms and pets will be explained to all personnel involved with the Project.	All action alternatives	SSS
62.	If a dead or injured Utah prairie dog is located, initial notification must be made to the Service's Division of Law Enforcement, Salt Lake City, Utah, at telephone 801-975-3330, to the Utah Division of Wildlife Resources at telephone number (435) 865-6100, and to the Authorized Officer at (435) 865-3000. Instruction for proper handling and disposition of such specimens would be issued by the Division of Law Enforcement. Care must be taken in handling sick or injured animals to ensure effective treatment and care and in handling dead specimens to preserve biological material in the best possible state.	All action alternatives	SSS
63.	Use spot applications or low-boom broadcast applications for herbicides within Utah prairie dog habitat, where possible, to limit the probability of contaminating non-target food and water sources, especially vegetation over areas larger than the treatment area.	C, D	SSS
64.	Surveys would take place in potential known pygmy rabbit habitats (non-listed populations). Select fuel break routes with the least density of active burrows.	All action alternatives	SSS
65.	Where fuel breaks are wider than 100 feet (30 meters) on either side of roads, a buffer would be applied to the outer portion of the fuel break, from 101 feet (30.7 meters) up to 200 feet (61 meters) from road edge, as follows: no disturbing vegetation within 33 feet (10 meters) of active and inactive Columbia Basin pygmy rabbit burrows and limit disturbance proposed between 33 and 98 feet (10 and 30 meters) of active and inactive Columbia Basin pygmy rabbit burrows, such that shrub height is not reduced below 20 inches (50 centimeters) or shrub foliar cover is not reduced below 15 percent.	B	SSS
66.	Use of prescribed fire would be avoided within 0.25 mile of occupied pygmy rabbit burrows (non-listed populations). Additional site specific analysis would be required if this buffer cannot be avoided.	All action alternatives	SSS

#	Design Feature	Applicable Alternatives	Applicable Resources[1]
67.	Design projects so facilitating practices (e.g. staging areas or travel routes) avoid affecting USFWS listed Threatened, Endangered or Proposed species.	All action alternatives	SSS
68.	Comply with any additional conservation measures developed during ESA Section 7 consultation for this PEIS.	All action alternatives	SSS

Source: BLM interdisciplinary team input

[1] Resource codes

GEN: General design feature that is not resource-specific
AIR: Air quality
CULT: Cultural, paleontological, and tribal resources
FF: Fire and fuels
FW: Fish and wildlife
LG: Livestock grazing
REC: Recreation
SD: Special designations
SOC: Socioeconomics
SOIL: Soil resources
SSS: Special status species
TM: Travel management
VEG: Vegetation resources
VIS: Visual resources
WR: Water resources
WHB: Wild horses and burros

[2] The action alternatives are Alternatives B, C, and D

[3] Historic properties are cultural resources that are archaeological sites, districts, or traditional cultural properties (TCPs) that are significant, or are suspected to be significant, under the National Register of Historic Places, as defined in 36 CFR 63; TCPs are defined in National Register Bulletin 38. Other significant cultural resources are those important historic or traditional places, landscapes, or resources with significance to Native American tribes and other cultural groups, according to regulations and guidance discussed in BLM Manuals and Handbooks 8100 and 1780.

D.1 GRADUATED USE PLAN

Because livestock are mobile, the BLM anticipates that some incidental grazing may occur beyond the fuel treatment zone in the graduated use area – a ½-mile buffer zone along the fuel break. Utilization caps for perennial grasses would be assigned in the graduated use area to ensure that targeted grazing does not impact regularly scheduled grazing, and to limit or eliminate the need for fencing to accomplish the treatment.

- Utilization respective to targeted grazing use will be limited to the following to ensure resource damage does not occur and permitted AUMs are not negatively impacted:
  1) No more than 30%[1] utilization (light use) of perennial grasses allowed within the ¼-mile graduated use area - the buffer from the edge of the 200-foot treatment area (i.e., fuel break) out to ¼ mile.
  2) No more than 16%[1] utilization (slight use) of perennial grasses between ¼ mile and ½ mile graduated use areas (Figure 2-1).

Diagram of Targeted Grazing Treatment Expectations

¼ to ½-mile graduated use area: ≤16% utilization

¼-mile graduated use area: ≤30% utilization
250-foot targeted grazing treatment area
Road
250-foot targeted grazing treatment area
¼-mile graduated use area: ≤30% utilization

¼ to-½ mile graduated area: ≤16% utilization

- If utilization standards are exceeded in graduated use areas, within 48 hours livestock must be removed or moved to another portion of the treatment area that has not exceeded utilization levels/has not yet met fuel break treatment objectives (i.e., 2-inch stubble height in treatment area).
- In instances where targeted grazing occurs in a pasture where authorized grazing (identified on a grazing permit) has already occurred per the current year's grazing schedule, utilization levels on perennial grasses within the graduated use area may exceed the 30% and 16% utilization levels, respectively, but will not exceed the utilization level identified in the existing grazing permit or land use plan.
- Temporary electric avoidance fencing may be utilized to protect sensitive resources (e.g., riparian areas) within the treatment area or graduated use area during targeted grazing, and will be removed once treatment is complete.
- Targeted grazing resource adaptive management triggers:
  – >30% utilization of perennial grasses in ¼-mile graduated use area (buffer from edge of treatment area out to ¼ mile); and/or
  – >16% utilization of perennial grasses in ½-mile graduated use area (buffer from ¼ mile out to ½ mile from treatment).

[1] Utilization class interval midpoint for Key Species and Landscape Appearance Methods per Technical Reference 1734-03 "Utilization Studies and Residual Measurements."

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Appendix E
Additional Resources

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Appendix E. Additional Resources

Below is a list of additional resources that field staff can reference or tier to when undertaking fuel break projects. Note this is not a complete list and sources not listed may also be appropriate to reference.

E.1 NEPA Documents

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E.2 OTHER DOCUMENTS

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Appendix F

Vegetation Framework and Methodology

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Appendix F. Vegetation Framework and Methodology

This document shows the process used to develop vegetation states and conifer phases for the purpose of the two programmatic environmental impact statements, Fuel Breaks and Rangeland Restoration & Fuels Reduction. Each vegetation state relates to a relative amount of shrub, perennial grass/forb, and annual invasive grass foliar cover. The conifer phase relates to the successional stages of pinyon pine and juniper forests and areas of sagebrush that are adjacent to these forests (considered encroachment areas). This framework is expected to be useful for the PEIS NEPA analysis of the affected environment and environmental consequences of a variety of potential fuels treatments, fuels reduction and restoration, as well as for guiding project development at the field level.

F.1 METHODS FOR VEGETATION STATES

Vegetation was partitioned into three common plant categories found within sagebrush communities: invasive annual grasses (IAG), perennial grasses and forbs (PGF), and sagebrush (SB). The percent cover of each category was divided into low, medium, and high cover classes for IAG and PGF; percent cover of SB was divided into low, intermediate, moderate, and high cover classes. The range for each cover class is identified in **Table F-1**. Percent cover breakpoints within each vegetation type were derived from Mealor et al. (2013) for IAG, Chambers et al. (2014) for PGF, and Connelly et al. (2000), Connelly et al. (2003), and Hagen et al. (2007) for SB.

Table F-1
Sagebrush and Grassland Habitat Classes with Cover Breakpoints

Vegetation Type	Code	Percent Cover Class
low sagebrush cover	LSB	0-5
intermediate sagebrush cover	ISB	6-14
moderate sagebrush cover	MSB	15-25
high sagebrush cover	HSB	26+
low invasive annual grass cover	LIAG	0-5
medium invasive annual grass cover	MIAG	6-25
high invasive annual grass cover	HIAG	26+
low perennial grass & forb cover	LPGF	0-5
medium perennial grass & forb cover	MPGF	6-19
high perennial grass & forb cover	HPGF	20+

GIS Datasets to support vegetation categories and treatment methods:

1. Historical vegetation layer from Landfire, called Biophysical Settings (BPS) was used to identify the extent of sagebrush by extracting the sagebrush and associated habitats that occurred historically on the landscape. This layer was chosen over the Existing Vegetation (EVT) in order to capture areas historically supporting sagebrush communities.
2. Vegetation cover was identified using the USGS National Cover Database Shrubland products (Homer et al. 2015) which is a percentage-based set of raster datasets covering a majority of the project area. For the purposes of this exercise, percent sagebrush and two subsets of percent herbaceous (annual and perennial) were used to develop the vegetation categories. While other shrubs may add a few additional percentages of cover, the BLM used sagebrush cover alone because it is the most important shrub type for management purposes.

The IDT then aggregated the vegetation cover classes into seven 'vegetation states' based on relative amounts of each cover class (dominant and subdominant cover types). This was accomplished by creating a decision tree (**Figure F-1**) that combined the three classified layers and assigned a vegetation state to each of the possible combinations. The conclusions from **Figure F-1** are distilled in **Table F-2**.

Table F-2
Description of the Vegetation States

Vegetation State (Combine Classes)	Percent Cover by Vegetation Type			Description
	Shrub	Perennial Grass and Forb	Invasive Annual Grasses	
Other	0-5 (low)	0-5 (low)	0-5 (low)	Rock, playas and open water
Invasive Annual Grasses (IAG)	0-5 (low)	0-5 (low)	6+ (moderate to high)	Sites dominated by invasive annual grasses (may include poa spp.)
Invasive Annual Grasses with Shrubs (IAG/Shrub)	6-25 (low-moderate)	0-5 (low)	6+ (moderate to high)	Shrub overstory with invasive annual grass understory
Perennial Grasses and Forbs (PGF)	0-5 (low)	6+ (moderate to high)	0-5 (low)	Sites dominated by perennial grass and forbs (including nonnative seedings)
Perennial Grasses and Forbs with Shrubs (PGF/Shrub)	6+ (intermediate to high)	6+ (moderate to high)	0-5 (low)	Intact vegetation and similar to reference state
Perennial Grasses and Forbs with Invasive Annual Grasses (PGF/IAG)	0-5 (low)	6+ (moderate to high)	6+ (moderate to high)	Perennial grassland with invasive annual grasses filling interspaces
Shrubs and Perennial Grasses and Forbs with Invasive Annual Grasses (PGF/IAG/Shrub)	6+ (intermediate to high)	6+ (moderate to high)	6+ (moderate to high)	Intact vegetation with invasive annual grasses filling interspaces
Shrub with Depleted Understory	15+ (moderate to high)	0-5 (low)	0-26+ (low to high)	Shrub-dominated vegetation

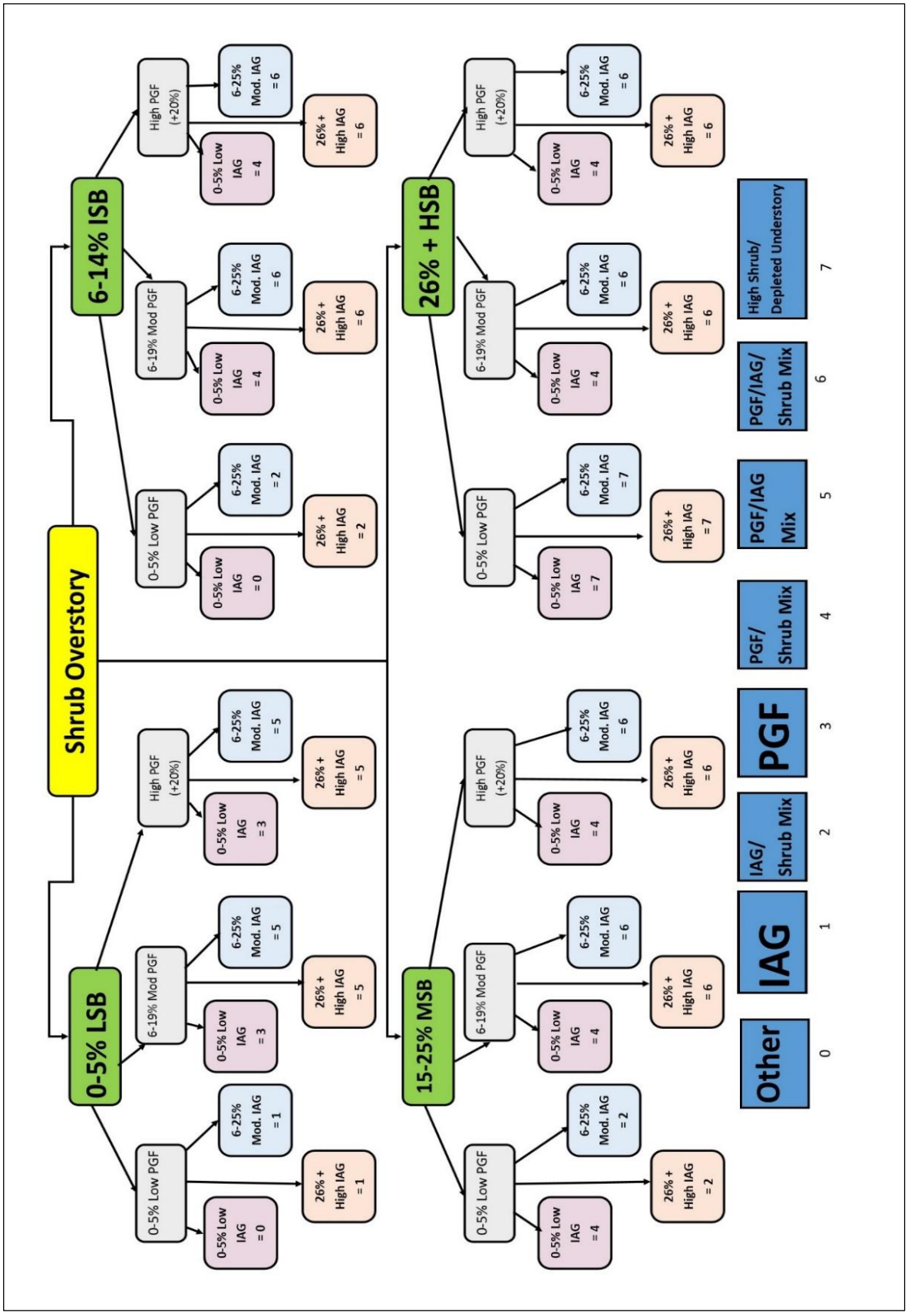

Figure F-1. This diagram shows the combinations of relative cover types resulting in each vegetation state. Abbreviations: LSB (low sagebrush), ISB (intermediate sagebrush), MSB (moderate sagebrush), HSB (high sagebrush), IAG (invasive annual grass), PGF (low perennial grass & forb).

F.2 METHODS FOR CONIFER PHASES

Priority areas for conifer treatment were first identified using a 6.2 mile buffer on sage-grouse leks and mule deer winter habitat. Tree-encroached sagebrush habitats were divided into classes based on tree density and fire history (Miller et al. 2014) (**Table F-3**). A tree canopy layer was obtained from the National Land Cover Database website to determine break points by phase.

Table F-3
Conifer Habitat Classes with Cover Breakpoints

Classes	Percent Tree Cover
Phase 1 (unburned)	0-9
Phase 1 (recently burned)	0-9
Phase 2	10-30
Phase 3	31+

The percent tree canopy layer does not differentiate tree species, therefore Landfire EVT was used to parse out where pinyon pine and juniper (PJ) communities are located. Additional phase 1 areas were added to this layer from a conifer encroachment dataset obtained from the Landscape Approach Data Portal website. This encroachment layer includes other plant communities besides PJ, mainly sagebrush communities that are adjacent to conifers. Finally, BLM fire history (using burn years 2008-2017) was overlaid with the phases to identify the recently burned phase 1 areas.

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Appendix G

Impact Topics with Less than Significant Impacts

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Appendix G. Impact Topics with Less than Significant Impacts

Table G-1
Impact Topics with Less than Significant Impacts

Impact Topic	Not Present	Present, Not Affected	Present, May be Affected (+/-)	Rationale
Visual Resources			- +	Visual Resource Management (VRM) classes are established through the RMP process for all BLM-administered lands. Visual management objectives are established for each class. Objectives for VRM classes are as follows: ● Class I Objective. The objective of this class is to preserve the existing character of the landscape. This class provides for natural ecological changes; however, it does not preclude very limited management activity. The level of change to the characteristic landscape should be very low and must not attract attention. ● Class II Objective. The objective of this class is to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape. ● Class III Objective. The objective of this class is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape. ● Class IV Objectives. The objective of this class is to provide for management activities which require major modifications of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements. The objectives for the VRM classes provide the visual management standards for the design and development of future projects and for rehabilitation of existing projects.
Visual Resources			-	No fuel breaks are being proposed in VRM Class I in this PEIS. In other VRM Classes, the

Impact Topic	Not Present	Present, Not Affected	Present, May be Affected (+/-)	Rationale
(continued)			+	BLM will not install fuel breaks that do not meet class objectives. The visual resource contrast rating process (Manual Section 8431) provides a systematic means to evaluate proposed projects and determine whether these projects conform with the approved VRM class objectives. It also provides a means to identify mitigating measures that can be taken to minimize adverse visual impacts. The VRM system, therefore, provides a means to provide timely inputs into proposed surface disturbing projects to ensure that these objectives are met. At the site-specific level, the visual resource contrast rating process (Manual Section 8431) is used as a visual design tool in project design and as a project assessment tool during environmental review. Contrast ratings are required for proposed projects in highly sensitive areas or high impact projects, but may also be used for other projects where it would appear to be the most effective design or assessment tool. Short-term impacts on visual resources could occur from installing fuel breaks in VRM Classes II, III, and IV. Visual design considerations shall be incorporated into all surface disturbing projects regardless of size or potential impact. Emphasis shall be placed on providing these inputs during the initial planning and design phase so as to minimize costly redesign and mitigation at later phases of project design and development. Project monitoring efforts include timely and thorough compliance evaluations, especially during the construction phase, to ensure that visual management provisions are effectively carried out. Design features can be developed at the field office level if needed.

Impact Topic	Not Present	Present, Not Affected	Present, May be Affected (+/-)	Rationale
Noise Resources			- +	The only impact fuel breaks will have on noise resources will occur during construction, which, in some cases, will involve sound generated from mechanical treatment methods like chainsaws and mowers. Additionally, the intensity of noise generally dissipates as it travels away from the source, resulting in a decrease in loudness. Generally, a doubling of distance from the noise source results in an approximately 6-decibel reduction in sound pressure level. If a chainsaw has a typical sound intensity of 100 dBA, the sound will attenuate to moderate levels (around 60dBA) at 0.3 miles (American Academy of Audiology 2013). Accordingly, potential impacts on noise resources will be localized, temporary, and short-term. Finally, under all alternatives, fuel breaks would be constructed along existing roads: interstates, state highways, county roads, BLM-administered roads, and primitive roads, as well as along developed ROWs. In these areas, acceptable noise levels are higher given the expected impacts from traffic noise. Generally, the difference in noise levels between automobile traffic and lawn and power tools is small (according to the American Academy of Audiology, the difference is around 20 dBA (2013)). Accordingly, the potential maximum noise level generated during construction of fuel breaks, will only occur in areas with expected higher noise levels such that impacts, if any, will not have a significant effect on noise resources.
Wilderness Areas		X		No effects on Wilderness are expected because no fuel breaks are proposed in Wilderness in this PEIS.
Wilderness Study Areas		X		No effects on wilderness study areas are expected, since no fuel breaks are proposed in wilderness study areas in this PEIS.
National, Scenic, and Historic Trails		X		No effects on National, Scenic, and Historic Trails are expected, since no fuel breaks are proposed in these corridors in this PEIS.
Lands with Wilderness Characteristics Managed to Protect those Characteristics		X		No effects on lands with wilderness characteristics managed to maintain or enhance those characteristics are expected, since no fuel breaks are proposed in these areas within the Fuel Breaks PEIS.
Wild and Scenic Rivers		X		No effects on Wild and Scenic Rivers are expected, since no fuel breaks are proposed within 0.25 mile from Wild and Scenic Rivers in this PEIS.

Impact Topic	Not Present	Present, Not Affected	Present, May be Affected (+/-)	Rationale
Areas of critical environmental concern		X		Areas of critical environmental concern are areas where it has been determined that special management attention is required to protect relevant and important values. Relevant and important values are described on BLM Manual 1613, Areas of Critical Environmental Concern (Section 1). Management of ACECs is provided in the applicable RMP or ACEC activity plan. While no specific management direction is provided in BLM policy, it is assumed that all management for ACECs would maintain or enhance relevant and important values.
Other Special Designations Areas		X		The Fuel Breaks PEIS does not propose treatments in NCAs or National Monuments. It is assumed that most of these areas have management direction regarding treatments and ground disturbance.
Lands and Realty		X		The FLPMA of 1976 directs the BLM to manage public lands to protect their resource values, and to develop resource management plans consistent with those of state and local governments. Management actions on BLM-administered lands are guided by land use plans, which establish goals and objectives for resource management. The BLM's Lands and Realty Program manages a wide range of public land transactions, such as purchases and acquisitions; sales and exchanges; withdrawals; leases and permits; and right-of-way authorizations. Land authorizations in the decision area include those for roads, electrical transmission lines, water facilities, communication sites, and oil and gas distribution lines. This PEIS is a regional-level programmatic analysis. It contains broad regional descriptions of resources, provides a broad environmental impact analysis, and provides Bureau wide decisions on fuel breaks. Impacts on land uses have not been identified at the programmatic level on purchases and acquisitions; sales and exchanges; withdrawals; leases and permits; and right-of-way authorizations.
Water Resources		X		No significant effects on water quality or water quantity are expected, since this PEIS does not propose the creation of fuel breaks within riparian conservation areas, and buffers around surface water would protect water resources from sedimentation. Over the long term, the creation of fuel breaks would reduce impacts from large-scale fire events on water resources.

Impact Topic	Not Present	Present, Not Affected	Present, May be Affected (+/-)	Rationale
Livestock grazing		X		No significant effects on livestock grazing are expected, since this PEIS does not propose any changes to permitted grazing. Fuel breaks may require short-term exclusions of livestock grazing from certain areas, but best management practices would reduce these impacts to less than significant. Over the long term, the creation of fuel breaks would reduce impacts to livestock forage from large-scale fire events. See below for more information regarding livestock grazing in the project area.
Wild horses and burros		X		No significant effects on wild horses and burros are expected, since this PEIS does not propose any changes to Herd Management Areas or to the management of wild horses and burros. Fuel breaks may require short-term exclusions of wild horses from certain areas, but best management practices would reduce these impacts to less than significant. Over the long term, the creation of fuel breaks would reduce impacts to wild horse and burro forage from large-scale fire events. See below for more information regarding wild horses and burros in the project area.
Comprehensive Travel and Transportation Management		X		No effects on comprehensive travel and transportation management are expected, since this PEIS would be in conformance with Field Office guidance and travel planning. This PEIS does not propose changes to travel management.

[1] Indicates whether effects would be beneficial or adverse. If both "-" and "+" are shown, there may be some beneficial and some adverse effects.

G.1 LIVESTOCK GRAZING

Management of livestock grazing is authorized and enforced through both permits and leases and is commonly carried out through the development and implementation of allotment management plans or terms and conditions of the grazing permit or lease. Allotment management plans further outline how livestock grazing is managed to meet multiple use, sustained yield, and other needs and objectives, as determined through land use plans.

Grazing permits and leases outline the kind and number of livestock allowed, the period of use (seasonal), the allotment to be used, and the amount of use in animal unit months (AUMs). An AUM is the amount of forage necessary for the sustenance of one cow or its equivalent for 1 month, and an allotment is an area of land designated and managed for grazing of livestock (43 CFR 4100.0-5).

Table G-2, below, identifies the total number of AUMs assigned for each state in the project area.

Table G-2
AUMs by State in the Project Area

State	AUMs
Idaho	1,050,237
Nevada	1,245,897
Northeast California	134,218
Oregon and Washington	852,948
Utah	703,289

Sources: BLM 2017; BLM GIS 2018

Grazing success depends on the quality and amount of forage available during the grazing season. Wildland fire removes potential forage in the short term and can change forage composition in the long term, leading to inefficient grazing. In particular, wildland fire alters sagebrush habitat. Sagebrush can take years or decades to regenerate, and invasive annual grasses, such as cheatgrass, are adapted to frequent wildfire. In the absence of a robust perennial grass component, invasive annual grasses are likely to dominate these systems following wildfire (NTT 2011).

G.2 WILD HORSES AND BURROS

The BLM protects, administers, and controls wild horses in accordance with the Wild Free-Roaming Horses and Burros Act of 1971 (Public Law 92-195, as amended). The act's purpose is to "manage wild horses and burros within herd management areas (HMAs) designated for their long-term maintenance, in a manner designed to achieve and maintain a thriving natural ecological balance and multiple use relationships."

The FLPMA directs the BLM to administer wild horses and burros as one of numerous multiple uses. Under the Wild Free-Roaming Horses and Burros Act, the BLM identified herd areas as places used as habitat by a herd of wild horses at the time the act was passed. To carry out its duties under the act, the BLM evaluated each herd area to determine if it had adequate food, water, cover, and space to sustain healthy and diverse wild horse and burro populations over the long term. It then designated the areas that met those criteria as HMAs, where horses or burros can be viably managed as a component of the BLM-administered lands.

The BLM designated an appropriate management level (AML) for each HMA. An AML is defined as the number of adult horses or burros (expressed as a range, with an upper and lower limit) to be managed within an HMA (BLM 2010). It is based on available forage and other resources necessary to sustain the horse or burro populations, as well as resource objectives and other designated uses of the BLM-administered lands.

Wild horse herds grow at an average rate of 20 percent annually. The BLM seeks to control horse and burro populations so that their numbers do not exceed the carrying capacity of the land. This is done primarily by gathering animals periodically so that numbers are near the AML. Fertility control is being used in some HMAs as a means to reduce the population growth rate. When horse and burro populations begin to exceed the AML, excess animals are gathered and offered to the public through periodic adoption.

Table G-3, below, identifies the total number of HMAs, acres, estimated wild horse and burro population, and high AMLs for each state in the project area.

Table G-3
Herd Management Areas

State	Total Number of HMAs	Acres	Estimated Population[1]	High AMLs
Idaho	6	383,895	580 (h)	617
Nevada	83	14,032,947	40,394 (h), 3,623 (b)	11,987 (h) 824(b)
Northeast California	13	1,206,400	5,336 (h) 487 (b)	1,513 (h) 116(b)
Oregon and Washington	18	2,733,5777	4,682 (h) 49 (b)	2,666 (h) 24 (b)
Utah	19	2,154,458	4,848 (h) 344 (b)	1,786 (h) 170 (b)

Sources: BLM 2018c; BLM GIS 2018

[1] (h) = wild horse; (b) = burro

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Appendix H

Fuel Models in the Project Area

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Appendix H. Fuel Models in the Project Area

H.1 Project Area Fuel Models

The general fuel models in the project area are the following (Scott and Burgan 2005 and Stebleton and Bunting 2009):

- Bare Ground (NB9)—Land devoid of enough fuel to support wildland fire spread. These areas may include gravel pits, arid deserts with little vegetation, sand dunes, or rock outcroppings.
- Grass 1 (GR1)—Short, Sparse, Dry Climate Grass. The primary carrier of fire is sparse grass with small amounts of fine dead fuel. Grass is generally short, either naturally or from being grazed, and may be sparse or discontinuous.
- Grass 2 (GR2)—Low Load, Dry Climate Grass. The primary carrier of fire is grass, though small amounts of fine dead fuel may be present. Fuel loading is greater than GR1, and the fuel bed may be more continuous. Shrubs, if present, do not affect fire behavior.
- Grass 4 (GR4)—Moderate Load, Dry Climate Grass. The primary carrier of the fire is continuous, dry climate grass. Load and depth are greater than GR2; the fuel bed is about 2 feet deep.
- Grass 7 (GR7)—High Load, Dry Climate Grass. The primary carrier of fire is continuous dry climate grass. Load and depth are greater than GR4. Grass is about 3 feet tall.
- Grass-Shrub 1 (GS1)—Low Load, Dry Climate Grass-Shrub. The primary carrier of fire is grass and shrubs combined. Shrub cover is up to 50 percent. Shrubs are about 1 foot high and grass load is low.
- Grass-Shrub 2 (GS2)—Moderate Load, Dry Climate Grass-Shrub. The primary carrier of fire is grass and shrubs combined. Shrub cover is up to 50 percent. Shrubs are 1 to 3 feet high and grass load is moderate.
- Shrub 1 (SH1)—Low Load, Dry Climate Shrub. The primary carrier of fire is woody shrubs and shrub litter. Shrub cover is greater than 50 percent. Low shrub fuel load and fuel bed is about 1 foot deep; some grasses may be present.
- Shrub 2 (SH2)—Moderate Load, Dry Climate Shrub. The primary carrier of fire is woody shrubs and shrub litter. Moderate fuel load (higher than SH1), fuel bed is about 1 foot deep, and no grass fuel is present.
- Shrub 5 (SH5)—High Load, Dry Climate Shrub. The primary carrier of fire is woody shrubs and shrub litter. Shrubs are between 4 and 6 feet high and cover is over 50 percent, grass is sparse to nonexistent.
- Shrub 7 (SH7)—Very High Load, Dry Climate Shrub. The primary carrier of fire is woody shrubs and shrub litter. Shrubs are between 4 and 6 feet high and cover is over 50 percent, grass is sparse to nonexistent. Conditions are similar to SH5, but SH7 has a higher fuel loading.
- Timber-Understory 1 (TU1)—Low Load, Dry Climate, Timber-Grass Shrub. The primary carrier of fire is low load grass or shrub with litter or both.

Under the driest conditions, the rate of spread and flame length for the above fuel models are depicted in the graphs that follow this discussion. For the fuel models, spread rates and flame lengths are

described as very low, low, moderate, high, very high, and extreme. This corresponds to the fire behavior in **Table H-1**.

Table H-1
Adjective Class Definitions for Predicted Fire Behavior

Adjective Class	Rate of Spread (Chains[1] per Hour)	Flame Length (Feet)
Very Low	0–2	0–1
Low	2–5	1–4
Moderate	5–20	4–8
High	20–50	8–12
Very High	50–150	12–25
Extreme	>150	>25

Source: Scott and Burgan 2005

Surface fire flame lengths influence fire suppression activities, as described in **Table H-2**.

Table H-2
Fire Suppression Interpretations of Flame Length

Flame Length (Feet)	Interpretation
<4	Fires can generally be attacked at the head or flanks by persons using hand tools. Hand line should hold the fire.
4–8	Fires are too intense for direct attack on the head by persons using hand tools. Hand line cannot be relied on to hold the fire. Equipment such as dozers, pumpers, and retardant aircraft can be effective.
8–11	Fires may present serious control problems—torching out, crowning, and spotting. Control efforts at the fire head will probably be ineffective.
>11	Crowning, spotting, and major fire runs are probable. Control efforts at head of fire are ineffective.

Source: Andrews and Rothermel 1982

H.2 Fuel Break Desired Condition Fuel Model Crosswalk

Desired conditions for fuel breaks as represented by a fuel model would be as follows:

- GR1 fuel model would represent a mowed or targeted, grazed fuel break; represents a desired condition for a fuel break
- SH1 fuel model would represent a green strip, composed of short stature, widely spaced, and discontinuous vegetation; represents a desired condition for a fuel break
- NB9 fuel model would represent vegetation removal, such as found in brown strips; represents a desired condition for a fuel break

[1] A unit of measure in land survey, equal to 66 feet (20 meters; 80 chains equal 1 mile [1.6 meters]). Commonly used to report fire perimeters and other fire line distances, this unit is popular in fire management because of its convenience in calculating acreage; for example, 10 square chains equal 1 acre (NWCG 2018).

The following are the potential fuel models that can be found in the project area and the desired condition of the fuel break if one were created in that vegetation state:

- NB9: Bare Ground—Land devoid of enough fuel to support wildland fire spread. These areas may include gravel pits, arid deserts with little vegetation, sand dunes, or rock outcroppings. This is a desired condition and may occur naturally in the project area, and no treatments would be necessary.
- GR1: Short, Sparse, Dry Climate Grass—This is a desirable condition that represents sparse perennial bunchgrass or other sparse grass vegetation. There may be some fuel breaks established in these areas, especially if they are not common and have native vegetation that needs to be preserved or in areas with a moderate to low resistance/resilience (R&R) rating where, if burned, cheatgrass or other invasive annuals could outcompete the natives. This is a desired condition for the fuel breaks.
- GR2: Low Load, Dry Climate Grass—This condition represents a perennial bunchgrass understory. Fuel breaks established in these areas would help reduce fire size and decrease fire behavior, thereby increasing opportunities for safe engagement by firefighters. These areas can also be used to protect areas of suitable sagebrush communities or areas with a moderate to low R&R rating where, if burned, cheatgrass or other invasive annuals could outcompete natives. The desired fuel break condition would be GR1 or SH1.
- GR4: Moderate Load, Dry Climate Grass—This condition represents a continuous, annual, invasive grass fuel bed, such as cheatgrass. Fuel breaks established in these areas would help reduce fire size and decrease fire behavior, thereby increasing opportunities for safe engagement by firefighters. The desired fuel break condition would be GR1, SH1, or NB brown strip.
- GR7: High Load, Dry Climate Grass—This condition represents a continuous, annual, invasive grass fuel bed, such as cheatgrass. Fuel breaks created under these fuel conditions would help reduce fire size and decrease fire behavior, thereby increasing opportunities for safe engagement by firefighters. The desired fuel break condition would be GR1, SH1, or NB brown strip.
- GS1: Low Load, Dry Climate Grass-Shrub—This condition represents a grass-shrub mix, with low 1-foot-high shrubs and a scattered herbaceous layer (scattered perennial grasses); shrub cover is up to 50 percent. Fuel breaks established in these areas would help reduce fire size and decrease fire behavior, thereby increasing opportunities for safe engagement by firefighters. These fuel breaks can be used to protect areas of suitable sagebrush communities or areas with a moderate to low R&R rating; if these areas burn, cheatgrass or other invasive annuals could outcompete natives. The desired fuel break condition would be GR1 or SH1.
- GS2: Moderate Load, Dry Climate Grass-Shrub—This condition represents a grass-shrub mix, with shrubs between 1 and 3 feet high and a continuous herbaceous layer (perennial bunchgrass understory with native or nonnative invasive annuals); shrub cover is up to 50 percent. Fuel breaks established in these areas would help reduce fire size and decrease fire behavior, thereby increasing opportunities for safe engagement by firefighters. These fuel breaks can be used to protect areas of suitable sagebrush communities or areas with a moderate to low R&R rating where, if burned, cheatgrass or other invasive annuals could outcompete natives. The desired fuel break condition would be GR1 or SH1.
- SH1: Low Load, Dry Climate Shrub—This condition represents a grass-shrub mix, with low stature shrubs (about 1-foothigh), with some grasses present (sparse perennial bunchgrass

understory, native or nonnative invasive annuals), and where shrub cover is greater than 50 percent. Fuel breaks established in these areas would help reduce fire size and increase opportunities for safe engagement by firefighters. The desired fuel break condition would be GR1 or SH1 green strip.

- SH2: Moderate Load, Dry Climate Shrub—This condition represents an area dominated by shrubs, with a depleted understory. Shrub cover is over 50 percent. Fuel breaks established in these areas would help reduce fire size and decrease fire behavior, thereby increasing opportunities for safe engagement by firefighters. The desired fuel break condition would be GR1 or SH1.
- SH5: High Load, Dry Climate Shrub—This condition represents an area dominated by shrubs, with a depleted understory. Shrub cover is over 50 percent, and there may be sparse grasses. Fuel breaks established in these areas would help reduce fire size and decrease fire behavior, thereby increasing opportunities for safe engagement by firefighters. The desired fuel break condition would be GR1 or SH1.
- SH7: Very High Load, Dry Climate Shrub—This condition represents an area dominated by shrubs, with a depleted understory. Shrub cover is over 50 percent, and there may be sparse grasses. Fuel breaks established in these areas would help reduce fire size and decrease fire behavior, thereby increasing opportunities for safe engagement by firefighters. The desired fuel break condition would be GR1 or SH1.

If juniper is growing within the footprint of the fuel break, removing or modifying (limbing) the trees and treating the understory would increase the fuel break effectiveness. This would result in a desired condition, as described above.

Additional fuel models that are not included above and that describe a timber or coniferous overstory are as follows:

- Woodland Phase I Recently Burned—Conifer cover is between 0 and 9 percent. Understory vegetation will determine the primary carrier of the fire, which can be described as UB9, GR1, or GS1. Along with conifer treatment, if needed, the desired fuel break condition of the understory vegetation would be either GR1 or SH1.
- Woodland Phase I Unburned—Conifer cover is between 0 and 9 percent, and fuel models can be described as GS1, SH1, SH2, or TU1. Understory vegetation will determine the primary carrier of the fire. Along with conifer treatment, the understory, desired fuel break condition would be GR1 or SH1.
- Woodland Phase II—Conifer cover is between 10 and 30 percent. Fuel models can be described as SH1 or TU1, depending on the percent conifer cover. Along with conifer treatment as described in Table 2-2 the understory, desired fuel break condition would be GR1 or SH1.
- Woodland Phase III, which occurs as small inclusions in Phase 1 and Phase 2—These areas have a conifer cover of 31 percent or higher; there is limited understory vegetation. It can be described as TU1. Conifer treatment would be as described in Table 2-2. In this vegetation state there is limited understory vegetation, but if one does exist and treatement determined to be needed, identify the dominant vegetation state to determine preferred fuel break type and reference treatment as described in Table 2-2., desired fuel break condition would be GR1 or SH1.

- Woodland Phase III, Larger Intact Woodland—These areas have a conifer cover of 31 percent or higher; there is limited understory vegetation. It can be described as TU1. Conifer treatment would be as described in Table 2-2. In this vegetation state there is limited understory vegetation, but if one does exist and treatment determed to be needed, identify the dominant vegetation state to determine preferred fuel break type and reference treatment as described in Table 2-2, desired fuel break condition would be GR1 or SH I.

H.3 DEVELOPMENT PROCESS FOR PREFERRED FUEL BREAK TYPES WITHIN TABLE 2-2

Common to all Vegetation States: Brown strips would be an option for fuel breaks along Maintenance Level 5 roads such as interstates, state highways, or other highly traveled corridors. Use and placement would be determined at the site-specific level. Because of this, brown strips are the preferred fuel break type in each vegetation state and were given the ranking of 1a. At the site-specific level, a field office may decide to implement a different fuel break type other than brown strips, but for the purpose of this analysis, brown strips were the preferred option along Maintenance Level 5 roads.

Invasive Annual Grasses: This vegetation state describes sites dominated by invasive annual grasses. Green strips were identified as the preferred fuel break for this vegetation state due to the need to break up continuous fuels by replacing the current invasive annual grasses with plants that are short statured and widely spaced and do not cure early in the season but rather retain their moisture well into the summer months. Green strips, once in place, would be self-sustaining fuel breaks and would require minimal maintenance. Mowed and targeted grazing fuel breaks would still be an option in this vegetation state, but would be of lower priority due to the need for continued potential yearly maintenance. Mowed and targeted grazing fuel breaks could be utilized until green strip fuel breaks could be implemented, based on site-specific prioritization by field offices.

Invasive Annual Grasses with Shrubs: This vegetation state describes areas with shrubs in the overstory and invasive annual grass in the understory. Green strips were identified as the preferred fuel break for this vegetation state due to the need to break up the continuous fuels by replacing the current invasive annual grasses with plants that are short statured and widely spaced and do not cure early in the season but rather retain their moisture well into the summer months. Green strips once in place would be self-sustaining fuel breaks and would require minimal maintenance. Mowed and targeted grazing fuel breaks would still be an option in this vegetation state but would be of lower priority due to the need for potential yearly maintenance. Targeted grazing fuel breaks could be used in areas with a low shrub cover, while in areas with more shrub cover, mowed fuel breaks would be preferred in order to reduce flame length. Mowed and targeted grazing fuel breaks could be utilized until green strip fuel breaks could be implemented, based on site-specific prioritization by field offices.

Perennial Grasses and Forbs: This vegetation state describes areas that consist of either native intact vegetation or non-native perennial seedings. Mowed fuel breaks would be preferred in areas of native intact vegetation, where the desired vegetation would be kept, but the vegetation height would be reduced to decrease flame lengths. In areas of non-native perennial seedings, mowing would also reduce vegetation height and, in turn, decrease flame lengths. Targeted grazing fuel breaks would also be a viable option in this vegetation state to reduce vegetation height and could be timed to impact specific vegetation types. In this vegetation state, green strip fuel breaks would only occur in the non-native perennial seedings and could be prioritized over mowing or targeted grazing fuel breaks or mowed and

targeted grazing fuel breaks could be utilized until green strip fuel breaks could be implemented, based on site-specific prioritization by field offices.

Perennial Grasses and Forbs with Shrubs: This vegetation state consists of intact vegetation and is similar to the reference state. Mowed fuel breaks would be the preferred fuel break method, where the vegetation height would be reduced to decrease flame lengths. Targeted grazing fuel breaks could be used in areas with a low shrub cover and could be timed to impact specific vegetation types. In this vegetation state, green strip fuel breaks would occur in areas where non-native perennial seedings are present.

Perennial Grasses and Forbs with Invasive Annual Grasses: This vegetation state describes perennial grasses with invasive annual grasses filling interspaces. Targeted grazing fuel breaks would be the preferred method to reduce vegetation height and could be timed to impact specific vegetation types such as invasive annual grasses. Mowed fuel breaks could be used to reduce fuel height and reduce flame length. It would be a desired fuel break if targeted grazing would not be viable. In this vegetation state, green strip fuel breaks would occur in areas where non-native perennial seedings are present.

Shrubs and Perennial Grasses and Forbs with Invasive Annual Grasses: This vegetation state describes intact vegetation with invasive annual grasses filling interspaces. Mowed fuel breaks would be the preferred fuel break method, where vegetation height would be reduced to decrease flame lengths. Targeted Grazing fuel breaks could be used in areas with low shrub cover and could be timed to impact specific vegetation types. In this vegetation state, green strip fuel breaks would occur in areas where non-native perennial seedings are present.

Shrubs with Depleted Understory: This vegetation state describes a shrub-dominated area. Mowed fuel breaks would be the preferred fuel break method, where vegetation height would be reduced to decrease flame lengths. Green strips are an option but would require intensive work to establish. Targeted grazing fuel breaks were not considered an option due to lack of grasses or forb vegetation.

Sites with Pinyon or Juniper:

Phase I: Due to the low tree cover, fuel break establishment would be dependent on the dominant vegetation state as described above. Limbing of trees left in the fuel break may be required to eliminate ladder fuel component.

Phase II or III: Fuel break establishment within these vegetation states would require treatment of both the overstory and understory. Overstory treatments would increase spacing between trees to reduce the canopy closure and decrease crown fire potential. Limbing remaining trees left within the fuel break may be required to eliminate ladder fuel component. Understory treatments would be determined by vegetation state described above.

Photographs of Fuel Models in the Project Area

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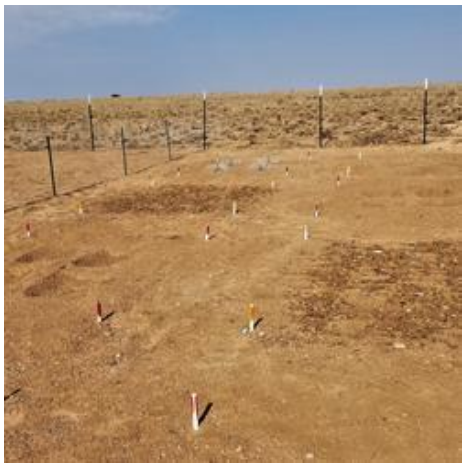
Project Area Fuel Model Photographs: The following photographs depict general fuel models in the project area (Scott and Burgan 2005; Stebleton and Buntin 2009):



Bare Ground (NB9)

Grass 1 (GR1) Short, Sparse, Dry Climate Grass

Grass 2 (GR2) Low Load, Dry Climate Grass

Grass 4 (GR4) Moderate Load, Dry Climate Grass

Grass 7 (GR7) High Load, Dry Climate Grass

Grass-Shrub 1 (GS1) Low Load, Dry Climate Grass-Shrub

Shrubs: 15% Perennial Grass: 18% Total Grass: 18% Bare Ground: 36%

Grass-Shrub 1 (GS1): Perennial Grass and Forbs with Shrubs

Shrubs: 24% Perennial Grass: 3% Total Grass: 23% Bare Ground: 35%

Grass-Shrub 1 (GS1): Invasive Annual Grass and Shrub Mix

Grass-Shrub 2 (GS2) Moderate Load, Dry Climate Grass-Shrub

Grass-Shrub 1 (GS1) or Grass-Shrub 2 (GS2): Perennial Grass and Forbs with Shrubs and Invasive Annual Grass

Shrub 1 (SH1) Low Load, Dry Climate Shrub

Shrub 2 (SH2) Moderate Load, Dry Climate Shrub

Shrub 5 (SH5) High Load, Dry Climate Shrub

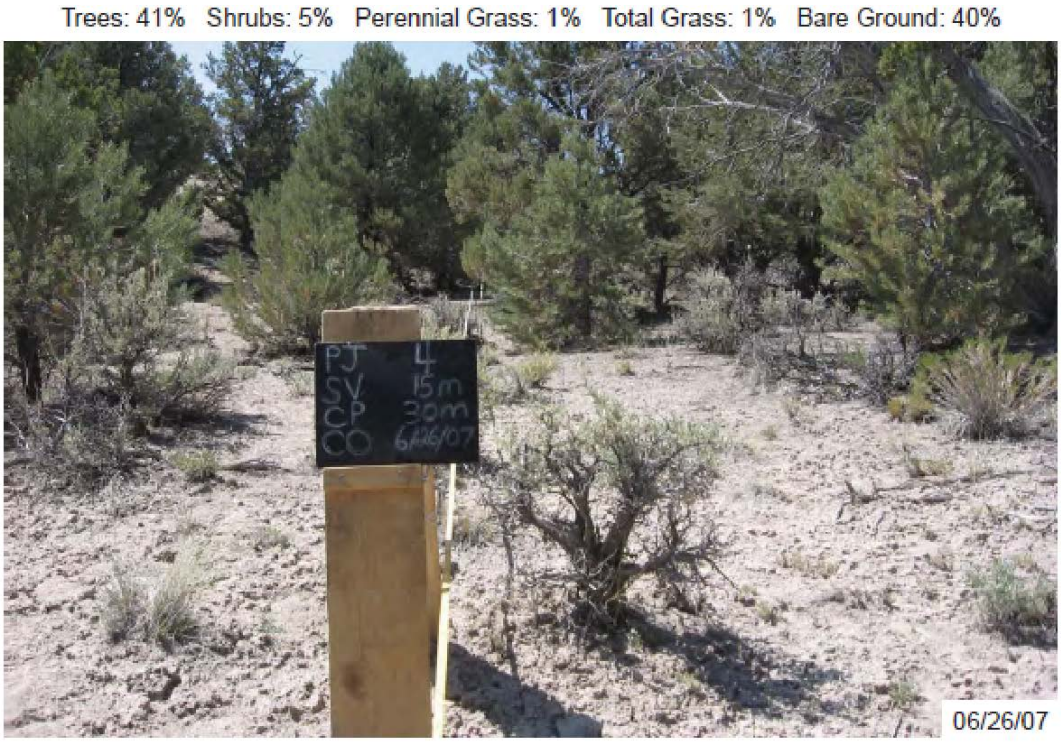
Shrub 7 (SH7) Very High Load, Dry Climate Shrub

Trees: 3% Shrubs: 16% Perennial Grass: 31% Total Grass: 31% Bare Ground: 23%

Timber-Understory 1 (TU1): Phase I Pinyon-Juniper Woodland

Trees: 20% Shrubs: 8% Perennial Grass: 3% Total Grass: 3% Bare Ground: 55%

Timber-Understory 1 (TU1): Phase II Pinyon-Juniper Woodland



Timber-Understory 1 (TU1): Phase III Pinyon-Juniper Woodland

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Rate of Spread and Flame Lengths for Fuel Types in the Project Area

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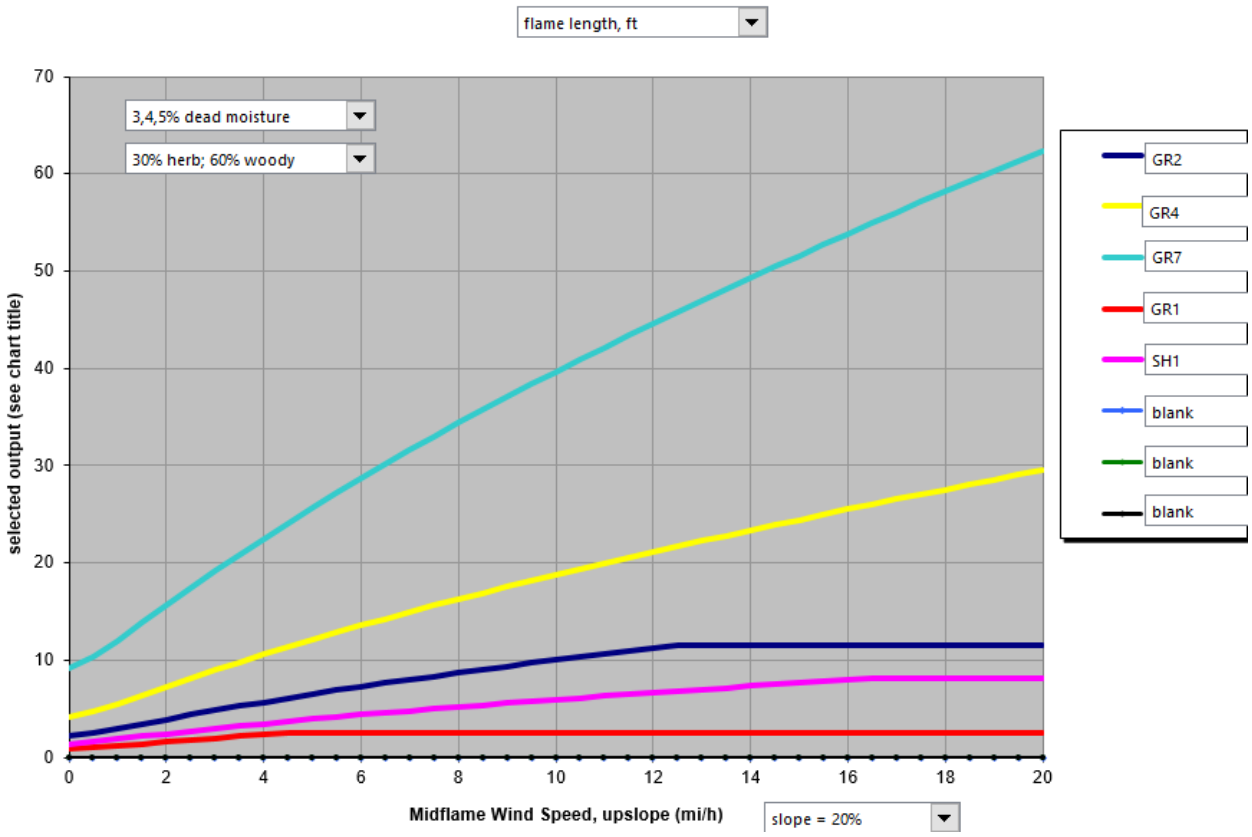
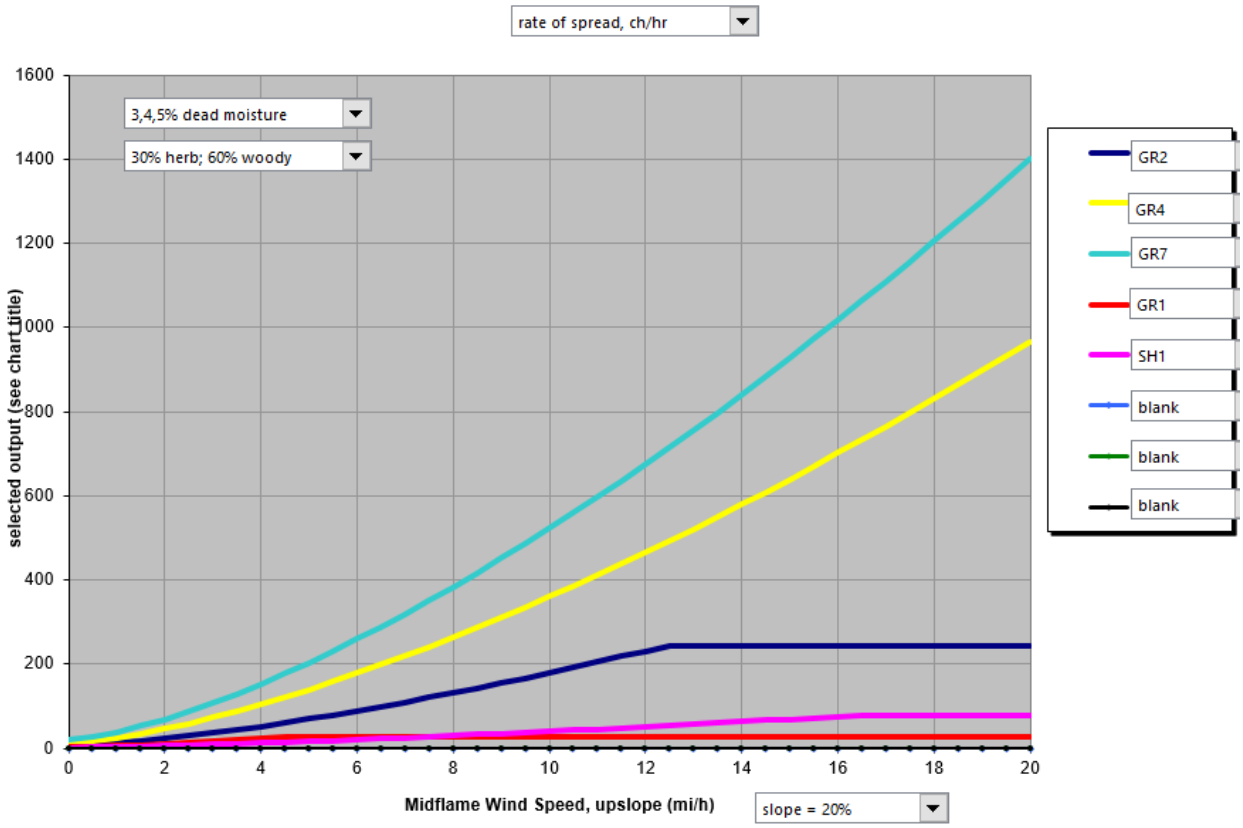
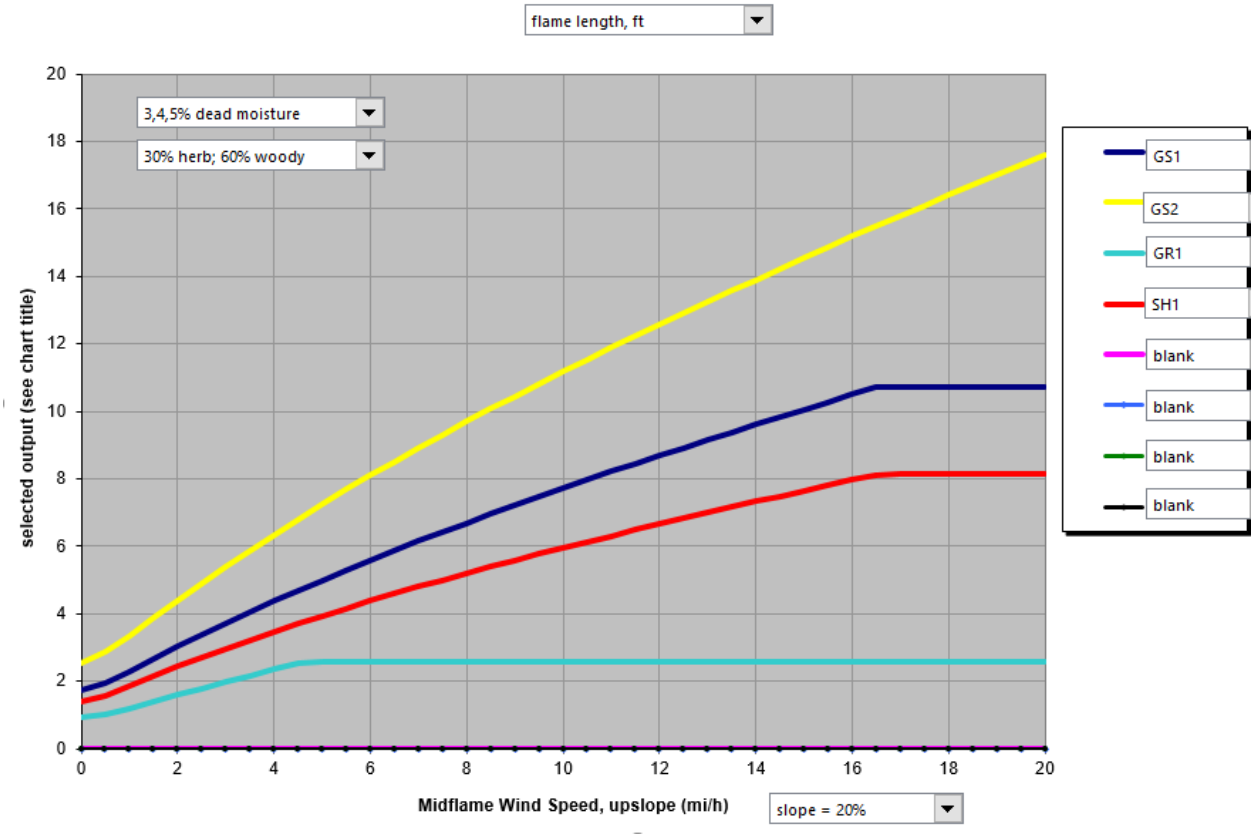


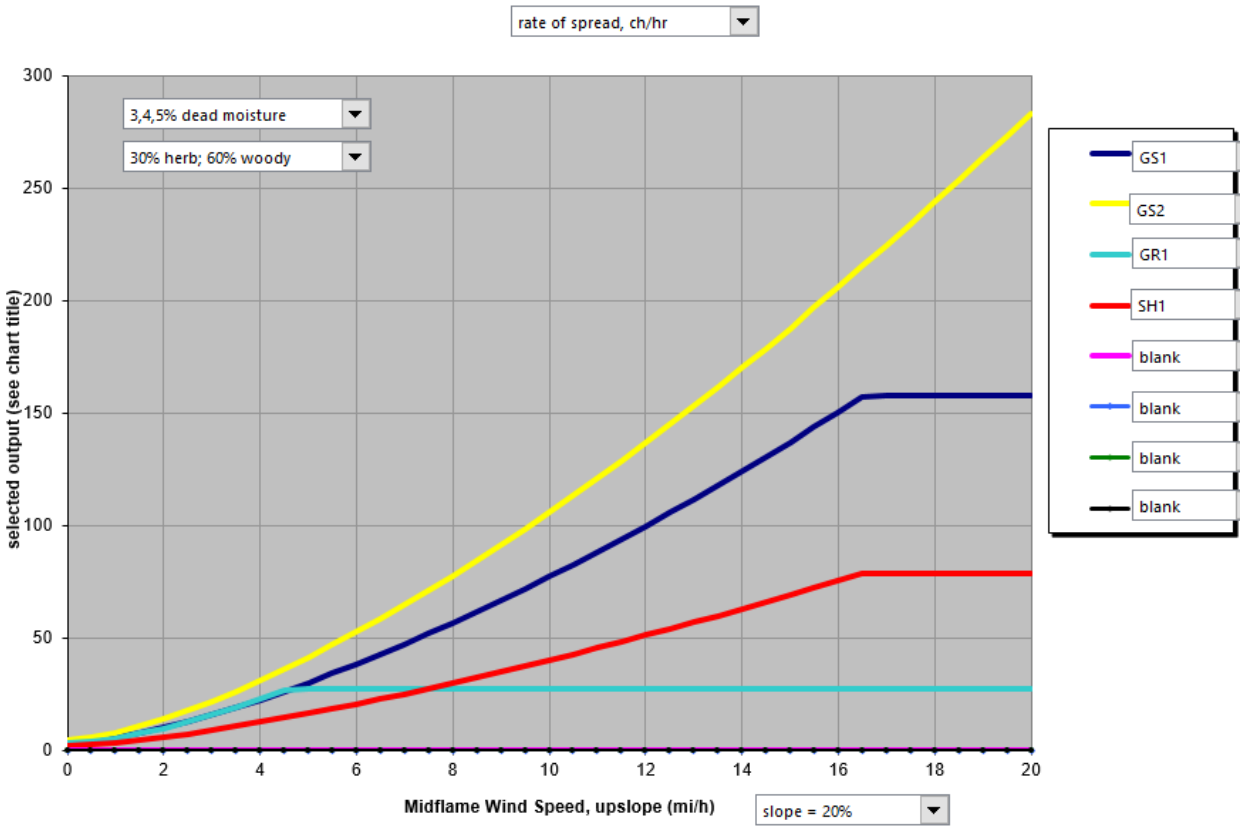
Flame Lengths for grass fuel models under weather and fuel conditions as described in Table 4-3 and 20% slope. Includes the flame lengths of desired fuel models (GR1 and SH1) within fuel breaks.



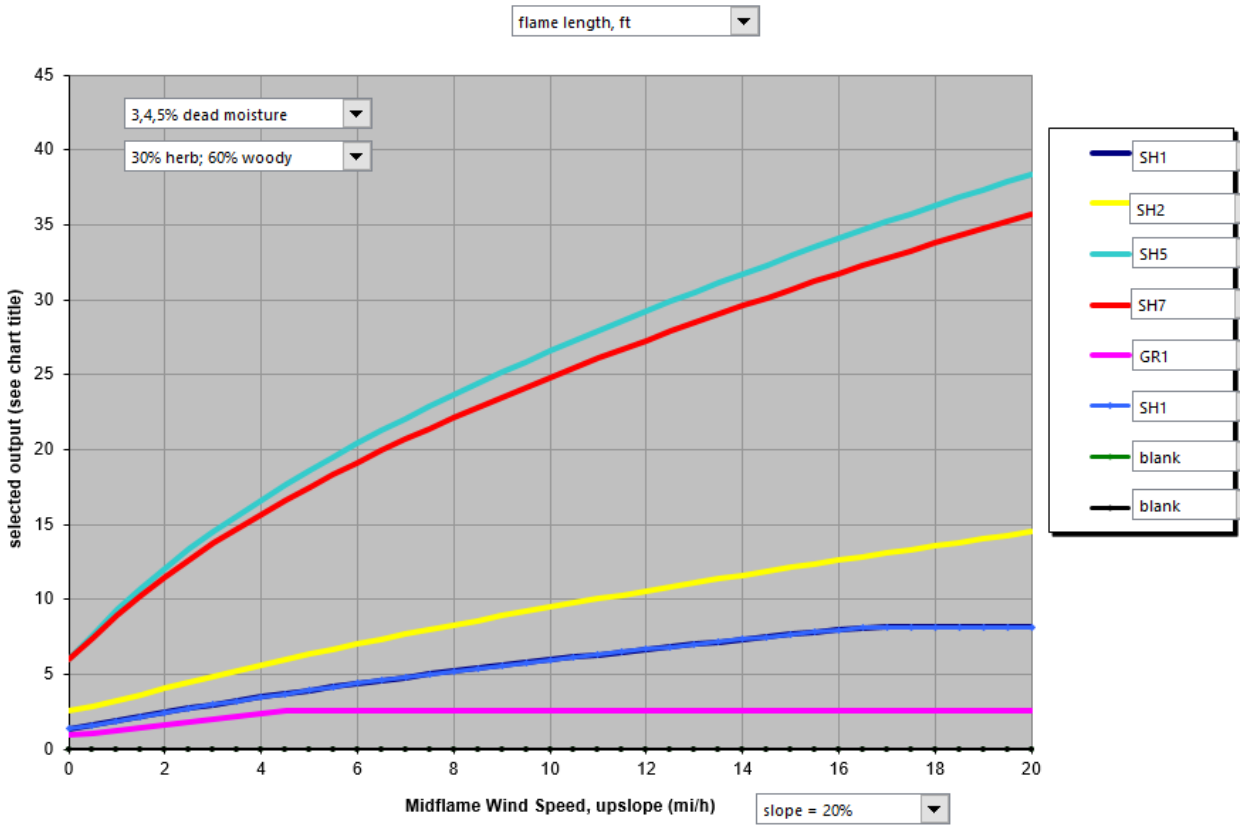
Rates of Spread (chains/hour) for grass fuel models under weather and fuel conditions as described in Table 4-3 and 20% slope. Includes the rates of spread of desired fuel models (GR1 and SH1) within fuel breaks.



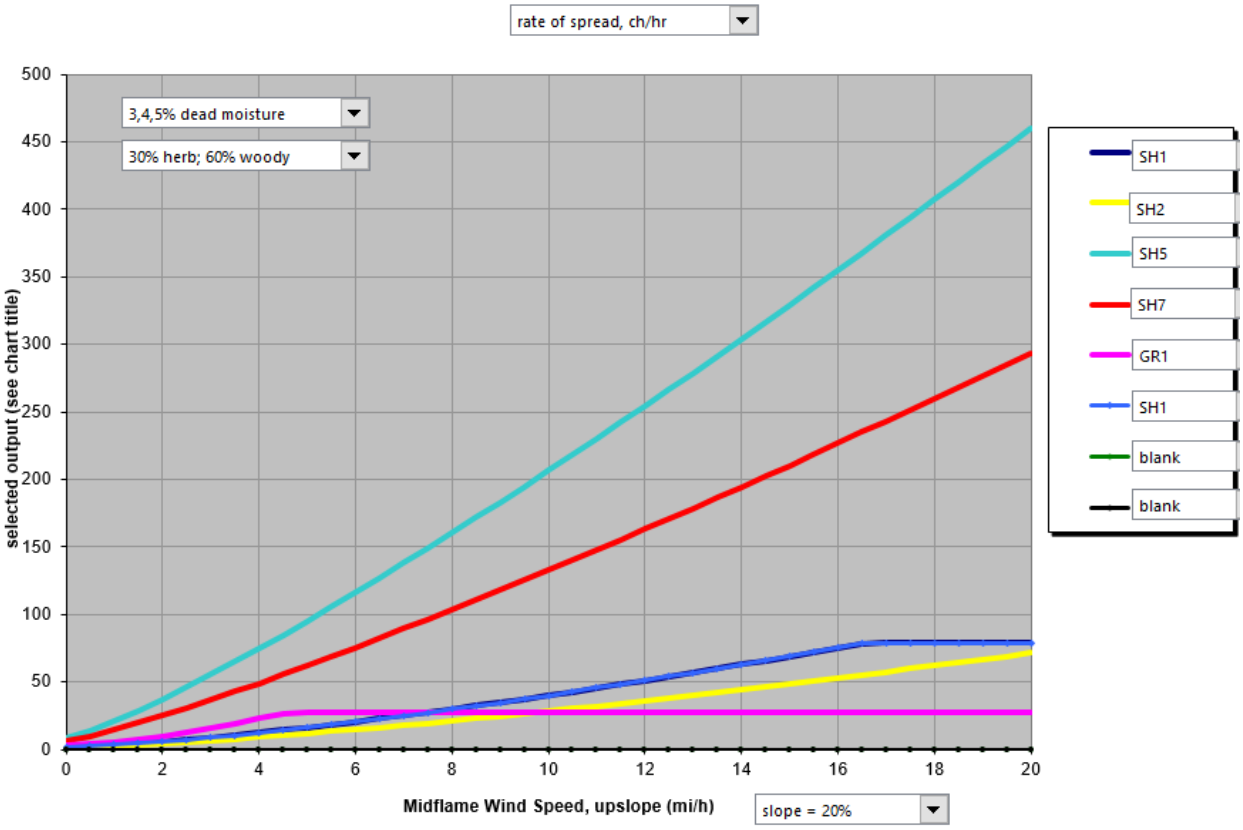
Flame Lengths for grass and shrub fuel models under weather and fuel conditions as described in Table 4-3 and 20% slope. Includes the flame lengths of desired fuel models (GR1 and SH1) within fuel breaks.



Rates of Spread (chains/hour) for grass and shrub fuel models under weather and fuel conditions as described in Table 4-3 and 20% slope. Includes the rates of spread of desired fuel models (GR1 and SH1) within fuel breaks.



Flame Lengths for shrub fuel models under weather and fuel conditions as described in Table 4-3 and 20% slope. Includes the flame lengths of desired fuel models (GR1 and SH1) within fuel breaks.



Rates of Spread (chains/hour) for shrub fuel models under weather and fuel conditions as described in Table 4-3 and 20% slope. Includes the rates of spread of desired fuel models (GR1 and SH1) within fuel breaks.

Appendix I

Representative Migratory Birds in the Project Area

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Appendix I. Representative Migratory Birds in the Project Area

Table I-1
Representative Migratory Birds in the Project Area[1]

Common Name	Latin Name	Seasons
Bald eagle	*Haliaeetus leucocephalus*	Year-round
Bendire's thrasher	*Toxostoma bendirei*	Breeding
Black swift	*Cypseloides niger*	Breeding
Black-chinned Sparrow	*Spizella atrogularis*	Breeding
Brewer's sparrow	*S. breweri*	Breeding
Burrowing owl	*Athene cunicularia*	Year-round
Cactus wren	*Campylorhynchus brunneicapillus*	Year-round
Calliope hummingbird	*Stellula calliope*	Breeding, migrating
Cassin's finch	*Carpodacus cassinii*	Year-round
Common raven	*Corvus corax*	Year-round
Costa's hummingbird	*Calypte costae*	Year-round
Ferruginous hawk	*Buteo regalis*	Year-round
Flammulated owl	*Otus flammeolus*	Breeding
Fox sparrow	*Passerella iliaca*	Year-round
Golden eagle	*Aquila chrysaetos*	Year-round
Grasshopper sparrow	*Ammodramus savannarum*	Breeding
Grace's warbler	*Dendroica graciae*	Breeding
Gray vireo	*Vireo vicinior*	Breeding
Greater sage-grouse	*Centrocercus urophasianus*	Year-round
Green-tailed towhee	*Pipilo chlorurus*	Wintering, breeding
Juniper titmouse	*Baeolophus ridgewayi*	Year-round
Lawrence's goldfinch	*Carduelis lawrencei*	Breeding
Le Conte's thrasher	*Toxostoma lecontei*	Year-round
Lewis's woodpecker	*Melanerpes lewis*	Year-round
Loggerhead shrike	*Lanius ludovicianus*	Year-round
Long-billed curlew	*Numenius americanus*	Breeding
Lucy's warbler	*Vermivora luciae*	Breeding
Mountain plover	*Charadrius montanus*	Breeding
Nuttall's woodpecker	*Picoides nuttallii*	Year-round
Oak titmouse	*Baeolophus inornatus*	Year-round
Olive-sided flycatcher	*Contopus cooperi*	Breeding
Peregrine falcon	*Falco peregrinus*	Year-round
Pinyon jay	*Gymnorhinus cyanocephalus*	Year-round
Prairie falcon	*Falco mexicanus*	Year-round
Purple finch	*Carpodacus purpureus*	Year-round
Rufous hummingbird	*Selasphorus rufus*	Breeding, migrating
Rufous-crowned sparrow	*Aimophila ruficeps*	Year-round
Sagebrush sparrow	*Artemisiospiza belli*	Breeding

Common Name	Latin Name	Seasons
Sage thrasher	*Oreoscoptes montanus*	Breeding, wintering
Short-eared owl	*Asio flammeus*	Year-round
Sonoran yellow warbler	*Dendroica petechia* ssp. *sonorana*	Breeding, migrating
Swainson's hawk	*Buteo swainsoni*	Breeding
Virgina's warbler	*Vermivora virginiae*	Breeding
White-headed woodpecker	*Picoides albolarvatus*	Year-round
Williamson's sapsucker	*Sphyrapicus thyroideus*	Year-round
Willow flycatcher	*Empidonax traillii*	Breeding

Source: BCC 2008

[1] Note that this list is a sample list of birds within the project area; it is not a complete list of species that occur.

Appendix J
Special Status Species in the Project Area

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Appendix J. Special Status Species in the Project Area

Table J-1
Threatened, Endangered, Candidate/Proposed Species and Their Critical Habitat with the Potential to Occur in the Treatment Area

Species Common and Scientific Name[1]	Status[2]	Occurrence	Critical Habitat	Habitat Description
Mammals				
Columbia Basin pygmy rabbit DPS (*Brachylagus idahoensis*)	E	Yes	No	Sagebrush steppe and areas with relatively deep, loose soils that allow burrowing in the Columbia Basin in Washington state.
Gray wolf (*Canis lupus*)	E	Yes	No	Sagebrush and forested areas throughout most of the US and Canada; large tracts of contiguous habitat are essential
Grizzly bear (*Ursus arctos*)	T, Exp.	Yes	No	Woodlands, forests, alpine meadows, and prairies, with a preference for riparian areas
Utah prairie dog (*Cynomys parvidens*)	T	Yes	No	Shrub steppe and grasslands; found only in southwestern and central Utah (USFWS 2012)
Sierra Nevada bighorn sheep (*Ovis canadensis sierrae*)	E	Yes	Yes	Sagebrush steppe, talus, rocky outcroppings; found only in the Sierra Nevada of California (USFWS 2007)
Birds				
Bi-state sage grouse (*Centrocercus urophasianus*)	PT	Yes	Proposed	Large expanses of sagebrush with a diversity of grasses, forbs, and healthy wetland and riparian ecosystems
Mexican spotted owl (*Strix occidentalis lucida*)	T	Potential	Yes	Roosts and nests in late seral forests or rocky canyon habitats, though forages in a wider variety of habitats, including pinyon-juniper woodlands
Insects				
Carson wandering skipper (*Pseudocopaeodes eunus obscurus*)	E	Yes	No	Grassland habitats on alkaline substrates in Nevada and California, where there are three potentially viable known occurrences
Plants				
Barneby reed-mustard (*Schoenocrambe barnebyi*)	E	Potential	N/A	Coarse soils derived from cobble and gravel river terrace deposits; associated with other desert shrubland plants; endemic to the Canyonlands of south-central Utah, where it is known from five occurrences in two distinct clusters: one in the southern portion of the San Rafael Swell in southern Emery County and the other in Capitol Reef National Park in central Wayne County

Species Common and Scientific Name[1]	Status[2]	Occurrence	Critical Habitat	Habitat Description
Barneby ridge-cress (*Lepidium barnebyanum*)	E	Potential	N/A	Ridge crests of white shale outcrops; found with other mound-forming species in pinyon-juniper communities; known populations occupy a habitat of less than 200 ha, on four ridgelines in Duchesne County, Utah
Clay phacelia (*Phacelia argillacea*)	E	Potential	N/A	Steep hillsides of shaley clay colluvium; known only from four sites in Utah along the Douglas Creek and Gordon Gulch members of the Green River formation in the Wasatch Mountains in Pleasant Valley; these probably comprise only two populations due to the close proximity of both pairs of occurrences
Clay reed-mustard (*Schoenocrambe argillacea*)	T	Yes	N/A	Desert shrub plant communities in association with shadscale; endemic to the Uinta Basin (Book Cliffs area) in Uintah County, northeast Utah Endemic to a small area in the Uinta Basin, Uintah County, Utah, where there are 6-7 mapped occurrences clustered in 3 "populations," with fewer than 10,000 individuals in total
Frisco clover (*Trifolium friscanum*)	C	Yes	N/A	Inhabits soils derived from volcanic gravels; associated with pinyon-juniper and sagebrush communities; endemic to 4 mountain ranges in Beaver and western Millard Counties of west-central Utah. Approximately seven occurrences and 3000-7500 plants are known
Jones cycladenia (*Cycladenia humilis* var. *jonesii*)	T	Yes	N/A	Gypsiferous, saline soils at elevations of 4,390–6,000 feet in plant communities of mixed desert scrub, juniper, or wild buckwheat-Mormon tea. Known from 26 sites in Utah and Arizona
Kodachrome bladderpod (*Lesquerella tumulosa*)	E	Yes	N/A	White, bare shale knolls; known from a single population of about 20,000 plants scattered over an area only about 4 km wide in Kane County, Utah
Last Chance townsendia (*Townsendia aprica*)	T	Yes	N/A	Saltbush and pinyon-juniper communities on clay or clay-silt exposures of the Mancos, Morrison, Summerville, and Entrada Formations of south-central Utah; a narrow endemic of south-central Utah that is known from 23 populations
Pariette cactus *(Sclerocactus brevispinus*)	T	Potential	Yes	Fine soils in clay badlands derived from the Uinta Formation in Utah within sparsely vegetated desert shrubland; 1–5 occurrences in a single area a few miles across in the Pariette Draw region of the central Uinta Basin (Duchesne County, Utah)
San Rafael cactus (*Pediocactus despainii*)	E	Potential	Yes	Limestone gravels, shales, clays, and silty substrates; endemic to central Utah (Emery and Wayne Co.) where there are about 21 extant occurrences; some sites are close to each other and connected by suitable habitat, so may comprise one population

Species Common and Scientific Name[1]	Status[2]	Occurrence	Critical Habitat	Habitat Description
Shrubby reed-mustard (*Schoenocrambe suffrutescens*)	E	Potential	Yes	Endemic to semi-barren, white-shale layers in the Uinta Basin of eastern Utah; surrounded by mixed desert shrub and pinyon-juniper woodlands; there are currently 8 known populations
Slickspot peppergrass (*Lepidium papilliferum*)	T	Yes	Yes	Endemic to southwestern Idaho on the Snake River Plain and its adjacent northern foothills (approx. 90 by 25 miles) and a disjunct population on the Owyhee Plateau (approx. 11 by 12 mi), where it is restricted to unique small-scale openings within sagebrush-steppe habitats; approximately 45 extant occurrences
Uinta Basin hookless cactus (*Sclerocactus wetlandicus*)	T	Yes	N/A	Coarse soils derived from cobble and gravel river and stream terrace deposits or rocky surfaces on mesa slopes; endemic to the Uinta Basin in northeast Utah (Duchesne and Uintah Counties) with approx. 8 occurrences observed since 1989
Webber's ivesia (*Ivesia webberi*)	T	Yes	Yes	Sparse vegetation with shallow, rocky, clay soils; known from 16 extant occurrences scattered over a small portion of northeastern California and western Nevada, occupying a maximum of 165 acres. 2,170 acres of land in 16 units are designated as critical habitat for the species.
Wright fishhook cactus (*Sclerocactus wrightiae*)	E	Yes	N/A	Arid sites with widely spaced shrubs, perennial herbs, bunch grasses, or scattered pinyon and juniper. Estimated population size is 4,500 to 21,000 individuals.

Source: USFWS 2018

[1]T&E species that may occur within the project area but would not be potentially affected by the proposed action or alternatives were excluded. These include species associated with open water, riverine, alpine, or subalpine habitats.

[2]E = Endangered; T = Threatened; P = Proposed; C = Candidate; Exp. = Experimental population; Status listed is that of the listed population in the project area; the status of populations outside of this area may differ.

Table J-2
BLM Sensitive Species with the Potential to Occur in the Treatment Area

Common Name	*Latin Name*	Habitat Description
Mammals		
Pallid bat	*Antrozous pallidus*	Shrub-steppe grasslands; most abundant in Great Basin ecosystems
Small-footed myotis	*Myotis ciliolabrum*	Desert scrub, grasslands, sagebrush steppe, pinyon-juniper woodlands, and agricultural/urban areas
Townsend's big-eared bat	*Corynorhinus townsendii*	Deserts, native prairies, active agricultural sites
Western mastiff-bat	*Eumops perotis californicus*	Desert scrub, chaparral, and montane coniferous forests
Desert bighorn sheep	*Ovis canadensis nelsoni*	Alpine meadows, mountain slopes, and foothills, all with rocky slopes for climbing
Fringed myotis	*Myotis thysanodes*	Low desert scrub to high coniferous forests
Owens Valley vole	*Microtus californicus vallicola*	Mesic vegetation in Owen's Valley
Pygmy rabbit	*Brachylagus idahoensis*	Sagebrush steppe habitats with high foliar cover of sagebrush.
Sierra Nevada bighorn sheep	*Ovis canadensis sierrae*	Open upland, montane, and alpine habitats and meadows with rocky terrain
Yuma myotis	*Myotis yumanensis*	Dry rocky cliffs associated with desert scrub, sagebrush, pinyon-juniper and coniferous forests
Gray wolf	*Canis lupus*	Large areas of contiguous habitat, including grasslands and montane areas
Spotted bat	*Euderma maculatum*	Desert and subalpine meadows, including desert-scrub, pinyon-juniper woodland, and fields
Black-tailed jackrabbit	*Lepus californicus*	Herbaceous and desert-shrub areas and open, early stages of forest and chaparral habitats
White-tailed jackrabbit	*Lepus townsendii*	Sagebrush, subalpine conifer, juniper, alpine dwarf-shrub, and perennial grassland; also uses successional stages of conifer habitats
Shaw Island vole	*Microtus townsendii pugeti*	Wet meadows, marshes, flood plains, areas with rank vegetation and salt marshes
Little Brown myotis	*Myotis lucifugus*	Pinyon-juniper, Joshua tree woodland and montane coniferous forest
Preble's shrew	*Sorex preblei*	Arid or semiarid shrub-grasses associated with sage-brush-dominated coniferous forest
Townsend's ground squirrel	*Spermophilus townsendii*	Desert springs in arid environments as well as ridgetops, hillsides, and valley bottoms, canal and railroad embankments, and old fields
White salmon pocket gopher	*Thomomys talpoides limosus*	Grassland and herbaceous habitats as well as shrubland and chaparral
Washington ground squirrel	*Urocitellus washingtoni*	Shrub steppe habitats of southeastern Washington and north-central Oregon
Kit fox	*Vulpes macrotis*	Desert scrub, chaparral, and grasslands
Allen's big-eared bat	*Idionycteris phyllotis*	Pinyon-juniper woodlands, desert shrub, grasslands; typically found near cliffs, boulders, lava flows, etc.
Big brown bat	*Eptesics fuscus*	Variety of habitats including pinyon-juniper, sagebrush, creosote, and agricultural/urban habitats; roots in caves and trees
Brazilian free-tailed bat	*Tadarida brasiliensis*	Pinyon-juniper woodlands
California myotis	*Myotis californicus*	Oak and juniper woodlands, canyons, desert scrub, and grasslands

Common Name	*Latin Name*	Habitat Description
Canyon bat	*Parastrellus hesperus*	Pinyon-juniper, blackbrush, creosote, sagebrush and salt-desert shrub; usually associated with rocky features
Cave myotis	*Myotis velefer*	Arid habitats, including creosote bush, brittlebush, cactus, and riparian desert areas
Dark kangaroo mouse	*Microdipodops megacephalus*	Shadscale scrub, sagebrush and alkali sink plant communities; may also be found in sand dunes
Hoary bat	*Lasiurus cinereus*	Wide variety of habitat types; prefers roosting in dense vegetation and trees
Inyo shrew	*Sorex tenelius*	Rocky mountain habitats in areas with logs, boulders, or sagebrush scrub
Merriam's shrew	*Sorex merriami*	Various grassland habitats, including grasses in sagebrush steppe/ pinyon/juniper habitat, mountain mahogany and mixed woodlands
Pale kangaroo mouse	*Microdipodops pallidus*	Fine sands in alkali sinks and desert scrub dominated by *Atriplex* and big sagebrush
Botta's pocket gopher	*Thomomys bottae*	Open habitats and meadows, where soils are deep enough to maintain permanent burrow systems
Fish Spring pocket gopher	*Thomomys bottae*	Open habitats and meadows, where soils are deep enough to maintain permanent burrow systems
San Antonio pocket gopher	*Thomomys bottae*	Open habitats and meadows, where soils are deep enough to maintain permanent burrow systems
Western jumping mouse	*Zapus princeps*	Moist fields, thickets, and woodlands
Western red bat	*Lasiurus blossevilli*	Woodland habitats, including mesquite bosque and cottonwood/willow riparian areas
Gunnison prairie dog	*Cynomys gunnisoni*	High desert, grasslands, meadows, and hillsides; often found in shrubs, such as rabbitbrush, sagebrush, and saltbush
White-tailed prairie dog	*Cynomys leucurus*	Grasslands, prairie and sometimes shrubby areas
Silky pocket mouse	*Perognathus flavus*	Low valley bottoms with soft soils, among weeds and shrubs
Bighorn sheep	*Ovis canadensis*	Alpine meadows, mountain slopes, and foothills
Merriam's ground squirrel	*Urocitellus canus*	High desert habitat dominated by big sagebrush, western juniper, and greasewood; also found in grasslands and agricultural lands
Piute ground squirrel	*Urocitellus mollis*	Desert and grassland habitats
Southern Idaho ground squirrel	*Urocitellus endemicus*	Rolling foothills originally dominated by big sagebrush, bitterbrush, and native bunchgrasses and forbs.
Birds		
Bald eagle	*Haliaeetus leucocephalus*	Riparian habitats with abundant fish and adjacent snags or other perches
Burrowing owl	*Athene cunicularia*	Open habitats with sparse vegetation
Golden eagle	*Aquila chrysaetos*	Open country especially around mountains, hills and cliffs
Greater sage-grouse	*Centrocercus urophasianus*	Sagebrush steppe, mountain shrub, desert riparian and wet meadows
Northern goshawk	*Accipiter gentilis*	Mature and old-growth forests, riparian corridors, and more open habitats such as sagebrush steppe
Swainson's hawk	*Buteo swainsoni*	Open habitats with scattered trees and grasslands.

Common Name	*Latin Name*	Habitat Description
Grasshopper sparrow	*Ammodramus savannarum*	Open grasslands and prairies with patches of bare ground
Black-throated sparrow	*Amphispiza bilineata*	Variety of dry open habitats, from Sonoran desert with mixed shrubs and cactus to barren flats of creosote bush or saltbush
Short-eared owl	*Asio flammeus*	Large open areas with low vegetation, including grasslands and sagebrush steppe
Ferruginous hawk	*Buteo regalis*	Arid and semiarid grasslands, and sagebrush steppe
Lesser goldfinch	*Carduelis psaltria*	Thickets, weedy fields, woodlands, forest clearings, scrublands, farmlands
Gray flycatcher	*Empidonax wrightii*	Open and arid habitats, especially sagebrush plains with few trees or shrubs, scrubby woods of juniper and pinyon pine
Merlin	*Falco columbarius*	Open and semi-open areas across northern North America
Peregrine falcon	*Falco peregrinus anatum*	Open landscapes with cliffs for nest sites; found anywhere from tundra to deserts
Sandhill crane	*Grus canadensis*	Wooded lakes to tundra ponds
Wallowa rosy finch	*Leucosticte tephrocotis wallowa*	Barren, rocky or grassy areas and cliffs in the alpine zone; winters in open areas like fields, brushy areas, and around human habitation
Ash-throated flycatcher	*Myiarchus cinerascens*	Dry scrub, open woodlands, and deserts
Long-billed curlew	*Numenius americanus*	High plains and rangelands
Mountain quail	*Oreortyx pictus*	Dense brush in wooded foothills and mountains, pine-oak, coniferous forest and sometimes pinyon-juniper woodlands
Broad-tailed hummingbird	*Selasphorus platycercus*	High-elevation meadows, shrubby habitats near pine-oak and evergreen forests, and forest openings within pinyon-juniper, oak woodlands, and evergreen forests
Sharp-tailed grouse	*Tympanuchus phasianellus*	Prairie, brushy groves, forest edges, open burns in coniferous forest
Columbian sharp-tailed grouse	*Tympanuchus phasianellus columbianus*	Sagebrush steppe, mountain shrub and grasslands
Bendire's thrasher	*Taxostoma bendirei*	Desert, especially areas with tall vegetation, cholla cactus, creosote bush and yucca, and in juniper woodland
Brewer's sparrow	*Spizella breweri*	Sagebrush steppe, desert scrub consisting mainly of saltbush and creosote
Gray-crowned rosy-finch	*Leucosticte tephrocotus*	Breeds in alpine areas, winters in open country including mountain meadows, high deserts, valleys and plains
Le Conte's thrasher	*Taxostoma lecontei*	Desert scrub, mesquite, tall riparian brush and chaparral
Loggerhead shrike	*Lanius ludovicianus*	Open country with short vegetation and open shrubs or low trees
Pinyon jay	*Gymnorhinus cyanocephalus*	Pinyon-juniper woodlands and chaparral
Sage thrasher	*Oreoscoptes montanus*	Sagebrush steppe
Green-tailed towhee	*Pipilo chlorurus*	prefers scrubby thickets and desert washes, though it can be found in a variety of shrubby habitats across its winter range
Sagebrush sparrow	*Amphispiza belli*	Sagebrush and other shrub steppe
Virginia's warbler	*Vermivora virginiae*	Dry mountainsides in scrub oak, chaparral, pinyon-juniper, or other low, brushy habitats

Common Name	*Latin Name*	Habitat Description
Reptiles		
Northern sagebrush lizard	*Sceloporus graciousus*	Mid- to high-altitudes in sagebrush and other shrublands, mainly in the mountains; prefers open areas with scattered low bushes and lots of sun
Striped whipsnake	*Coluber taeniatus*	Variety of habitats including shrub lands, grasslands, sagebrush flats, canyons, pinyon-juniper, and open pine-oak forests
California mountain kingsnake	*Lampropeltis zonata*	Diverse habitats including coniferous forest, oak-pine woodlands, riparian woodland, chaparral, manzanita, and coastal sage scrub
Desert horned lizard	*Phrynosoma platyrhinos*	Open sandy areas in deserts, chaparral, grassland
Greater short-horned lizard	*Phrynosoma hernandesi*	Semiarid plains to high mountains; occupies a variety of habitats including sagebrush, open pinyon-juniper, pine-spruce and spruce-fir forests
Long-nosed leopard lizard	*Gambelia wislizenii*	Sandy and gravelly desert and semi-desert areas with scattered shrubs or other low plants
Northern rubber boa	*Charina bottae*	Grassland, meadows and chaparral to deciduous and coniferous forests, to high alpine settings
Pygmy short-horned lizard	*Phrynosoma douglassii*	Semiarid plains to high mountains; open, shrubby or openly wooded areas with sparse vegetation at ground level
Ring-necked snake	*Diadophis punctatus*	Forest, woodlands, grassland, chaparral and riparian corridors in arid regions
Sierra alligator lizard	*Elgaria coerulea palmeri*	Sierra Nevada and immediately adjacent ranges; forested montane areas and montane chaparral
Sonoran mountain kingsnake	*Lampropeltis pytomelana*	Chaparral woodland and pine forests in mountainous regions, brushy rocky canyons, talus slopes and near streams and springs
Western red-tailed skink	*Plestiodon gilberti rubricaudatus*	Variety of habitats, avoids heavy brush and dense forest
Smooth green snake	*Opheodrys vernalis*	Moist, grassy areas usually in prairies, pastures, meadows, marshes, and lake edges
Longnose snake	*Rhinocheilus lecontei*	Desert lowland areas that have sandy or loose soil and numerous burrows
Ground snake	*Sonora semiannulata*	Dry, rocky areas with loose soil
Amphibians		
Oregon spotted frog	*Rana pretiosa*	Aquatic environments in mixed coniferous forests, preferring large marshy areas filled by warm water from springs; near cool, quiet, permanent water sources; slow streams that meander through meadows, sluggish streams and rivers, marshes, springs, pools, edges of small lakes, and ponds
Western spadefoot toad	*Spea hammondii*	Open areas with sandy or gravelly soils, also found in mixed woodlands, grasslands, coastal sage scrub, chaparral, sandy washes, lowlands, river floodplains, alluvial fans, playas, alkali flats
Woodhouse's toad	*Anaxyrus woodhousii*	Larger riparian corridors at lower elevations, and moist meadows, ponds, lakes, and reservoirs at higher elevations
Boreal toad	*Anaxyrus boreas* ssp. *boreas*	Desert springs and streams, wet meadows, marshes, ponds, lakes reservoirs, slow moving rivers and woodlands
Dixie Valley toad	*Anaxyrus williamsi*	Springs, seeps, streams and similarly inundated areas

Common Name	*Latin Name*	Habitat Description
Western toad	*Anaxyrus boreas*	Desert springs and streams, wet meadows, marshes, ponds, lakes reservoirs, slow moving rivers and woodlands
Great Plains toad	*Bufo cognatus*	Damp areas in open grasslands and farm fields
Invertebrates		
Salmon coil	*Helicodiscus salmonaceus*	Talus or rock outcrops in dry, open sage scrub at low to moderate elevations
Dalles mountainsnail	*Oreohelix variabilis*	Shrubland
Deschutes mountainsnail	*Oreohelix variabilis* ssp. *nov* (Deschutes)	Shrubland
Western bumblebee	*Bombus occidentalis*	Mixed woodlands, farmlands, urban areas, montane meadows and into the western edge of the prairie grasslands
Barry's hairstreak	*Callophrys gryneus chalcosiva*	Variety of open, brushy to lightly wooded, dry habitats and weedy areas
Intermountain sulphur	*Colias occidentalis pseudochristina*	Steep, sunny slopes with sage brush and scattered ponderosa pine
Eastern tailed blue	*Cupido comyntas*	Variety of open, brushy to lightly wooded, dry habitats and weedy areas
Island checkerspot	*Euphydryas colon colon*	Meadows, pine-oak woodlands, along streams or near lakes, agricultural lands, powerline right of ways, along roads, or old ski areas; wet meadows
Tawny-edged skipper	*Polites themistocles*	Moist grassy areas including prairie swales, pastures, lawns, roadsides, and vacant lots
Coronis fritillary	*Speyeria coronis coronis*	Mountain slopes, foothills, prairie valleys, chaparral, sagebrush, forest openings
Great basin fritillary	*Speyeria egleis*	Mountain meadows, forest openings, exposed rocky ridges
Baking Powder Flat blue	*Euphilotes bernaridno minuta*	Baking Powder Flat in Spring Valley in White Pine County
Big Smoky wood nymph	*Cercyonis oetus alkalorum*	Grassy, alkaline flats; known only from the Big Smoky Valley between the Toiyabe and Toquima ranges in central Nevada
Carson wandering skipper	*Pseudocopaeodes eunus obscurus*	Salt grass and nearby nectar producing flowers; grassland habitats on alkaline substrates
Early blue	*Euphilotes enoptes primavera*	Records only exist from lower mountain canyons in Mineral County in the Wassuk Range; Trend unknown and considered critically imperiled in Nevada
Great Basin small blue	*Philotiella speciosa septentrionalis*	Distribution unknown, type is from Lyon County
Mattoni's blue	*Euphilotes pollescens mattonii*	Sonoran desert, prairies and sand dunes; pinyon-juniper woodlands and prairie grasslands
Mojave gypsum bee	*Andrena balsaorhizae*	Occurs in various habitats; nests on the ground or in various natural cavities; restricted to the habitat of its host plant, sunray
Monarch butterfly	*Danaus plexippus plexippus*	Widespread and scattered; requires milkweed (Asclepiacae) or dogbane (Apocynoceae) as host plants for larvae
Mono basin skipper	*Hesperia uncas giulanii*	Known only from the Adobe Hills in Mono County, CA. Gently rolling hills with sandy substrate.
Railroad Valley skipper	*Hesperia uncas fulvapalla*	From alkali meadows on the floor of Railroad Valley in Nye County

Common Name	*Latin Name*	Habitat Description
Idaho Point-headed grasshopper	*Acroplophitus pulchellus*	Xeric shrub-dominated habitat
Plants		
A cyperus	*Cyperus lupulinus* ssp. *lupulinus*	Grows in sun-lit locations such as fields, prairies, roadsides and farms.
Aase's onion	*Allium aaseae*	Associated with relatively sparsely vegetated or bitterbrush/sagebrush bitterbrush communities.
Alender wild cabbage	*Caulanthus major* var. *nevadensis*	In the sagebrush and pinyon-juniper zones.
Alexander's buckwheat	*Eriogonum alexanderae*	Sagebrush scrub, great basin scrub, pinyon and juniper woodland.
Alpine azalea	*Kalmia procumbens*	Pinyon-juniper communities at 2100 to 2745 m (6890 to 9006 ft).
American woodsage, western germander	*Symphyotrichum jessicae*	Sagebrush scrub; northern juniper woodland; mountains and plateaus.
Arapien stickleaf, Arapien blazingstar	*Mentzelia argillosa*	Scrubland and woodland.
Arrow thelypody	*Thelypodium sagittatum* ssp. *sagittatum*	Under or around western juniper (*Juniperus occidentalis*) in canyons, seasonal creek drainages, and springs.
Arrow-leaf thelypody	*Thelypodium eucosmum*	Occurs in the Blue Mountains of Oregon; Its habitat is dominated by sagebrush and juniper.
Arthur's milk-vetch	*Astragalus arthurii*	Known to occupy alkaline soils in dry washes and on barren bluffs.
Asotin milkvetch	*Astragalus asotinensis*	Open canyon grasslands on steep slopes of all aspects.
Atwood's pretty phacelia	*Phacelia pulchella* var. *atwoodii*	Pinyon-juniper and sagebrush.
Austin's knotweed	*Polygonum austiniae*	Dry to moist flats or banks, from sagebrush plains to lower mountains, often with ponderosa pine.
Austin's plagiobothrys	*Plagiobothrys austiniae*	Pinyon-juniper communities at 1190 to 1310 m (3900 to 4300 ft) elevation.
Bald daisy	*Erigeron calvus*	Sandy loam substrates in Great Basin scrub.
Barren Valley collomia	*Collomia renacta*	Mostly a woodland-border species in pinyon-juniper and subalpine sagebrush zones in Nye County, Nevada.
Bartonberry	*Rubus bartonianus*	Dry open ground, gravelly soil; sagebrush; elevations of 1,500-1,750 meters (5000 to 5800 ft). Also in disturbed areas along roadsides.
Bashful beardtongue	*Penstemon pudicus*	In the subalpine sagebrush, mountain mahogany, and upper pinyon-juniper zones.
Bastard kentrophyta	*Astragalus tegetarioides*	Dry open ground, gravelly soil; sagebrush; elevations of 1,500-1,750 meters (5000 to 5800 ft). Also in disturbed areas along roadsides.
Beaked cryptantha	*Cryptantha rostellata*	Found in dry, volcanic outcrops with sagebrush/bitterbrush.
Beaked spikerush	*Eleocharis rostellata*	Sandy or loamy soils on the lower and middle Snake River Plains and surrounding, rolling, sagebrush-dominated foothills.
Beautiful penstemon	*Penstemon perpulcher*	Habitats include dry sand prairies, dolomite prairies, and gravelly hill prairies.

Common Name	*Latin Name*	Habitat Description
Beaver Dam breadroot	*Pediomelum castoreum*	Found in desert shrublands, grows in disturbed areas.
Bellard's kobresia	*Kobresia myosuroides*	Barren clay slopes, pale gray chip-rock, dry hillsides, alkali clay bluffs, alkali meadows.
Biennial stanleya	*Stanleya confertiflora*	Barren clay slopes in sagebrush communities.
Black lily	*Fritillaria camschatcensis*	Open valley bottom areas in the lower sagebrush zones.
Black snake-root	*Sanicula marilandica*	Grows pure stands in mixed prairie associations and disturbed habitats.
Blaine pincushion	*Sclerocactus blainei*	In sagebrush associations within the pinyon-juniper and mountain sagebrush zones.
Blue gramma	*Bouteloua gracilis*	Short grass in the mixed prairies and throughout the Great Plains and the Southwest
Blue-leaved penstemon	*Penstemon glaucinus*	Found in habitats ranging from open desert to moist forests.
Blunt sedge	*Carex obtusata*	Dry or vernally moist grasslands, bluffs, and sandy flood plains. Associated species include common juniper.
Bodie Hills cusickiella	*Cusickiella quadricostata*	Pumice, gravelly or sandy substrates in Great Basin scrub.
Bodie Hills rockcress	*Boechera bodiensis*	Dry, open, slopes in sagebrush associations within the pinyon-juniper and mountain sagebrush zones.
Bolander onion	*Allium bolanderi* var. *bolanderi*	Heavy soils and openings in brush and woods.
Bolander's camissonia	*Camissonia bolanderi*	Best developed on southern slopes; common associates are *Artemisia rigida*, *Lomatium* spp., *Brassica* spp.
Branching montia	*Montia diffusa*	Found in mesic grasslands, low meadows.
Bristle-flowered collomia	*Collomia macrocalyx*	Best developed on southern slopes; common associates are *Artemisia rigida*, *Lomatium* spp., *Brassica* spp.
Broad fleabane	*Erigeron latus*	Gravelly or rocky hillsides and outcrops in the sagebrush zone, near juniper woodlands.
Bugleg goldenweed	*Pyrrocoma insecticruris*	Mountain meadows, sagebrush/grass; 5000-6000 feet elevation.
Bupleurum	*Bupleurum americanum*	Rocky places, grassy hillsides, meadows.
Calcereous buckwheat	*Eriogonum ochrocephalum* var. *calcareum*	On the valley floor or on dunes in barren openings with *Atriplex* spp., *Grayia* spp., *Chrysothamnus* spp., and *Artemisia* spp.
California buttercup	*Ranunculus californicus* var. *californicus*	Coastal bluffs, open grasslands, rocky slopes along the shore, and rocky wooded areas. Usually in dry grasslands areas.
California chicory	*Rafinesquia californica*	In the mixed-shrub and sagebrush zones.
California maiden-hair	*Adiantum jordanii*	Open areas of Great Basin sagebrush/bitterbrush scrub.
California milk-vetch	*Astragalus californicus*	Dry hillsides, stony ridges, and canyon benches, among sagebrush, in open oak woods or in openings of coniferous forests.
Callaway milkvetch	*Astragalus callithrix*	Deep, sandy soil on the valley floor or on dunes in barren openings with Atriplex, Grayia, Chrysothamnus, and Artemisia.
Candelaria blazingstar	*Mentzelia candelariae*	Found in disturbed, loose, gravelly slopes and clay hills.
Carson Valley monkeyflower	*Erythranthe carsonensis*	Shrubland.

Common Name	*Latin Name*	Habitat Description
Cascade reedgrass	*Calamagrostis tweedyi*	Occupy a variety of habitats from low elevation wetlands to dry windblown mountains ridges.
Cespitose evening primrose	*Oenothera caespitosa* ssp. *caespitosa*	Found in Coal Valley Formation, on rounded knolls, low ridges, slopes, and especially small drainages on all aspects.
Chain-fern	*Woodwardia fimbriata*	On foothills and valley floors above the playas, shadscale, and mixed shrub, often associated with *Atriplex confertifolia*.
Challis crazyweed	*Oxytropis besseyi* var. *salmonensis*	Occurs within the shrub-steppe in sandy wash or open lower slopes.
Challis milkvetch	*Astragalus amblytropis*	Gravelly washes and banks in the creosote-bursage, shadscale, and blackbrush zones
Chambers' twinpod	*Physaria chambersii*	Sandy or rocky locations; sagebrush plateaus, pinyon-juniper woodland roadsides.
Chinle chia	*Salvia columbariae* var. *argillacea*	In the pinyon-juniper zone.
Cima milkvetch	*Astragalus cimae* var. *cimae*	Mesas and stony hillsides, commonly among sagebrush. Habitats include Great Basin scrub, and pinyon juniper woodland.
Coastal lipfern	*Cheilanthes intertexta*	Grows in rocky habitats.
Coffee fern	*Pellaea andromedifolia*	Found on dry Western facing sunny banks, in coastal and woodland habitats.
Columbia milk-vetch	*Astragalus columbianus*	Sandy to gravelly loams in sagebrush-grass communities of the Columbia River floodplain.
Common jewel flower	*Streptanthus glandulosus*	Grows in grassland, chaparral, and woodlands.
Common moonwort	*Botrychium lunaria*	Associated with *Juniperus osteosperma*, *Atriplex confertifolia*, *Sarcobatus vermiculatus*, *Artemisia spinescens*, *A. tridentata*.
Common twinpod	*Physaria didymocarpa* var. *didymocarpa*	Occurs in a wide variety of habitats, including gravelly prairies, dry hillsides, and road cuts.
Congdon's monkeyflower	*Diplacus congdonii*	Found in mountains and foothills in moist spots, slopes, canyons, and sometimes in disturbed areas.
Cooke's phacelia	*Phacelia cookei*	Volcanic or sandy substrates in Great Basin scrub.
Cooper's rubber-plant	*Hymenoxys cooperi* var. *canescens*	Sagebrush steppe zone.
Cooper's goldflower	*Hymenoxys cooperi* var. *canescens*	Found near roadsides, open areas, and edges of juniper-pine forests.
Coral lichen	*Aspicilia rogeri*	Found in shrub steppe and prefers open habitats that are moist in winter or spring but dry most of the year.
Cordelia beardtongue	*Penstemon floribundus*	Steep mountain slopes and associated alluvial fans in a limestone rock desert.
Cordilleran sedge	*Carex cordillerana*	Found in naturally disturbed, rocky slopes with organic layer and leaf litter in mesic mixed forests and grassy slopes.
Cordroot sedge	*Carex chordorrhiza*	Occurs in transition mires, low-sedge vegetation and sedge dominated 'flarks' (wide, elongated pools) of raised mires.
Coville's lip-fern	*Cheilanthes covillei*	It grows in rocky crevices in the mountains and foothills.

Common Name	*Latin Name*	Habitat Description
Coyote tobacco	*Nicotiana attenuata*	Dry sandy bottomlands, rocky washes, and other dry open places. Associated species include big sagebrush, rabbitbrush, buckwheat, giant wildrye.
Craters-of-the-Moon wild buckwheat	*Eriogonum ovalifolium* var. *focarium*	Occurs on black volcanic gravel on gentle slopes and flats in sagebrush communities, conifer woodlands.
Creeping chickweed	*Stellaria humifusa*	Restricted to light-colored (white and tan) tuffaceous sandstone substrates, usually on rounded, gentle slopes.
Creeping nailwort	*Paronychia sessiliflora*	Found in dry, stony hillsides, summits, and sandstone mesas.
Crenulate moonwort	*Botrychium crenulatum*	Dry, open, sparsely-vegetated, calcareous sandy-clay soils on flats and gentle slopes of hillsides and alluvial fans.
Crested shield-fern	*Dryopteris cristata*	Found in crevices of volcanic or carbonate rock in the pinyon-juniper zone, 6900-7400 ft elevation.
Crinite mariposa-lily	*Calochortus coxii*	Found in moist, north-facing grasslands and Jeffrey pine savannahs.
Cronquist's forget-me-not	*Hackelia cronquistii*	Found in north-facing gentle to moderate slopes. Usually found with a plant association that includes big sagebrush and indian ricegrass.
Cronquist's phacelia	*Phacelia cronquistiana*	Often found in pinyon-juniper-sagebrush and ponderosa pine communities.
Cronquist's stickseed	*Hackelia cronquistii*	Found in north-facing gentle to moderate slopes. Associated with big sagebrush and indian ricegrass.
Crosby buckwheat	*Eriogonum crosbyae* var. *crosbyae*	Typically on rolling hills dominated by big sagebrush.
Currant milkvetch	*Astragalus uncialis*	Found in dry alkaline soils derived from limestone. With sagebrush in gullied foothills.
Currant Summit clover	*Trifolium andinum* var. *podocephalum*	Within pinyon-juniper woodlands in settings such as rocky hills. Other documented associates include *Artemisia tridentata*.
Cusick's camas	*Camassia cusickii*	Occurs at low to mid elevations on steep, rocky hillsides. Often found in sagebrush scrub and among ponderosa pine.
Cusick's giant-hyssop	*Agastache cusickii*	On road cuts or other disturbances crossing such habitats, in pinyon-juniper, sagebrush, and mixed-shrub zones.
Cusick's lupine	*Lupinus lepidus* var. *cusickii*	Open woods and dry slopes.
Cusick's milk-vetch	*Astragalus cusickii* var. *cusickii*	Dry grassy or rocky slopes in loose, finely textured soils on roadcuts, talus, and sagebrush plains.
Cusick's monkeyflower	*Diplacus cusickii*	Arid regions, including bottomlands. Associated species are sparse but include arrowleaf buckwheat.
Cutler's spurred lupine	*Lupinus caudatus* var. *cutleri*	Occurs in pinyon-juniper woodland.
Dalles mt. buttercup	*Ranunculus triternatus*	Meadow-steppe dominated by perennial xerophytic bunchgrasses and broad-leaved herbs.
Dalles water-starwort	*Callitriche fassettii*	Sagebrush and mountain mahogany communities, oak, pinyon-juniper and montane conifer woodlands
Darwin Mesa milk-vetch	*Astragalus atratus* var. *mensanus*	Carbonate, rocky substrates in Great Basin scrub and pinyon-juniper woodland.

Common Name	*Latin Name*	Habitat Description
Davis's milkweed	*Asclepias cryptoceras* ssp. *davisii*	On steep rocky slopes with sagebrush.
Death Valley round-leaved phacelia	*Phacelia mustelina*	Great Basin scrub and pinyon-juniper woodland.
DeDecker's clover	*Trifolium kingii* subsp. *dedeckerae*	Stabilized dunes in Great Basin scrub.
Deer Lodge buckwheat	*Eriogonum pharnaceoides* var. *cervinum*	Occurs in sagebrush and mountain mahogany communities, oak, pinyon-juniper and montane woodlands.
Deeth buckwheat	*Eriogonum nutans* var. *glabratum*	Sandy flats and slopes, saltbush and sagebrush communities, and in montane conifer woodlands.
Densetuft hairsedge	*Bulbostylis capillaris*	Found in disturbed habitats and grassland.
Desert chaenactis	*Chaenactis xantiana*	Grows near pinyon-juniper woodland and sagebrush scrub.
Desert dodder	*Cuscuta denticulata*	Parasitic on a variety of native shrubs in desert areas, including sagebrush and rabbitbrush.
Desert needlegrass	*Pappostipa speciosa*	Found in rocky slopes and canyons of arid to semi-arid regions.
Desert pincushion, broadflower pincushion	*Chaenactis stevioides*	Grows in deserts, open arid and semiarid habitat
Desert prenanthella	*Prenanthella exigua*	Grows near pinyon-juniper woodland.
Diffuse stickseed	*Hackelia diffusa* var. *diffusa*	Bottoms of mossy talus and scree slopes, shaded areas, cliffs, roadsides, and other disturbed sites.
Dimeresia or doublet	*Dimeresia howellii*	Grows in dry volcanic soils, primarily on the Modoc Plateau volcanic plain.
Disappearing monkeyflower	*Mimulus evanescens*	Grows in sagebrush-juniper plant associations, among rocky rubble and boulders in vernally moist, heavy gravel.
Drummond's mountain-avens	*Dryas drummondii* var. *drummondii*	Frequently in small washes or other moisture-accumulating microsites, in the sagebrush and lower pinyon-juniper zones.
Dusky canada goose	*Branta canadensis occidentalis*	Dry, densely vegetated, relatively undisturbed, on moderate to steep north-facing slopes in the sagebrush zone
Dwarf lousewort	*Pedicularis centranthera*	Usually granitic, sandy or rocky substrates in Great Basin scrub and pinyon-juniper woodland.
Dwarf phacelia	*Phacelia tetramera*	Grows near sagebrush scrub
Eastwood milkweed	*Asclepias eastwoodiana*	In open areas, including shale outcrops, generally barren, frequently in small washes, in the sagebrush and lower pinyon-juniper zones.
Elko rockcress	*Boechera falcifructa*	Gently north-sloping, sagebrush-dominated slopes with a high moss/cryptogamic cover over silty substrates.
Elusive Jacob's-ladder	*Polemonium elusum*	Occurs where vegetation transitions from sagebrush and mountain mahogany to Douglas-fir woodland
Engelmann's daisy	*Erigeron davisii*	Found in dry, mountainous areas and grassland, with the highest diversity in North America.
Ephemeral monkeyflower	*Mimulus evanescens*	Volcanic, gravelly, and rocky substrates in Great Basin scrub and pinyon-juniper woodland.

Common Name	*Latin Name*	Habitat Description
Erect pygmy-weed	*Crassula connata*	Open areas
Featherleaf kittenstails	*Synthyris pinnatifida* var. *lanuginosa*	Occurs in dry, rocky areas in pin cushion communities of high elevations
Fee's lip-fern	*Cheilanthes feei*	In arid climates, on limestone or sandstone cliff crevices, outcrops, rocky areas, and steep slopes.
Few-flowered bleedingheart	*Dicentra pauciflora*	Gravelly places, coniferous litter,
Field milk-vetch	*Astragalus agrestis*	Great Basin scrub and pinyon-juniper woodland.
Flat Top buckwheat, Smith's wild buckwheat	*Eriogonum corymbosum* var. *smithii*	Purple-sage, desert shrub, and rabbitbrush communities, on the Entrada Formation.
Four-petal jamesia, Basin jamesia	*Jamesia tetrapetala*	Grows with chokecherry, mountain mahogany, Ephedra, and sagebrush at around 7,600 feet elevation
Franklin's penstemon	*Penstemon franklinii*	Sagebrush community on sandy-gravelly and sandy soils across a gently sloping landscape.
Fremont's combleaf	*Polyctenium fremontii*	It is found near sagebrush scrub
Fringed redmaids	*Calandrinia ciliata*	Thrive in open grasslands as well as disturbed areas and cultivated fields.
Frisco buckwheat	*Eriogonum soredium*	Limestone outcrop-surfaces with gravel and scattered rocks and boulders in pinyon-juniper
Frisco clover	*Trifolium friscanum*	Grows on calcareous and volcanic gravels, usually on relatively steep slopes, within pinyon-juniper.
Gambel milk-vetch	*Astragalus gambelianus*	Foothill woodland, southern oak woodland, coastal sage scrub.
Garrett's California fuchsia (Garrett's firechalice)	*Epilobium canum* ssp. *garrettii*	Dry/Desert
Gasquet manzanita	*Arctostaphylos hispidula*	Open rocky sites with serpentine or sandstone substrate.
Geyer's onion	*Allium geyeri* var. *geyeri*	Great Basin scrub, pinyon and juniper woodland; gravelly or rocky.
Gilman's milkvetch	*Astragalus gilmanii*	Found in the Great Basin scrub, pinyon and juniper woodland; gravelly or rocky.
Gold poppy	*Eschscholzia caespitosa*	Mostly on south to west aspects, in sparse Juniperus osteosperma woodland.
Golden buckwheat	*Eriogonum chrysops*	Often described as occurring within sagebrush communities.
Golden chinquapin	*Chrysolepis chrysophylla* var. *chrysophylla*	Dry open sites to fairly thick woodlands. Most competitive on sites that are relatively infertile.
Goodrich eared rockcress	*Arabis goodrichii*	Rocky slopes in sagebrush and pinyon-juniper woodlands.
Goose Creek milkvetch	*Astragalus anserinus*	Occurs in drainage bottoms, lower to upper slope and crest positions, in open Utah juniper, big sagebrush, or rabbitbrush.
Gorman's iris	*Iris tenax* var. *gormanii*	Along the eastern edges of Elko and White Pine Counties, at elevations of 4600 to 6900 ft
Gould's camissonia	*Camissonia gouldii*	Volcanic ash cones in pinyon-juniper and big sagebrush communities.
Granite prickly phlox	*Linanthus pungens*	Occurs in dry, open forest, woodland, shrubland, and grassland habitats and their intergradations.
Gray cryptantha	*Cryptantha leucophaea*	Dry, often sandy places. Associated with rabbitbrush, bluebunch wheatgrass, cheatgrass, and sagebrush.

Common Name	*Latin Name*	Habitat Description
Gray pine	*Pinus sabiniana*	Grows in the summer dry mountains and foothills
Great Basin fishhook cactus	*Sclerocactus pubispinus*	Found in rocky hillsides of woodland and upper desert mountains. Sagebrush and pinyon-juniper communities.
Great Basin gilia	*Aliciella leptomeria*	Open habitats in semiarid regions, on dry bluffs or in sandy swales.
Green buckwheat	*Eriogonum umbellatum* var. *glaberrimum*	Found in sandy to gravelly slopes, sagebrush communities, aspen and montane conifer woodlands.
Green keeled cotton-grass	*Eriophorum viridicarinatum*	Schoonover Formation, on mostly steep slopes of all aspects, and supporting a sparse to moderately dense vegetation
Green muhly, marsh muhly	*Muhlenbergia racemosa*	Grows in disturbed areas, wetlands and other moist and wet habitats. It can grow in dry areas.
Green-band mariposa lily	*Calochortus macrocarpus* var. *maculosus*	Found in dry plains, rocky slopes, sagebrush scrub, and in pine forests. Usually occurring in volcanic soils.
Grimes vetchling	*Lathyrus grimesii*	Grassland/herbaceous, Shrubland/chaparral
Gumbo milkvetch	*Astragalus ampullarius*	Mixed desert shrub and juniper communities
Hairy wild cabbage	*Caulanthus pilosus*	Native to open, dry habitat.
Hall's aster	*Symphyotrichum hallii*	Moist to dry prairies and open places in valley and plains.
Hall's daisy	*Erigeron aequifolius*	Great Basin scrub and pinyon-juniper woodland in clay or rocky substrates.
Hanaupah rock daisy	*Perityle villosa*	Great Basin scrub and pinyon-juniper woodland in clay or rocky substrates.
Hare's-foot milkvetch	*Astragalus purshii* var. *lagopinus*	Dry plains, slopes, often on basalt or pumice, often with sagebrush.
Hayden's mustard	*Terraria haydenii*	Scattered juniper habitat, very little vegetation.
Henderson's bentgrass	*Agrostis hendersonii*	Found in dry desert slopes, sandy washes, and valleys. Found within *Artemisia tridentata* to pinyon-juniper woodlands.
Henderson's phlox	*Phlox hendersonii*	Found from high-elevation ridges to north-facing walls at lower elevations, in mountain sagebrush and pinyon-juniper.
Henderson's ricegrass	*Achnatherum hendersonii*	Often associated with *Artemisia rigida* and occasionally with *Pinus ponderosa*.
Hoffmann's buckwheat	*Eriogonum hoffmannii* var. *hoffmannii*	Granitic or carbonate, rocky substrates in pinyon and juniper woodland.
Holmgren lupine	*Lupinus holmgrenianus*	Fond in dry desert slopes, sandy washes, and valleys. Found within Artemisia tridentata to pinyon-juniper woodlands.
Holmgren smelowskia	*Nevada holmgrenii*	Sites are found in the mountain sagebrush and upper pinyon-juniper zones.
Hooker's balsamroot	*Balsamorhiza hookeri* var. *idahoensis*	Associated with pinyon juniper, stiff sagebrush, and low sagebrush
Hoover's tauschia	*Tauschia hooveri*	Shrubland/chaparral
Howell's rush	*Juncus howellii*	Occurs on gentle to steep slopes of all aspects; most commonly associated with open Utah juniper communities.

Common Name	*Latin Name*	Habitat Description
Howell's thelypodium	*Thelypodium howellii* var. *howellii*	Rocky, granitic substrates in pinyon and juniper woodland
Howell's whitlow-grass	*Draba howellii*	Rocky outcrops, meadows, dry-stone walls, brick walls, railway embankments, yards, paths, sloping pastures
Ibapah springparsley	*Cymopterus ibapensis*	Sagebrush steppe zone.
Idaho hawksbeard	*Crepis bakeri* ssp. *idahoensis*	Occurs in canyon grasslands and on dry mountain slopes.
Idaho penstemon (also known as Idaho beardtongue)	*Penstemon idahoensis*	4400-7000 ft in the pinyon-juniper, sagebrush, and shadscale zones. Most commonly associated with Utah juniper (*Juniperus osteosperma*) communities.
Inchhigh lupine	*Lupinus uncialis*	Found in gravelly limestone soils on knolls, slopes, and small drainages, from the pinyon-juniper to the subalpine conifer zones.
Inflated Cima milk-vetch	*Astragalus cimae* var. *sufflatus*	Great Basin scrub
Intermountain wavewing (shadscales spring parsley)	*Cymopterus basalticus*	Bare basaltic rocks, barren clays in Utah. In pinyon-juniper and sagebrush communities.
Inyo blazing star	*Mentzelia inyoensis*	Documented on a variety of substrates in habitats that include sagebrush scrub and pinyon-juniper.
Inyo rock daisy	*Perityle inyoensis*	Shale or gravelly substrates in Great Basin scrub and pinyon and juniper woodland.
Jaeger's hesperidanthus	*Hesperidanthus jaegeri*	Sand or gravelly substrates in pinyon and juniper woodland.
Janish's penstemon	*Penstemon janishiae*	Hillsides and slopes on clay soil derived volcanic rock with Artemisia to pinyon-juniper.
Kanab thelyplody	*Thelypodiopsis ambigua* var. *erecta*	Pinyon-juniper and mixed desert shrub communities, practically always on degraded purple Chinle shales.
Kane breadroot	*Pediomelum epipsilum*	Pinyon-juniper woodland on Chinle and Moenkopi formations.
Kaye H. Thorne's buckwheat	*Eriogonum artificis*	Pinyon and juniper woodland communities on gravelly substrates.
Kellogg's lily	*Lilium kelloggii*	Can grow in dry, rocky sites to shaded, deep soiled areas in forests, below 3500 feet.
Kellogg's rush	*Juncus kelloggii*	Dry, open, light-colored, strongly alkaline shrink-swell clay in mixed-shrub and lower sagebrush zones.
Kidney-leaved violet	*Viola renifolia*	Along washes, roadsides, and canyon floors, particularly on carbonate-containing substrates.
King's rattleweed	*Astragalus calycosus*	Forb/herb
Lahontan Basin buckwheat	*Eriogonum rubricaule*	Found in volcanic slopes.
Lahontan beardtongue	*Penstemon palmeri* var. *macranthus*	Along washes, roadsides and canyon floors, particularly on carbonate-containing substrates.
Lahontan milkvetch	*Astragalus porrectus*	Gravelly or sandy washes and outwash fans of volcanic sand or rock debris in the foothills of desert mountains.
Lahontan sagebrush	*Artemisia arbuscula* ssp. *longicaulis*	Confined to gypsum-rich soils in central and eastern Clark County and southern Lincoln County, Nevada
Lanceleaf springbeauty	*Claytonia multiscapa* var. *flava*	Grows in foothills up to alpine slopes

Common Name	*Latin Name*	Habitat Description
Lance-leaved draba	*Draba cana*	Open, dry, knolls, badlands, or outcrops, usually northeast to southeast aspects, in pinyon-juniper or sagebrush.
Large Canadian St. John's wort	*Hypericum majus*	Found in fields, pastures, abandoned fields and in sunny locations.
Large yellow evening primrose, Flaming Gorge evening primrose	*Oenothera acutissima*	Rocky mountain juniper-sagebrush communities, and sagebrush scrub.
Large-leaved filaree	*Erodium macrophyllum*	Open sites, grassland, scrub, vertic clay, occasionally serpentine. Grassland/herbaceous, Shrubland/chaparral
Lavin eggvetch	*Astragalus oophorus* var. *lavinii*	Occurs barren, arid and open, knolls, badlands, in pinyon-juniper and sagebrush communities.
Lavin's milk-vetch	*Astragalus oophorus* var. *lavinii*	Rocky substrates in pinyon and juniper woodland.
Lee's lewisia	*Lewisia leeana*	Cliffs and rocks
Leiberg's clover	*Trifolium leibergii*	Dry, exposed, shallow, relatively barren and undisturbed, on flat to moderately steep slopes of all aspects.
Lemmon buckwheat	*Eriogonum lemmonii*	Rolling hills on weathered tuff, fine, light colored, sandy loam, and silt loam.
Lemmon's milk-vetch	*Astragalus lemmonii*	Rocky or gravelly substrates in Great Basin scrub and pinyon and juniper woodland.
Lens-pod milk-vetch	*Astragalus lentiformis*	Rocky substrates in pinyon and juniper woodland.
Lichen	*Calicium quercinum*	Found on twigs and in sheltered sites on old wood or bark.
Lichen	*Hypotrachyna riparia*	On deciduous shrubs and trees in foothills of the western Cascade Range, Oregon.
Lichen	*Lecanora caesiorubella* ssp. *merrillii*	On barks of trees and shrubs, decaying wood in dry, open coniferous woodland, chaparral, and salt marsh.
Lichen	*Leptogium cyanescens*	Found on shaded twigs of deciduous trees and shrubs in humid habitats, rarely in exposed situations.
Lichen	*Lobaria linita*	Found on moss-covered rocks in cool, moist areas in forests.
Lichen	*Microcalicium arenarium*	Found on bark, wood, root, and rock faces that are sheltered from precipitation
Lichen	*Peltula euploca*	Found on acidic rocks in deserts and other open, arid habitats.
Lichen	*Ramalina pollinaria*	Grows on bark and rocks.
Lichen	*Sigridea californica*	Growing on the trunks of trees and shrubs, such as *Quercus* spp., *Heteromeles* spp., *Adenostoma* spp., and *Pinus* spp.
Lichen	*Texosporium sancti-jacobi*	Shadscale, desert shrub, and juniper communities on calcareous substrates at 5100 to 6300 ft elevation
Lichen	*Thelenella muscorum* var. *octospora*	On soil, rock, and dead or dying mosses in dry woodlands, prairie, shrub-steppe, and subalpine forest.
Lichen	*Umbilicaria phaea* var. *coccinea*	Associated vegetation includes, *Juniperus occidentalis*, *Pinus ponderosa*.
Limestone buckwheat	*Eriogonum eremicum*	Found in shadscale, desert shrub, and juniper communities on calcareous substrates.

Common Name	*Latin Name*	Habitat Description
Limestone daisy	*Erigeron uncialis* var. *uncialis*	Sandy to rocky substrates in Great Basin scrub and pinyon and juniper woodland.
Limestone monkeyflower	*Erythranthe calcicola*	Usually carbonate, usually talus slopes in pinyon and juniper woodland.
Little bluestem	*Schizachyrium scoparium* var. *scoparium*	Hill prairies, gravel prairies, sand prairies, black soil prairies, clay prairies, and scrubby barrens
Little ricegrass	*Stipa exigua*	Carbonate, rocky in great Basin scrub and pinyon and juniper woodland.
Liverwort	*Herbertus dicranus*	Found in dry to moist and open to shaded cliffs, outcrops, boulders, tree trunks, tree bases, dead trees, bushes.
Liverwort	*Lophozia gillmanii*	Found on peaty soil, usually associated with cliffs or ledges. It is an obligate calciphile.
Liverwort	*Phymatoceros phymatodes*	Forest Edge, Forest/Woodland, Grassland/herbaceous
Liverwort	*Porella vernicosa* ssp. *fauriei*	Found in crevices of granitic cliffs and outcrops on protected exposures in the pinyon-juniper zone.
Liverwort	*Ptilidium pulcherrimum*	Found in sandy rhyolitic soils on flats and gentle slopes of mountain sagebrush.
Liverwort	*Scapania obscura*	Pinyon-juniper, sagebrush, and mixed desert shrub communities.
Liverwort	*Sphaerocarpos hians*	Habitats include desert scrub, grasslands, sagebrush steppe, and pinyon-juniper
Loa milkvetch, Glenwood milkvetch	*Astragalus loanus*	Volcanic gravels in sagebrush and pinyon-juniper communities.
Lobb's buckwheat	*Eriogonum lobbii*	Found in a number of mountain plant communities.
Lone Mountain goldenheads	*Tonestus graniticus*	Crevices in granite cliffs and on bedrock outcrops within pinyon pine woodlands.
Long Valley Milkvetch	*Astragalus johannis-howellii*	Usually found in great basin scrub, pinyon and juniper woodland.
Long-bract frog orchid	*Coeloglossum viride*	Grows chiefly in sub-arid soil in damp open woods in thickets and shrub boarders.
Long-calyx eggvetch	*Astragalus oophorus* var. *lonchocalyx*	Pinyon-juniper, sagebrush, and mixed desert shrub communities.
Long-flowered snowberry	*Symphoricarpos longiflorus*	Found in relatively barren clay or sandy-clay knolls, slopes, and flats in the pinyon-juniper woodland zone.
Long-haired star-tulip	*Calochortus longebarbatus* var. *longebarbatus*	Mesic, alkaline, clay substrates in Great Basin scrub.
Longsepal globemallow	*Iliamna longisepala*	Dry, open hillsides, gravelly streamsides, sagebrush-covered foothills.
Long-stemmed androsace	*Androsace elongata* ssp. *acuta*	Found on slopes, coastal scrub, meadows and seeps, pinyon and juniper woodland, and valley and foothill grassland
Loose-flowered vetch	*Astragalus tenellus*	Plains, Foothills, Montane
Lost Creek wild buckwheat	*Eriogonum brevicaule* var. *mitophyllum*	Dry, sunny site with a poor, sandy soil
Lost River Silene, lobed catchfly	*Silene scaposa* var. *lobata*	Scrubland, slope
Low feverfew	*Parthenium ligulatum*	Black sagebrush, pygmy sagebrush, and pinyon-juniper communities.
Macfarlane's four-o'clock	*Mirabilis macfarlanei*	On steep slopes and ridgelines of all aspects in the pinyon-juniper zone.

Common Name	*Latin Name*	Habitat Description
Mackenzie's phacelia	*Phacelia lutea* var. *mackenzieorum*	In the pinyon-juniper and sagebrush zones. Endemic to the Pine Nut and Virginia Ranges.
Maguire's daisy	*Erigeron maguirei*	Formations in lower limits of juniper woodland communities.
Margaret rushy milkvetch	*Astragalus convallarius* var. *margaretiae*	Grows beneath *Artemisia tridentata* in pinyon-juniper woodland.
Marigold navarretia	*Navarretia tagetina*	Found in open, grassy flats, vernal pools.
Masonic Mountain jewelflower	*Streptanthus oliganthus*	Plant communities include sagebrush, great basin scrub, and pinyon-juniper woodland.
McGee Meadows lupine	*Lupinus magnificus* var. *hesperius*	Sandy or gravelly in Great Basin scrub (volcanic ash) and pinyon and juniper woodland.
Meadow milkvetch	*Astragalus diversifolius*	Moist, often alkaline meadows and swales in sagebrush valleys or closed drainage basins.
Meadow pussy-toes	*Antennaria corymbosa*	Found in loose, sandy to gravelly soils, in the creosote-bursage, blackbrush, and mixed-shrub zones.
Membrane-leaved monkeyflower	*Erythranthe hymenophylla*	In the pinyon-juniper and mountain sagebrush zones.
Midget quillwort	*Isoetes minima*	Found in seasonally wet swales in big sagebrush shrub steppe.
Milo baker's cryptantha	*Cryptantha milo-bakeri*	Rocky, gravelly soil, sometimes serpentine, in conifer or mixed conifer-deciduous forests, Jeffrey pine.
Miner's candle	*Cryptantha scoparia*	Found in dry open slopes in mixed desert shrub, sagebrush, and pinyon -juniper communities.
Modoc Rim sideband	*Monadenia fidelis* ssp. *nov. (Modoc Rim)*	Found in mesic forests habitats or near springs or other water sources in forest situations.
Mono County Phacelia	*Phacelia monoensis*	It grows along with sagebrush, pinyon-juniper, great basin scrub, and rabbitbrush.
Mono Lake lupine	*Lupinus duranii*	Volcanic pumice, gravelly in Great Basin scrub.
Mono milk-vetch	*Astragalus monoensis*	Sandy in Great Basin scrub.
Moonwort	*Botrychium lunaria*	Occurs on calcareous soils in the sunlight of open fields and wood edges.
Moss	*Bruchia flexuosa*	Occurring in small clusters in openings among grasses on open expanses of seasonally moist bare soil.
Moss	*Bryoerythrophyllum columbianum*	Habitats include grassland steppe as well as ledges and bluffs near rivers.
Moss	*Ephemerum crassinervium*	Found on damp disturbed soil, often in old fields, paths, river banks or spots of open bare ground.
Moss	*Ephemerum serratum*	Finely grained soil in arable fields, mud at the margins of reservoirs and rivers, or as part of the ephemeral community on tracks.
Moss	*Orthotrichum euryphyllum*	Primarily in dry *Juniperus occidentalis*, *Pinus ponderosa*, and *Artemisia tridentata* associations.
Moss	*Physcomitrium immersum*	Grows on wet soil in floodplains or mud flats, also at roadsides and in bare spots of fields.
Moss	*Pseudephemerum nitidum*	Grows on the edge of fields.

Common Name	*Latin Name*	Habitat Description
Moss	*Rhytidiadelphus subpinnatus*	Grows heavily on grazed pastures and on mown fairways on golf courses.
Moss	*Thamnobryum neckeroides*	Found in open, gravelly soils in the subalpine conifer, subalpine sagebrush, mountain mahogany, and upper pinyon-juniper zones.
Mound cryptanth	*Cryptantha compacta*	Salt desert shrub and mixed desert shrub communities.
Mount Moriah beardtongue	*Penstemon moriahensis*	Habitats include scrubby sagebrush/mountain mahogany woodlands, open sagebrush meadows and slopes, and upper pinyon-juniper and pinyon woodland.
Mountain townsendia	*Townsendia montana*	Mainly in the subalpine conifer zone.
Mourning milkvetch	*Astragalus atratus* var. *inseptus*	Endemic to the Snake River Plain in Idaho. Occurs on sparsely vegetated ridge crests.
Mulford's milkvetch	*Astragalus mulfordiae*	Gentle to steep south and west-facing slopes in shrub-steppe or desert shrub communities.
Murdock's evening primrose	*Oenothera murdockii*	Barrens, Forest/Woodland, Woodland - Conifer
Naked-stemmed evening-primrose	*Chylismia scapoidea ssp. scapoidea*	Sagebrush desert, mostly in sandy or gravelly soils, including sand dunes and unstable areas.
Narrowleaf grapefern	*Botrychium lineare*	Meadow dominated by knee-high grass, shaded woods and woodlands. Early seral habitats
Narrow-leaved amole	*Chlorogalum angustifolium*	Grows in heavy, rocky, soils in woodland and on grassy hillsides.
Narrow-stem cryptantha	*Cryptantha gracilis*	Open, sandy, gravelly, or clay slopes and flats in the salt-desert, shadscale, and lower sagebrush zones.
Needle Mountains milkvetch	*Astragalus eurylobus*	Gravel washes and sandy soils in alkaline desert and arid grassland.
Needleleaf sedge	*Carex duriuscula*	Occurs in the desert along disturbed areas. Also found in a forest, grassland, meadow, and riparian areas.
Neese narrowleaf penstemon	*Penstemon angustifolius* var. *dulcis*	Four-winged saltbush, sagebrush-Eriogonum, and juniper communities of sand dunes.
Nevada lupine	*Lupinus nevadensis*	Hillsides and valley floors, on dry, sandy, and stony soil with pinyon-juniper and sagebrush.
Nevada suncup	*Camissonia nevadensis*	Open, sandy, gravelly, or clay slopes and flats in the salt-desert, shadscale, and lower sagebrush zones.
Nevada willowherb	*Epilobium nevadense*	Mixed-mountain brush and piñon-juniper-mountain brush
Newberry's milkvetch	*Astragalus newberryi* var. *castoreus*	Woodland, rocky outcrops, gravely hillsides.
Northern golden-carpet	*Chrysosplenium tetrandrum*	Gentle slopes in open areas or under shrubs in the upper salt desert and lower sagebrush zones.
Northern grass-of-parnassus	*Parnassia palustris* var. *tenuis*	Found in mountain ranges.
Northern microseris	*Microseris borealis*	Meadow steppe habitat dominated by bunchgrasses and forbs.
Northern wormwood	*Artemisia campestris* ssp. *borealis* var. *wormskioldii*	Grows in generally arid with shrub steppe vegetation.
Northwestern yellowflax	*Sclerolinon digynum*	Occurs in vernal pools margins and seasonally wet gravelly to rocky soils. Also found in grasslands.

Common Name	*Latin Name*	Habitat Description
Nuttall's sandwort	*Minuartia nuttallii* ssp. *fragilis*	Open, gravelly benches, dry rocky areas, or limestone talus from open sagebrush hills to alpine slopes.
Obscure scorpionflower	*Phacelia inconspicua*	Open sandy spots in sagebrush/grass zone, near junipers.
Ochoco lomatium	*Lomatium ochocense*	Open, barren scabland with *Artemisia rigida*/*Poa secunda* plant association.
Oregon daisy	*Erigeron oreganus*	Dry, open soils among boulders in healthy sagebrush steppe vegetation.
Oregon white-top aster	*Sericocarpus oregonensis* var. *oregonensis*	Found in mesic to moist habitats, well-drained open woodlands, and dry, open, often rocky coniferous forest.
Osgood Mountains milkvetch (also identified as "mudflat milkvetch")	*Astragalus yoder-williamsii*	Dry, cold ridge crests, stony flats, and disturbed roadbeds. Associated with low sagebrush and big mountain sagebrush.
Ostler pepperplant	*Lepidium ostleri*	Pinyon-juniper community, often in shaded sites on limestone outcrop.
Ostler's ivesia or Wah Wah ivesia	*Ivesia shockleyi* var. *ostleri*	Pinyon-juniper and adjacent ponderosa pine communities in crevices of quartzite or whitish outcrops.
Owyhee clover	*Trifolium owyheense*	Barren slopes in sagebrush-steppe or desert shrub vegetation.
Owyhee prickly phlox	*Leptodactylon glabrum*	Found in disturbed silty clay soils of valley bottoms in salt desert vegetation, or on roadsides or in abandoned fields.
Owyhee sagebrush	*Artemisia papposa*	This species grows in meadows, alkaline flats, and sagebrush-juniper slopes.
Pacific fir-moss	*Huperzia miyoshiana*	Found in loose soil and rock crevices among boulders in pinyon-juniper woodlands and sagebrush shrublands.
Pacific pea	*Lathyrus vestitus* ssp. *ochropetalus*	Dry, open to wooded areas, forest edges, and roadsides, near or within historical prairies.
Packard's buckwheat	*Eriogonum shockleyi* var. *packardiae*	Occurs in the sagebrush-steppe zone of the western Snake River Plain, in azonal microhabitats.
Packard's desert parsley	*Lomatium packardiae*	Found within sagebrush communities, on dry, open, rocky clay soils derived from rhyolite or volcanic ash.
Packard's milkvetch	*Astragalus cusickii* var. *packardiae*	Shrub-steppe, and to a lesser extent bunchgrass grassland community.
Pahrump silverscale	*Atriplex argentea* var. *longitrichoma*	Saline valley bottoms, with shrubby saltbush, creosote bush, mesquite, and annual weedy grasses and forbs.
Pahute Mesa beardtongue	*Penstemon pahutensis*	In loose soil and rock crevices among boulders in pinyon-juniper woodlands and sagebrush shrublands.
Pale blue-eyed grass	*Sisyrinchium sarmentosum*	Forest - Conifer, Forest/Woodland, Grassland/herbaceous.
Pale sedge	*Carex pallescens*	Anthropogenic, forests edges, meadows and fields.
Palmer's evening-primrose	*Tetrapteron palmeri*	Grows in desert and sagebrush habitats.
Palouse goldenweed	*Pyrrocoma liatriformis*	Grassland communities and transition zones between prairie and open ponderosa pine. It also occurs in mesic grassland habitats.

Common Name	*Latin Name*	Habitat Description
Palouse milk-vetch	*Astragalus arrectus*	Grassy loess hillsides, sagebrush slopes, river bluffs, and openings in yellow pine forest.
Palouse thistle	*Cirsium brevifolium*	Open grasslands and grassy areas (roadsides) rarely extending far into forest or shrublands.
Panamint dudleya	*Dudleya saxosa* subsp. *saxosa*	Great Basin scrub and pinyon and juniper woodland.
Panamint Mountains buckwheat	*Eriogonum microthecum* var. *panamintense*	Rocky, sometimes carbonate in Great Basin scrub and pinyon and juniper woodland.
Panamint Mtns. lupine	*Lupinus magnificus* var. *magnificus*	Gravelly or rocky, vernally mesic in Great Basin scrub and pinyon and juniper woodland.
Parish's horse-nettle	*Solanum parishii*	Grows in many types of habitats, including inland chaparral, woodlands, and forests.
Parry's petalonyx	*Petalonyx parryii*	Often found in warm, dry desert regions.
Pasqueflower	*Anemone patens* var. *multifida*	Prairies and grasslands, open alpine slopes and ridges in loose, sandy, well-drained soil.
Pauper milk-vetch	*Astragalus misellus* var. *misellus*	Habitat is stony hills and pastures and gravelly clay banks, on basaltic bedrock, with sagebrush and juniper.
Pauper milk-vetch	*Astragalus misellus* var. *pauper*	Associated species include sagebrush, rock buckwheat, bluebunch wheatgrass, and yellow fleabane.
Payson's milkvetch	*Astragalus paysonii*	Endemic of Clearwater Mountains; occurs primarily in disturbed areas such as recovering burns, clear cuts, road cuts, and blow downs.
Peninsular onion	*Allium peninsulare*	Valley Grassland, Foothill Woodland, and Coastal Chaparral.
Phipp's hawthorn	*Crataegus phippsii*	Occurs in open thickets. Sometimes found in riparian areas. Forest/Woodland, Shrubland/chaparral, Woodland - Conifer.
Picabo milkvetch	*Astragalus oniciformis*	Occurs almost exclusively on the *Artemisia tridentata* var. *wyomingensis*/*Stipa comata* habitat type.
Pine Nut Mountains mousetails	*Ivesia pityocharis*	Shrubland/chaparral. Seasonally saturated soils in sagebrush flats.
Pink egg milkvetch	*Astragalus oophorus* var. *lonchocalyx*	Pinyon-juniper, sagebrush, and mixed desert shrub communities.
Pinnate spring-parsley	*Cymopterus beckii*	Sandy or stony crevices, ledges, and cliff bases on Navajo Sandstone in pinyon-juniper, mountain brush, and ponderosa pine.
Pinyon Mesa buckwheat	*Eriogonum mensicola*	Great Basin scrub
Pinyon penstemon	*Penstemon pinorum*	Pinyon-juniper, mountain-mahogany, ephedra, oak, sagebrush, and less commonly greasewood communities.
Pioche blazingstar	*Mentzelia argillicola*	Found in forb, herb, and subshrub.
Piper's daisy	*Erigeron piperianus*	Commonly found in virgin stands of the big sagebrush/bluebunch wheatgrass association.
Playa phacelia	*Phacelia inundata*	Great Basin, scrub, Playa/salt flat. Alkali playas and seasonally inundated areas with clay soils.
Plumas ivesia	*Ivesia sericoleuca*	Volcanic, rocky, sometimes roadsides in Great Basin scrub and pinyon and juniper woodland.
Plumed clover	*Trifolium plumosum* ssp. *plumosum*	Dry hillsides and meadows. Associated species include ponderosa pine, lupine, and Idaho fescue.

Common Name	*Latin Name*	Habitat Description
Plumed clover	*Trifolium plumosum* var. *amplifolium*	Known from Palouse prairie remnants, forest edge, and one site described as a sedge wetland to open Pinus ponderosa forest with bunchgrass understory. .
Polished blazingstar	*Mentzelia polita*	Open areas in mixed desert shrub communities.
Prairie moonwort	*Botrychium campestre*	Occurs primarily in non-forested habitats at low elevations, although it may grow under shrubs in or at the margins of these habitats.
Prickly-poppy	*Argemone munita* ssp. *rotundata*	Found on open slopes and foothills.
Prostrate bladderpod	*Lesquerella prostrata*	Sagebrush, grass, and juniper communities.
Prostrate ceanothus	*Ceanothus prostratus*	Dry to mesic forest sites, often associated with chaparral
Psorlea globemallow	*Sphaeralcea psoraloides*	Desert, Forest/Woodland, Woodland - Conifer. Salt and mixed desert shrub communities. Pinyon-juniper communities
Puget balsamroot	*Balsamorhiza deltoidea*	Yellow Pine Forest, Red Fir Forest, Lodgepole Forest, Foothill Woodland, Chaparral, Valley Grassland, (many plant communities).
Pulsifer's milk-vetch	*Astragalus pulsiferae* var. *pulsiferae*	Rocky, carbonate in Great Basin scrub and pinyon and juniper woodland.
Pulsifer's monkey-flower	*Erythranthe pulsiferae*	Seasonally wet or moist open areas; often in exposed mineral soil or in grass/forb openings in ponderosa pine, Douglas fir.
Purple cymopterus	*Cymopterus purpurascens*	Found in desert regions and near pinyon-Juniper woodland.
Purple thick-leaved thelypody	*Thalictrum dasycarpum*	On soil, small mammal pellets, dead twigs, and on chaparral.
Pygmy suncup	*Camissonia pterosperma*	Pinyon-Juniper Woodland
Rabbit Valley gilia	*Aliciella caespitosa*	Found within open pinyon-juniper communities, often mixed with mountain brush, sagebrush, or ponderosa pine.
Rabbitbrush or Bloomer's goldenweed	*Ericameria bloomeri*	Grows in coniferous forests.
Racemose pyrrocoma	*Pyrrocoma racemosa* var. *racemosa*	Northern Juniper Woodland, Sagebrush Scrub, Alkali Sink, Red Fir Forest, wetland-riparian.
Railroad Canyon buckwheat	*Eriogonum soliceps*	Gravelly soil, sagebrush communities.
Railroad Valley globemallow	*Sphaeralcea caespitosa* var. *williamsiae*	Greasewood, shadscale, and mixed shrubs zones, often more abundant on recovering disturbances such as washes and roadsides.
Red poverty weed	*Micromonolepis pusilla*	May be found in plains, open pine forest, chaparral slopes, and dry rock cliffs.
Redberry	*Rhamnus ilicifolia*	Chaparral, montane forests.
Red-fruited lomatium	*Lomatium erythrocarpum*	Generally found in open areas, in the ecotone between shrub-steppe vegetation, dominated by mountain mahogany and big sagebrush
Red-rooted yampah	*Perideridia erythrorhiza*	Found in moist prairies with tufted hairgrass and California oatgrass. Also pastureland and wood edges.
Reese River phacelia	*Phacelia glaberrima*	Low, barren hills with white, alkaline clay soils. Also limestone talus.

Common Name	*Latin Name*	Habitat Description
Rigid threadbush	*Nemacladus rigidus*	Desert scrub, juniper or pinyon-juniper woodland, sandy and gravelly wash bottoms, volcanic ash.
Roadside agrimonia	*Agrimonia striata*	Moist places, generally in woodland; Moist upper elevation mixed conifer forests.
Rock melic, nodding melicgrass	*Melica stricta*	Sagebrush Scrub, Yellow Pine Forest, Red Fir Forest, Northern Juniper Woodland, Lodgepole Forest, Subalpine Forest, Bristle-cone Pine Forest.
Rock purpusia	*Ivesia arizonica* var. *saxosa*	Crevices of cliffs and boulders on volcanic and possibly carbonate rocks in the upper mixed-shrub, sagebrush, and pinyon-juniper zones.
Rollins' lomatium	*Lomatium rollinsii*	Mid to low elevation canyon grasslands of early to late seral successional stage. Found on gentle to steep slopes.
Rose checker-mallow	*Sidalcea malviflora* ssp. *virgata*	Open meadows, prairies, grassy hillsides, fencerows, roadsides, and in low mountain areas.
Rose's lomatium	*Lomatium roseanum*	Bare rock/talus/scree, Shrubland/chaparral. Usually found within low sagebrush vegetation. Also common in open, dry, basalt talus.
Rosy balsamroot	*Balsamorhiza rosea*	Dry, rocky slopes at low elevation.
Rosy owl-clover	*Orthocarpus bracteosus*	Sagebrush Scrub, Northern Juniper Woodland. Likely to occur in wetlands and non-wetlands.
Rosy pussypaws	*Calyptridium roseum*	Occurs usually in nonwetlands, occasionally in Sagebrush Scrub, Northern Juniper Woodland, Red Fir Forest, Lodgepole Forest.
Rough pyrrocoma	*Pyrrocoma scaberula*	Mesic grasslands and transition zones between grasslands and ponderosa pine communities.
Rural paintbrush	*Castilleja flava* var. *rustica*	Subalpine sagebrush steppe, rocky slope.
Sabin's lupine	*Lupinus sabinianus*	Lower to mid-elevation mixed coniferous forests and transitional grasslands.
Sacajawea's bitterroot	*Lewisia sacajaweana*	Occurs in montane and subalpine habitats at elevations of 5,000 to 9,500 feet.
Saddle Mountain bittercress	*Cardamine pattersonii*	Grassland/herbaceous. Moss mats over bare rocks, moist cliffs and other rocky slopes, and grassy balds.
Sagebrush loeflingia	*Loeflingia squarrosa* var. *artemisiarum*	Rocky, carbonate in Great Basin scrub and pinyon and juniper woodland.
Sagebrush pygmyleaf	*Loeflingia squarrosa* ssp. *artemisiarum*	Occurs in dry soils and loose sands of washes. Found in Great Basin scrub and Sonoran Desert scrub.
Sagebrush stickseed	*Hackelia hispida* var. *disjuncta*	Rocky talus (sparsely-vegetated) at elevations of 600 to 2100 feet in the Columbia Basin and Eastern Cascades.
Saline plantain	*Plantago eriopoda*	Alkaline meadows at lower elevations.
Salt heliotrope	*Heliotropium curassavicum*	Occurs in Yellow Pine Forest, Red Fir Forest, Lodgepole Forest, Foothill Woodland, Chaparral, Valley Grassland.
Sanborn's onion	*Allium sanbornii* var. *sanbornii*	Heavy serpentine clay. Chaparral, Foothill Woodland, Yellow Pine Forest.
Sand seep clover or Kane white-tip clover	*Trifolium variegatum* var. *parunuweapensis*	Drainage bottoms with rushes within ponderosa pine and pinyon-juniper woodland.
Scapose or tufted Townsend daisy	*Townsendia scapigera*	Openings in sagebrush. Sagebrush Scrub, Pinyon-Juniper Woodland, Subalpine Forest, Lodgepole Forest.

Common Name	*Latin Name*	Habitat Description
Scarlet buckwheat	*Eriogonum phoeniceum*	Tuffaceous ash outcrops, sagebrush communities, pinyon-juniper woodlands.
Schoolcraft buckwheat	*Eriogonum microthecum* var. *schoolcraftii*	Sandy to rocky soil, sagebrush communities, pinyon-juniper woodlands.
Schoolcraft catseye	*Cryptantha schoolcraftii*	Sagebrush steppe zone.
Scribner's grass	*Scribneria bolanderi*	Sterile or sandy to rocky soil, often along roadsides, mostly in foothills and lower mtns.
Scrub lotus	*Lotus argyraeus* var. *multicaulis*	Pinyon/juniper woodland
Serpentine catchfly	*Silene hookeri* ssp. *serpentinicola*	Serpentine soils, chaparral, conifer forest.
Serpentine dwarf rose	*Rosa gymnocarpa* var. *serpentina*	Forest/Woodland, Shrubland/chaparral. Full sun in chaparral, dwarf forest on ultramafic substrates.
Sevier townsendia	*Townsendia jonesii* var. *lutea*	Salt desert and mixed desert shrub and juniper-sagebrush communities.
Sexton mt. mariposa-lily	*Calochortus indecorus*	Rocky, serpentine substrates. Probably in woodlands with grassy openings.
Shaggy horkelia	*Horkelia congesta* ssp. *congesta*	Grassland and oak savannah remnants and grassy balds.
Sharpfruited peppergrass	*Lepidium oxycarpum*	Valley Grassland, Coastal Salt Marsh, wetland-riparian.
Shasta orthocarpus	*Orthocarpus pachystachyus*	Alkaline in Great Basin scrub.
Shevock bristlemoss	*Orthotrichum shevockii*	Habitat is arid pinyon pine woodland to very open ponderosa pine forests. It is restricted to very large granitic boulders and rock walls.
Shiny-fruited popcorn flower	*Plagiobothrys lamprocarpus*	Moist places in an old [dirt] road.
Shockey's or matted cowpie buckwheat	*Eriogonum shockleyi* var. *shockleyi*	Gravelly or clayey flats, washes, and slopes, saltbush, blackbrush, and sagebrush communities, pinyon-juniper woodlands.
Shockley's ivesia	*Ivesia shockleyi*	Open, exposed rocky ridges and outcrops. Associates with pinyon pine-juniper woodlands and ponderosa pine forests.
Short-flowered eriogonum	*Eriogonum brachyanthum*	Creosote bush, other warm desert shrub & shad-scale communities
short-lobed penstemon	*Penstemon seorsus*	Dry, open, rocky places in the plains and foothills, often with sagebrush.
Sickle-pod rockcress	*Boechera atrorubens*	Rocky summits and sandy loam on sagebrush slopes.
Sickle-pod rockcress	*Arabis sparsiflora* var. *atrorubens*	Rocky summits and sandy loam on sagebrush slopes.
Sierra brodiaea	*Triteleia ixioides* ssp. *anilina*	Coniferous forest edges, often in moist gravel or sand.
Sierra Valley ivesia	*Ivesia aperta* var. *aperta*	Clay, often roadsides in Great Basin scrub and pinyon and juniper woodland.
Silver-bordered fritillary	*Boloria selene*	Mostly wet meadows, marshes, bogs and more open parts of shrubbier wetlands. Spring fed meadows in dry prairie regions.
Simpson's hedgehog cactus	*Pediocactus simpsonii*	Pinyon-juniper woodlands, sagebrush, montane and prairie grasslands, and coniferous forests.
Siskiyou fairy bells	*Prosartes parvifolia*	Montane conifer, mixed-evergreen forest, exposed roadsides.

Common Name	*Latin Name*	Habitat Description
Siskiyou mariposa-lily	*Calochortus persistens*	Open areas of ridgeline rock outcrops and talus within montane shrub plant communities of coniferous forests.
Siskiyou monardella	*Monardella purpurea*	Rocky slopes, generally on serpentine or related bedrock, chaparral, woodland, montane forest.
Siskiyou phacelia	*Phacelia leonis*	Upper montane coniferous forest openings; sometimes serpentinite. Sandy flats, slopes, conifer forest.
Slender moonwort	*Botrychium lineare*	Cliff, Forest - Conifer, Forest/Woodland, Grassland/herbaceous, Woodland - Conifer
Slender sedge	*Carex lasiocarpa* var. *americana*	Grass/Grass-like habitat.
Slender-flowered evening-primrose	*Tetrapteron graciliflorum*	Open or shrubby slopes, generally clay soils, grassland, oak and Joshua-tree woodland.
Slickspot peppergrass	*Lepidium papilliferum*	Playa/salt flat, Shrubland/chaparral. Semi-arid, sagebrush-steppe habitats.
Small-flower evening-primrose	*Eremothera minor*	Sandy slopes, flats, sagebrush scrub.
Smoky Mt. globemallow	*Sphaeralcea grossulariifolia* var. *fumariensis*	Desert, Forest/Woodland, Shrubland/chaparral, Woodland - Conifer.
Smooth mentzelia	*Mentzelia mollis*	Barren. Ash/claybed outcrops. Adjacent areas support sagebrush-shadscale plant communities.
Smooth wild cabbage	*Caulanthus crassicaulis* var. *glaber*	Dry sagebrush scrub, pinyon/juniper woodland.
Snake River cryptantha	*Cryptantha spiculifera*	Dry, open, flat, or sloping areas in stable or stony soils, with low vegetative cover.
Snake River goldenweed	*Pyrrocoma radiata*	A grazing-modified sagebrush/grassland community and steep, rocky hillsides.
Snake River milkvetch	*Astragalus purshii* var. *ophiogenes*	Arid, shrub-steppe habitat growing in shallow soils which generally excludes sagebrush.
Snowball cactus	*Pediocactus nigrispinus*	Sagebrush, grasslands, and coniferous forests.
Soldier Meadow cinquefoil	*Potentilla basaltica*	Grassland/herbaceous and in alkaline meadows above, and outflow stream margins below, desert springs.
South Fork John Day milk-vetch	*Astragalus diaphanus* var. *diurnus*	Dry, barren slopes and in openings in juniper woodland.
Southern Oregon buttercup	*Ranunculus austrooreganus*	Open oak savannahs and grasslands and along the margins of rocky vernal pools.
Spearhead	*Chlorocrambe hastata*	Moderately moist rocky places in the mountains, on hillsides, slopes, and canyons.
Spinescent fameflower	*Phemeranthus spinescens*	Basaltic outcrops and scablands in sagebrush deserts.
Spokane false golden-aster	*Heterotheca barbata*	Sandy plains; Grassland/herbaceous.
St. George blue-eyed grass	*Sisyrinchium radicatum*	Grassland/herbaceous. Occurs in moist, sometimes alkaline meadows, stream banks, and borders of springs.
Stalked moonwort	*Botrychium pedunculosum*	Mountain meadows, Streamside areas, open- to closed-canopy forests and woodlands, roadsides or similarly open or disturbed habitats.

Common Name	*Latin Name*	Habitat Description
Starveling milkvetch	*Astragalus jejunus* var. *jejunus*	Occurs on dry barren ridges and bluffs of shale, sandstone, clay, or cobblestones. Barrens, Shrubland/chaparral.
Steamboat monkeyflower	*Diplacus ovatus (Mimulus ovatus)*	Dry slopes in sagebrush and pinyon-juniper communities.
Stebbin's malacothrix	*Malacothrix stebbinsii*	Gravelly soils beneath shrubs, along ditches, near streams, in sagebrush steppes, creosote bush scrublands.
Sticky pyrrocoma	*Pyrrocoma lucida*	Carbonate or volcanic, gravelly or rocky substrate in pinyon and juniper woodland.
Stiff milkvetch or Idaho milkvetch	*Astragalus conjunctus* var. *conjunctus*	Dry rocky slopes, scablands, and hilltops throughout the sagebrush desert. It typically is found above 2000 feet.
Succor Creek parsley	*Lomatium packardiae*	Usually found within low sagebrush vegetation. Also common in open, dry, basalt talus.
Suksdorf's milk-vetch	*Astragalus pulsiferae* var. *suksdorfii*	Sandy, volcanic, lake margins in Great Basin scrub and pinyon and juniper woodland.
Sunnyside green gentian	*Frasera gypsicola*	Barrens, Desert, Shrubland/chaparral. White soils encrusted with mineral salts in valley bottoms.
Susanville beardtongue	*Penstemon sudans*	Forest/Woodland, Shrubland/chaparral. Open, sagebrush- or woodland-dominated, rocky slopes on volcanic, alkaline clay, or other igneous substrates.
Tall dropseed	*Sporobolus compositus* var. *compositus*	Prairie, Plains, Meadows, Pastures, Savannahs, Open woodlands.
Tecopa birdbeak	*Cordylanthus tecopensis*	Desert, Grassland/herbaceous. Mohavean desert scrub, alkali flats and meadows below 2500 feet.
Thin-leaved peavine	*Lathyrus holochlorus*	Characteristic habitat is believed to be prairie edge/oak savanna/prairie-oak woodland ecotone, which historically was maintained by fire.
Thompson's chaenactis	*Chaenactis thompsonii*	Barrens, Grassland/herbaceous. Mostly restricted to serpentine soils.
Thompson's clover	*Trifolium thompsonii*	Dry, open grasslands dominated by Idaho fescue and bluebunch wheatgrass, occasionally ponderosa woods.
Thompson's paintbrush	*Castilleja thompsonii*	Dry soil, frequently associated with sagebrush. Local on open slopes and bald summits of the surrounding mountains to about 7000 ft.
Three forks stickseed	*Hackelia ophiobia*	Most mesic talus and rock crevices along the Owyhee River and its tributaries near waterline and *Artemista packardiae*.
Three-leaf goldthread	*Coptis trifolia*	Sandy or gravelly soil of grasslands, sagebrush steppe, barren slopes; plains, valleys.
Threeleaf milkvetch, plains milkvetch	*Astragalus gilviflorus*	Barren knolls, stony hilltops, gullied bluffs and badlands, on limestone, shale or sandstone in sagebrush communities at 5340-6590 feet.
Three-toothed horkelia	*Horkelia tridentata* ssp. *tridentata*	Open areas, primarily in sagebrush communities and conifer woodlands.
Tiehm peppercress	*Stroganowia tiehmii*	Found most often within the sagebrush zone; outlying occurrences can be found in the surrounding lower juniper.
Timwort	*Cicendia quadrangularis*	Valley Grassland, Northern Oak Woodland, Foothill Woodland; < 2700 m.

Common Name	*Latin Name*	Habitat Description
Tioga Pass sedge	*Carex tiogana*	Grassland/herbaceous. On terraces next to lakes; meadows. Mesic sites; 3090-3310 m
To be determined	*Monardella angustifolia*	Surrounding vegetation includes sagebrush steppe and big sagebrush shrubland.
Tonopah milk-vetch	*Astragalus pseudiodanthus*	Great Basin scrub
Toquima milkvetch	*Astragalus toquimanus*	Forest/Woodland, Shrubland/chaparral, Woodland - Conifer. Gravelly/stony hillsides and canyon benches.
Torrey milkvetch	*Astragalus calycosus* var. *monophyllidius*	Forest - Conifer, Forest/Woodland. Open gravelly hillsides, in scattered juniper and pinyon forest, on limestone.
Trans montane abronia	*Abronia turbinata*	Sandy soils, desert scrub.
Tufted cryptantha	*Cryptantha caespitosa*	Populations are usually restricted to rocky or chalky ridgetops in cushion plant communities.
Tufted evening primrose	*Oenothera caespitosa* ssp. *marginata*	Rocky or sandy sites in granite, limestone, or sandstone soils, pinyon/juniper woodland to pine forest.
Tufted townsend daisy	*Townsendia scapigera*	Sagebrush Scrub, Pinyon-Juniper Woodland, Subalpine Forest, Lodgepole Forest, Bristle-cone Pine Forest.
Tunnel Springs beardtongue	*Penstemon concinnus*	Endemic to the Great Basin occurring in pinyon-juniper, blue grama, mountain mahogany, cliff rose, and sagebrush communities.
Twin-spiked moonwart	*Botrychium paradoxum*	Montane to subalpine grasslands or forb-dominated meadows. Also in western red cedar forests.
Tygh Valley milk-vetch	*Astragalus tyghensis*	Dry rocky soils with a thin overlying sandy layer. Part of mounded prairies, open bunchgrass grasslands, or semi-open juniper communities.
Umpqua mariposa-lily	*Calochortus umpquaensis*	Found within a rather broad continuum of habitats, from closed canopy coniferous forests to rather open, species-rich, grass-forb meadows.
United blazingstar, ventana stickleaf	*Mentzelia congesta*	Disturbed slopes, sagebrush scrub, pinyon/juniper woodlands, pine forests.
Upward-lobed moonwort	*Botrychium ascendens*	Lower montane coniferous forest (mesic).
Utah spurge	*Euphorbia nephradenia*	Shale, clay hills, blow sand and stabilized dunes; desert shrub and grassland communities.
Valley sedge	*Carex vallicola*	Dry to mesic hillsides, grasslands, thickets, open forests.
Veyo milkvetch	*Astragalus ensiformis* var. *gracilior*	Open valley floor in stiff clay soil, sheltering under and growing up through sagebrush, 4900 ft.
Wallowa ricegrass	*Achnatherum wallowaense*	Restricted to non-forested, rocky, shallow soils, dominated by *Poa secunda*, other bunchgrasses and forbs. Rigid sagebrush is often present.
Wanapum crazyweed	*Oxytropis campestris* var. *wanapum*	Open sagebrush communities dominated by shrubs and grasses on deep sand.
Ward's penstemon	*Penstemon wardii*	Semi-barren, light-colored clays (often calcareous or gypsiferous) in desert shrub and pinyon-juniper.
Warner mt. bedstraw	*Galium serpenticum* ssp. *warnerense*	Steep slopes, rocky areas, meadows, juniper woodland.
Washington monkeyflower	*Mimulus washingtonensis*	Forest, Shrub-Steppe.

Common Name	*Latin Name*	Habitat Description
Washoe suncup	*Camissonia pusilla*	Dry, open to branchy slopes, flats, and roadsides on sandy soil with *Artemisia* spp. to pinyon-juniper.
Wassuk beardtongue	*Penstemon rubicundus*	Desert scrub, sagebrush, pinyon-juniper ecosystems on rocky to gravelly soils on perched tufa shores.
Wavy-leaf thelypody	*Thelypodium laciniatum var. streptanthoides*	Sagebrush scrub.
Wax currant	*Ribes cereum* var. *colubrinum*	Dry habitats in conifer and oak woodlands.
Webber's ivesia	*Ivesia webberi*	Pinyon and juniper woodland (volcanic or granitic, rocky).
Welsh's milkvetch, Loa milkvetch	*Astragalus welshii*	Sagebrush, pinyon-juniper, and sagebrush-aspen communities.
Western sedge	*Carex occidentalis*	Dry grasslands, forests.
Western yellow oxalis	*Oxalis suksdorfii*	Open woods, fir, Douglas fir-oak woodlands, dry shrublands, roadsides, disturbed areas; 0–700 m.
Wheeler's skeleton-weed	*Chaetadelpha wheeleri*	Dunes, sandy soils and alkali flats in creosote bush scrub, sagebrush scrub.
White cushion erigeron	*Erigeron disparipilus*	Gravelly and rocky slopes, ridges, sagebrush, grassland.
White eatonella or false tickhead	*Eatonella nivea*	Sandy soils over basalt scabland.
White fairypoppy	*Meconella oregana*	Open ground at low elevations, usually in places that are wet in the spring.
White locoweed	*Oxytropis sericea* var. *sericea*	Sagebrush and pinyon-juniper habitats
White River swertia	*Frasera gypsicola*	White soils encrusted with mineral salts in valley bottoms.
White sand-verbena	*Abronia mellifera*	Sandy soils, cold desert scrub, grasslands.
Whited's milk-vetch	*Astragalus sinuatus*	Sagebrush-bunchgrass shrub-stepps on predominantly south facing slopes.
White-margined wax plant	*Glyptopleura marginata*	Sandy or rocky deserts, alkali flats, arid grasslands, often with *Atriplex* spp.
White-topped aster	*Sericocarpus rigidus*	Open, non-forested habitats that are seasonally mesic but somewhat moisture stressed during late summer.
Wilcox's penstemon	*Penstemon wilcoxii*	Grows in a range of habitats, from shrubby areas, forested slopes, moist soil, and rocky sites.
Wild crabapple	*Peraphyllum ramosissimum*	Oak-sagebrush, pinyon-juniper, mountain brush, and ponderosa pine communities.
Wildrose Canyon buckwheat	*Eriogonum eremicola*	Great Basin scrub
Willamette Valley larkspur	*Delphinium oreganum*	Native wet prairies, on the edges of ash and oak woodlands, and along roadsides and fence rows.
Williams's combleaf	*Polyctenium williamsiae*	Pinyon and juniper woodland
Windloving buckwheat	*Eriogonum anemophilum*	Bare rock/talus/scree, Desert, Shrubland/chaparral.
Winward's goldenbush	*Ericameria discoidea* var. *winwardii*	Landscape in the vicinity of known occurrences is predominantly mountain shrub grassland dominated by *Artemisia tridentata*.

Common Name	*Latin Name*	Habitat Description
Wirestem buckwheat	*Eriogonum pharnaceoides* var. *cervinum*	Occurs on sandy or gravelly slopes, sagebrush and mountain mahogany communities, oak, pinyon-juniper and montane conifer woodlands.
Wolf's evening primrose	*Oenothera wolfii*	Roadcuts and roadsides near the coast and possibly, moist sandy riparian areas.
Woven-spore lichen	*Teucrium canadense var. occidentale*	Lake and stream shore flats, prairie depressions
Yellow lady's-slipper	*Cypripedium parviflorum*	Damp forest understory of mixed deciduous and coniferous forests to open meadows and along streams in acidic soils
Yellowflower locoweed	*Oxytropis monticola*	Dry, sunny hillsides, rocky slopes, prairie meadows

Appendix K

Surface Fire Behavior Fire Characteristics Chart

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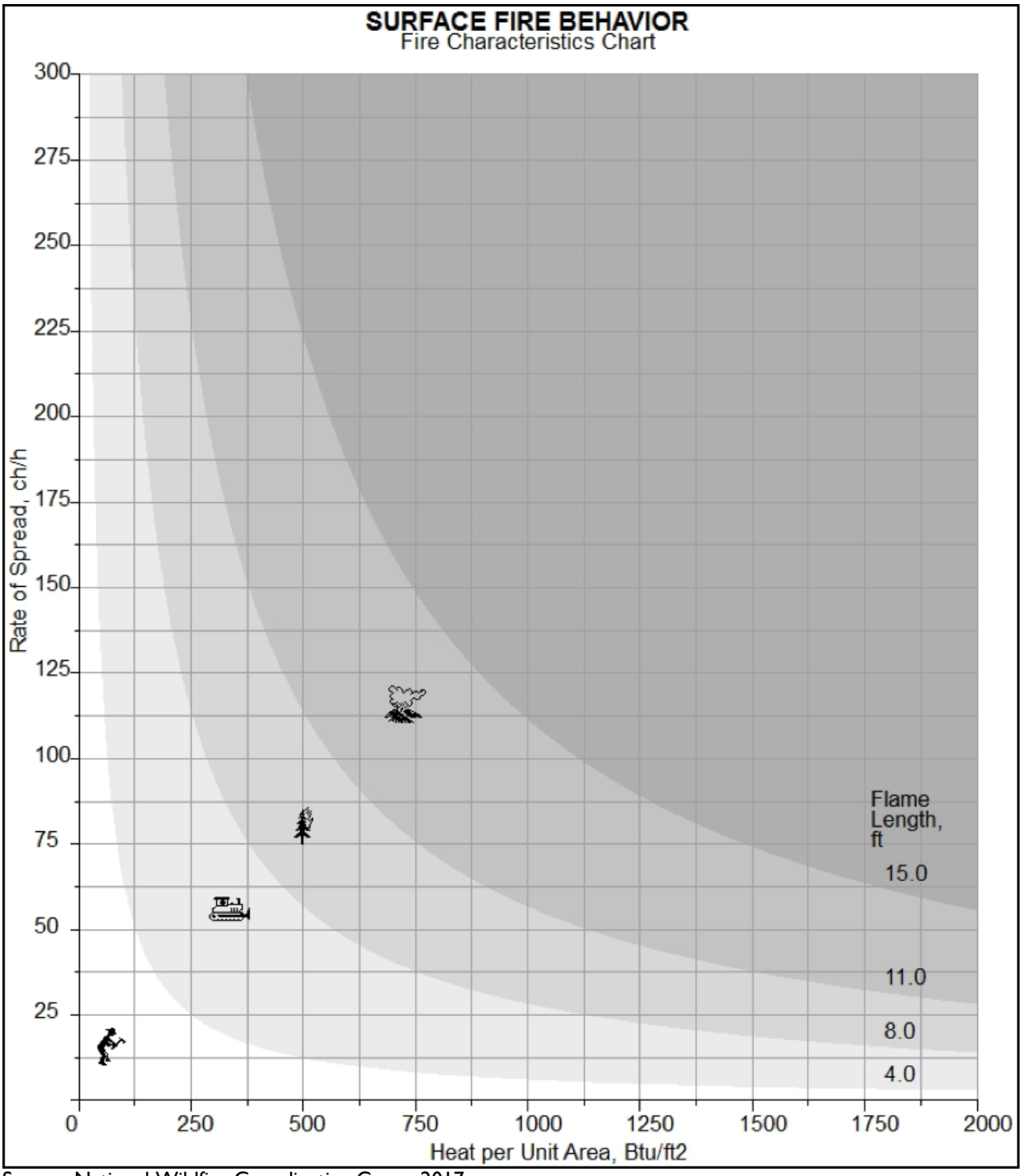
Appendix K. Surface Fire Behavior Fire Characteristics Chart



Source: National Wildfire Coordinating Group 2017

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Appendix L
Safe Separation Distance

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ANCHORPOINT
WILDLAND FIRE SOLUTIONS

BLM Fuel Break PEIS

Objective—Calculate the width of a fuel break by determining a separation distance that would allow firefighters to safely engage in suppression efforts against a fast-moving fire. In wildland fire, safety zones are used for this purpose. These same guidelines can be used by local managers to apply on local projects.

Fuel Break[1]*:*

A natural or manmade change in fuel characteristics which affects fire behavior so that fires burning into them can be more readily controlled.

Safety Zone[2]*:*

An area cleared of flammable materials used for escape in the event the line is outflanked or in case a spot fire causes fuels outside the control line to render the line unsafe. In firing operations, crews progress so as to maintain a safety zone close at hand allowing the fuels inside the control line to be consumed before going ahead. Safety zones may also be constructed as integral parts of fuel breaks; they are greatly enlarged areas which can be used with relative safety by firefighters and their equipment in the event of blowup in the vicinity.

Methodology—In the last few years a new formula has been created to calculate an adequate safety zone or safe separation distance (SSD)[3]. This formula continues to be adjusted as further research is completed. The most current formula is as follows:

$$SSD = 8 \times \text{vegetation height} \times \Delta$$

Slope-Wind Factor (Δ)			
	Terrain Slope (%)		
Wind Speed (mph)	Flat (< 15%)	15-30%	>35%
Light (0-6)	1/0.7/**0.7**	1/1/**1**	4/2/**2**
Moderate (7-15)	2/1/**1**	4/2/**1**	6/3/**2**
Strong (>18)	4/2/**2**	6/3/**2**	8/3/**2**

Fuels < 10' tall / 10' < Fuel > 40 '/ Fuel > 40'
SSD = Safe Separation Distance

For a more detailed discussion see attached document provided by Bret Butler (Spring 2018_Summary_v4).

[1] https://www.nwcg.gov/term/glossary/fuel-break%C2%A0
[2] https://www.nwcg.gov/term/glossary/safety-zone%C2%A0
[3] https://www.firelab.org/project/firefighter-safety

Example 1: 3’ tall sage brush, 22% slope, 10 mph wind
▲ = 4 SSD = 8 x 3’ x 4 = 96’ or .6 acres

Example 2: 20’ tall juniper, 10% slope, 15 mph
▲ = 1 - 2 SSD = 8 x 20’ x 1 = 160’ - 320’ or 2 to 3 acres

The SSD is a radius so it is multiplied by 2 pi (π) to get a circumference for a safety zone in continuous fuels. However, to determine the width of a linear fuel break, use the formula for a diameter (D = 2xSSD), if it is in a continuous fuel bed. If cutting off of a road, subtract the width of the road.

Discussion—Slope and wind are the two critical variables that can increase the needed spacing. The fuel type (vegetative species) is not factored into the equation, only the height. In email discussions with Bret Butler, Research Scientist that developed the SSD concept, he stated that although he believes there are differences in energy output by different species, he currently doesn't have the data to support it. The primary fuels that will be managed are pinyon-juniper woodlands and sagebrush. Both of these fuel types produce high heat energy when burned due to volatile oils in the needles and leaves. It is recommended that conservative values (worst case scenario) be used for determining spacing.

Submitted by:
Rodrigo Moraga
Fire Behavior Analyst
August 29, 2018

Safe Separation Distance calculation

SSD = 8 x vegetation height x Δ

Slope-Wind Factor (Δ)			
	Terrain Slope (%)		
Wind Speed (mph)	Flat (< 15%)	15-30%	>35%
Light (0-6)	1/0.7/**0.7**	1/1/**1**	4/2/**2**
Moderate (7-15)	2/1/**1**	4/2/**1**	6/3/**2**
Strong (>18)	4/2/**2**	6/3/**2**	8/3/**2**

Fuels < 10 feet height

Example:
Fuel = 6 ft
Slope=20%
Winds 14mph

Fuel Break width = 8 x 6 x 4= 192 = (D26) x 2= 384 (K26) linear feet

Example: Single fuel break on one side of a road

Slope-Wind Factor

Height of Vegetation	8*1	8*2	8*4	8*6	8*8
1	8	16	32	48	64
2	16	32	64	96	128
3	24	48	96	144	192
4	32	64	128	192	256
5	40	80	160	240	320
6	48	96	192	288	384
7	56	112	224	336	448
8	64	128	256	384	512
9	72	144	288	432	576
10	80	160	320	480	640
11	88	176	352	528	704
12	96	192	384	576	768
13	104	208	416	624	832
14	112	224	448	672	896
15	120	240	480	720	960
16	128	256	512	768	1024
17	136	272	544	816	1088
18	144	288	576	864	1152
19	152	304	608	912	1216
20	160	320	640	960	1280

Fuel breaks of 500 feet or less are in yellow.

Example: Two fuel breaks, one on each side of a road

SW factor X 2 = Fuelbreak width

Height of Vegetation	8*1	8*2	8*4	8*6	8*8
1	16	32	64	96	128
2	32	64	128	192	256
3	48	96	192	288	384
4	64	128	256	384	512
5	80	160	320	480	640
6	96	192	384	576	768
7	112	224	448	672	896
8	128	256	512	768	1024
9	144	288	576	864	1152
10	160	320	640	960	1280
11	176	352	704	1056	1408
12	192	384	768	1152	1536
13	208	416	832	1248	1664
14	224	448	896	1344	1792
15	240	480	960	1440	1920
16	256	512	1024	1536	2048
17	272	544	1088	1632	2176
18	288	576	1152	1728	2304
19	304	608	1216	1824	2432
20	320	640	1280	1920	2560

Safe Separation Distance calculation

SSD = 8 x vegetation height x Δ

Slope-Wind Factor (Δ)			
	Terrain Slope (%)		
Wind Speed (mph)	Flat (< 15%)	15-30%	>35%
Light (0-6)	1/0.7/**0.7**	1/1/**1**	4/2/**2**
Moderate (7-15)	2/1/**1**	4/2/**1**	6/3/**2**
Strong (>18)	4/2/**2**	6/3/**2**	8/3/**2**

10’ < Fuel > 40 ‘ height

Example: Single fuel break on one side of a road

Slope-Wind Factor

Height of Vegetation	8*.7	8*1	8*2	8*3
21	117.6	168	336	504
22	123.2	176	352	528
23	128.8	184	368	552
24	134.4	192	384	576
25	140	200	400	600
26	145.6	208	416	624
27	151.2	216	432	648
28	156.8	224	448	672
29	162.4	232	464	696
30	168	240	480	720
31	173.6	248	496	744
32	179.2	256	512	768
33	184.8	264	528	792
34	190.4	272	544	816
35	196	280	560	840
36	201.6	288	576	864
37	207.2	296	592	888
38	212.8	304	608	912
39	218.4	312	624	936
40	224	320	640	960

Fuel breaks of 500 feet or less are in yellow.

Example: Two fuel breaks, one on each side of a road

SW factor X 2 = Fuelbreak width

Height of Vegetation	8*.7	8*1	8*2	8*3
21	235.2	336	672	1008
22	246.4	352	704	1056
23	257.6	368	736	1104
24	268.8	384	768	1152
25	280	400	800	1200
26	291.2	416	832	1248
27	302.4	432	864	1296
28	313.6	448	896	1344
29	324.8	464	928	1392
30	336	480	960	1440
31	347.2	496	992	1488
32	358.4	512	1024	1536
33	369.6	528	1056	1584
34	380.8	544	1088	1632
35	392	560	1120	1680
36	403.2	576	1152	1728
37	414.4	592	1184	1776
38	425.6	608	1216	1824
39	436.8	624	1248	1872
40	448	640	1280	1920

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Appendix M
Consultation and Coordination

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Appendix M. Consultation and Coordination

Table M-1
Scoping Open Houses Held in 2018

Location	Date	Venue
California		
Susanville	6 February 2018	BLM Eagle Lake Field Office 2550 Riverside Drive Susanville, CA 96130
Idaho		
Boise	30 January 2018	Wyndham Garden Boise Airport 3300 South Vista Avenue Boise, ID 83705
Twin Falls	13 February 2018	Canyon Springs Red Lion Inn 1357 Blue Lakes Boulevard Twin Falls, ID 83301
Idaho Falls	14 February 2018	Hilton Garden Inn 700 Lindsay Boulevard Idaho Falls, ID 83402
Nevada		
Reno	7 February 2018	UNR – Crowley Student Union, Milt Glick Ballroom C 1664 North Virginia Street Reno, NV 89503
Elko	8 February 2018	Red Lion Hotel, High Desert Inn Ballroom 2065 Idaho Street Elko, NV 89801
Ely	13 February 2018	Bristlecone Convention Center 150 Sixth Street Ely, NV 89301
Tonopah	15 February 2018	Tonopah Convention Center 301 Brougher Avenue Tonopah, NV 89049
Oregon		
Lakeview	7 February 2018	BLM Lakeview District Interagency Office 1301 South G Street Lakeview, OR 97630
Burns	8 February 2018	Harney County Chamber of Commerce/Community Center 484 North Broadway Burns, OR 97720
Utah		
Snowville	31 January 2018	Snowville Elementary School 160 North Stone Road Snowville, UT 84336
Salt Lake City	15 February 2018	Courtyard by Marriott Downtown 345 West 100 South Salt Lake City, UT 84101
Cedar City	14 February 2018	Heritage Center – Festival Hall 105 North 100 East Cedar City, UT 84720

Location	Date	Venue
Vernal	1 February 2018	Uintah Conference Center 313 East 200 South Vernal, UT 84078
Washington		
Moses Lake	1 February 2018	Moses Lake Best Western 3000 West Marina Drive Moses Lake, WA 98837

Table M-2
Tribes Invited to Participate as a Cooperating Agency and Through Government-to-Government Consultation

Alturas Indian Rancheria, California
Bridgeport Indian Colony
Burns Paiute Tribe
California Native American Heritage Commission
Cedarville Rancheria, California
Coeur d'Alene Tribe
Confederated Salish and Kootenai Tribes of the Flathead Reservation
Confederated Tribes and Bands of the Yakama Nation
Confederated Tribes of the Colville Reservation
Confederated Tribes of the Goshute Reservation, Nevada and Utah
Confederated Tribes of the Umatilla Reservation
Confederated Tribes of the Warm Springs Reservation of Oregon
Death Valley Timbi-sha Shoshone Tribe
Duckwater Shoshone Tribe of the Duckwater Reservation, Nevada
Eastern Shoshone Tribe of the Wind River Reservation, Wyoming
Ely Shoshone Tribe of Nevada
Fort Bidwell Indian Community of the Fort Bidwell Reservation of California
Fort McDermitt Paiute and Shoshone Tribes of the Fort McDermitt Indian Reservation, Nevada and Oregon
Greenville Rancheria
Hopi Tribe of Arizona
Kaibab Band of Paiute Indians of the Kaibab Indian Reservation, Arizona
Kalispel Indian Community of the Kalispel Reservation
Klamath Tribes
Kootenai Tribe of Idaho
Las Vegas Tribe of Paiute Indians of the Las Vegas Indian Colony, Nevada
Lovelock Paiute Tribe of the Lovelock Indian Colony, Nevada
Moapa Band of Paiute Indians of the Moapa River Indian Reservation, Nevada
Navajo Nation, Arizona, New Mexico & Utah
Nevada Indian Commission
Nez Perce Tribe
Northwestern Band of Shoshone Nation
Paiute Indian Tribe of Utah
Paiute Indian Tribe of Utah - Cedar Band of Paiutes
Paiute Indian Tribe of Utah - Indian Peaks Band of Paiutes
Paiute Tribe of Utah - Kanosh Band of Paiutes
Paiute Indian Tribe of Utah - Koosharem Band of Paiutes
Paiute Indian Tribe of Utah - Shivwits Band of Paiutes
Paiute-Shoshone Tribe of the Fallon Reservation and Colony, Nevada

Pit River Tribe
Pyramid Lake Paiute Tribe of the Pyramid Lake Reservation, Nevada
Reno-Sparks Indian Colony
Shoshone-Bannock Tribes of the Fort Hall Reservation
Shoshone-Paiute Tribes of the Duck Valley Reservation, Nevada
Skull Valley Band of Goshute Indians of Utah
Southern Ute Indian Tribe
Spokane Tribe of the Spokane Reservation
Summit Lake Paiute Tribe
Susanville Indian Rancheria, California
Te-Moak Tribe of Western Shoshone Indians of Nevada
Te-Moak Tribe of Western Shoshone Indians of Nevada - Battle Mountain Band
Te-Moak Tribe of Western Shoshone Indians of Nevada - Elko Band
Te-Moak Tribe of Western Shoshone Indians of Nevada - South Fork Band
Te-Moak Tribe of Western Shoshone Indians of Nevada - Wells Band
The Modoc Tribe of Oklahoma
Ute Indian Tribe of the Uintah and Ouray Reservation, Utah
Ute Mountain Ute Tribe
Walker River Paiute Tribe of the Walker River Reservation, Utah
Washoe Tribe of Nevada and California
Winnemucca Indian Colony of Nevada c/o Reno Law Group
Yerington Paiute Tribe of the Yerington Colony & Campbell Ranch, Nevada
Yomba Shoshone Tribe of the Yomba Reservation, Nevada

Table M-3
Agencies and Organizations Invited to Participate as a Cooperating Agency

Agency or Tribe Invited to be a Cooperator	Accepted	Declined	No Response
California			
Bureau of Indian Affairs, Northern California Agency			X
California Department of Forestry			X
California Department of Fish and Wildlife			X
Commander, Department of Defense, Navy Region Southwest			X
Department of Defense, Navy Region Southwest			X
State Clearinghouse, Governor's Office of Planning and Research			X
Modoc Wildlife Refuge			X
National Park Service Whiskeytown			X
Lava Beds National Monument			X
Klamath National Forest			X
Lassen National Forest			X
Modoc National Forest			X
Plumas National Forest			X
Shasta-Trinity National Forest			X
Modoc County			X
Lassen County			X
Idaho			
Idaho National Guard	X		
Blaine County	X		
Cassia County	X		
Lemhi County	X		
Owyhee County		X	
Idaho Association of Counties			X
Idaho Department of Fish and Game			X
Idaho Governor's Office			X
Idaho Governor's Office of Species Conservation			X
Boise National Forest			X
Caribou-Targhee National Forest			X
Salmon-Challis National Forest			X
Sawtooth National Forest			X
Craters of the Moon National Monument			X
Bingham County			X
Custer County			X
Fremont County			X
Madison County			X
Twin Falls County			X
Power County			X

Agency or Tribe Invited to be a Cooperator	Accepted	Declined	No Response
Nevada			
Nevada Department of Wildlife	X		
Elko County	X		
Eureka County	X		
Humboldt County	X		
Lincoln County	X		
Storey County	X		
Churchill County		X	
Congressman Mark Amodei			X
Department of Defense, Fallon Naval Air Station			X
Department of Defense, Nellis Air Force Base			X
Nevada Department of Transportation			X
Nevada Department of Conservation and Natural Resources			X
Sagebrush Ecosystem Program			X
Clark County			X
Jefferson County			X
Lander County			X
Nye County			X
Pershing County			X
Washoe County			X
White Pine County			X
Oregon			
Oregon DOT		X	
Oregon Parks and Recreation		X	
Bonneville Power Administration			X
Department of Agriculture			X
Department of Energy			X
Department of Environmental Quality			X
Department of Fish and Wildlife			X
Department of Forestry			X
Department of Geology & Mineral Industries			X
Department of State Lands			X
Department of Transportation			X
Deschutes County Community Development Department			X
Federal Highway Administration, Oregon Division			X
Governor's Office of Natural Resources			X
Governor of Oregon			X
Harney Soil and Water Conservation District			X
Land Conservation and Development Department			X
State Parks & Recreation Department			X
Water Resources Department			X
US Army Corps of Engineers, Northwest Division			X
USDA Rural Development			X
US Forest Service, Pacific Region			X

Agency or Tribe Invited to be a Cooperator	Accepted	Declined	No Response
Baker County			X
Crook County			X
Gilliam County			X
Grant County			X
Harney County			X
Jefferson County			X
Lake County			X
Malheur County			X
Morrow County			X
Umatilla County			X
Union County			X
Sherman County			X
Wallowa County			X
Wasco County			X
Utah			
Carbon County	X		
Duchesne County	X		
Public Lands Policy Coordinating Office	X		
State of Utah, Governor's Public Lands Policy Coordination Office	X		
Beaver County	X		
Forest Service Intermountain Region			X
Box Elder County			X
Daggett County			X
Emery County			X
Garfield County			X
Grand County			X
Iron County			X
Juab County			X
Kane County			X
Millard County			X
Piute County			X
Rich County			X
Sanpete County			X
Sevier County			X
Tooele County			X
Uintah County			X
Utah County			X
Wasatch County			X
Wayne County			X
Washington			
Washington Department of Fish and Wildlife			X
Other			
Natural Resources Conservation Service, Nevada, Utah, Idaho, Oregon	X		
National Trails Intermountain Region, National Park Service	X		

Agency or Tribe Invited to be a Cooperator	Accepted	Declined	No Response
US Environmental Protection Agency, Regions 9 and 10		X	
Bureau of Reclamation			X
Department of Defense, Air Force Western Regional Office			X
Department of Defense, Army Regional Energy and Environmental Office, Western Department of Defense			X
Federal Highway Administration			X
Federal Energy Regulatory Commission			X
National Park Service, Washington DC			X
Natural Resources Conservation Service Clearinghouse			X
USDA Soil Conservation Service			X
US Department of Energy			X
US Fish and Wildlife Service, Nevada, California, Utah, Idaho, Oregon			X
US Forest Service, Research and Development			X

Table M-4
List of Preparers

BUREAU OF LAND MANAGEMENT	
Name	**Role/Responsibility**
Interdisciplinary Team	
Marlo Draper	BLM Project Manager
Sheila Lehman	ID NEPA Specialist
Dusty Pence	Fire/Fuels
Sandy Gregory	Fire/Fuels
Gillian Wigglesworth	Vegetation
Jeremy Bisson	Fish and Wildlife, Special Status Species
Shannon Bassista	Special Designations, Lands with Wilderness Characteristics, Recreation and Travel Management
Brianna Goehring	Livestock Grazing, Wild Horses and Burros
Kim Allison	Livestock Grazing, Wild Horses and Burros
Justin Shirley	Livestock Grazing, Wild Horses and Burros
Jeremy Bluma	Lands and Realty
Kelli Barnes	Cultural Resources and Tribal Interests, Paleontological Resources
Nick Pay	Cultural Resources and Tribal Interests, Paleontological Resources
Christa Braun	GIS
EMPSi	
Name	**Role/Responsibility**
Management Team	
Meredith Zaccherio	Project Manager
Peter Gower	Deputy Project Manager
Becky Boyle	Project Assistant
Interdisciplinary Team	
Morgan Trieger	Vegetation
Dan Morta	Vegetation
Andy Spellmeyer	Recreation, Lands with Wilderness Characteristics
Lindsay Chipman	Wildlife, Special Status Species
Kevin Rice	Wildlife
Kate Krebs	Lands with Wilderness Characteristics
Sarah Crump	Lands with Wilderness Characteristics, Socioeconomics
Derek Holmgren	Fire and Fuels
Laura Patten	Water and Soil Resources
Amy Cordle	Air Quality
Holly Prohaska	Livestock Grazing, Wild Horses and Burros
Zoe Ghali	Socioeconomics
Kevin Doyle	Cultural Resources, Tribal Interests, Paleontological Resources
Jacob Accola	GIS
Marcia Rickey	GIS