United States Department of the Interior

FISH AND WILDLIFE SERVICE
334 Parsley Boulevard
Cheyenne, Wyoming 82007

In Reply Refer to:
FWS/R6/ES/2025-0103531

Memorandum

To: Assistant Director for Resources and Planning, Bureau of Land Management, Headquarters, Washington, D.C.

TYLER ABBOTT

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Date: 2025.08.26 12:12:48 -06'00'

From: Field Supervisor, U.S. Fish and Wildlife Service, Wyoming Ecological Services Field Office, Cheyenne, Wyoming

Subject: Whitebark Pine Rangewide Programmatic Section 7 Consultation for Bureau of Land Management Livestock Grazing and Range Improvement; Lands, Realty and Cadastral Survey; Mining; Oil and Gas; Geothermal; Forest and Vegetation Management; Wild Horse and Burro Management; Recreation; Recovery Efforts and Research Activities; and Committed Conservation Measures

This document transmits the U.S. Fish and Wildlife Service's (FWS) programmatic biological opinion (PBO) for the effects to whitebark pine (*Pinus albicaulis*; WBP) from the U.S. Bureau of Land Management's (BLM) Livestock Grazing and Range Improvements; Lands, Realty and Cadastral Survey; Mining; Oil and Gas; Geothermal; Forest and Vegetation Management; Wild Horse and Burro Management; Recreation; Recovery Efforts and Research Activities; and committed conservation measures (*BLM Activities*) throughout the listed range of the WBP. Our opinion is based on our review of BLM's request for programmatic consultation on WBP received April 1, 2024 (BLM 2024), the biological assessment (BA) addendum received on March 7, 2025 (BLM 2025), and supplemental information received on August 22, 2025, for the *BLM Activities* on BLM-administered lands throughout the listed range of the species in accordance with section 7 of the Endangered Species Act of 1973, as amended (ESA; 16 U.S.C. 1531 *et seq.*). The *BLM Activities* include ongoing and future actions proposed on BLM-administered lands: the scope of this programmatic consultation covers potential effects to WBP from implementation of these *BLM Activities*.

It is anticipated that adverse effects to whitebark pine will occur as a result of the implementation of the *BLM Activities*. This PBO addresses these effects. Other federally listed, proposed, and candidate species, and proposed and designated critical habitat may also be affected by the activities identified in this PBO. Future ESA consultation will be required for any activity implemented pursuant to this PBO that may affect any other listed species or designated critical habitat not otherwise addressed in a separate section 7 consultation. Future ESA consultation will also be required for any BLM action that may affect whitebark pine for which effects are not addressed in this PBO. To address effects on whitebark pine, the attached PBO is based on information provided in the above referenced BLM documents, additional supporting material, as well as other information available to the FWS.

The FWS acknowledges the long-term, ongoing conservation efforts and commitments of the BLM relative to whitebark pine. These conservation efforts continue to provide proactive conservation for whitebark pine consistent with federal obligations under section 7(a)(1) of the ESA, thereby contributing to efforts to recover this species. We appreciate your efforts to ensure the conservation of endangered, threatened, proposed and candidate species. If you have questions regarding this consultation or your responsibilities under the ESA, please contact me directly at tyler_abbott@fws.gov or by phone at (307) 204-9042.

Attachment: Programmatic Biological Opinion for the Effects on Whitebark Pine from the Bureau of Land Management's Livestock Grazing and Range Improvements; Lands, Realty, and Cadastral Survey; Mining; Oil and Gas; Geothermal; Forest and Vegetation Management; Wild Horse and Burro Management; Recreation; Recovery Efforts and Research Activities; and Committed Conservation Measures Throughout the Species' Listed Range

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PROGRAMMATIC BIOLOGICAL OPINION

for the

Effects on Whitebark Pine from the Bureau of Land Management's Livestock Grazing and Range Improvements; Lands, Realty, and Cadastral Survey; Mining; Oil and Gas; Geothermal; Forest and Vegetation Management; Wild Horse and Burro Management; Recreation; Recovery Efforts and Research Activities; and Committed Conservation Measures Throughout the Species' Listed Range

U.S. Fish and Wildlife Service Reference Number 2025-0103531

Prepared by: U.S. Fish and Wildlife Service
Wyoming Ecological Services Field Office
August 26, 2025

Issued by: TYLER ABBOTT Digitally signed by TYLER ABBOTT Date: 2025.08.26 12:12:20 -06'00'

Tyler A. Abbott, Field Supervisor

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PROGRAMMATIC BIOLOGICAL OPINION

1. INTRODUCTION

The U.S. Fish and Wildlife Service (FWS) has prepared this programmatic biological opinion (PBO) in response to the U.S. Department of the Interior (US DOI), Bureau of Land Management (BLM) programmatic biological assessment (BA), BA addendum, supplementary information and request for formal consultation for the effects of the BLM Livestock Grazing and Range Improvements; Lands, Realty and Cadastral Survey; Mining; Oil and Gas; Geothermal; Forest and Vegetation Management; Wild Horse and Burro Management; Recreation; and Recovery Efforts and Research Activities; and committed conservation measures (*BLM Activities*) throughout the listed range of the whitebark pine (*Pinus albicaulis*) listed as threatened under the Endangered Species Act of 1973, as amended (ESA; 16 U.S.C. 1531 *et seq.*). Section 7(b) of the ESA and the implementing regulations at 50 CFR 402 direct the FWS to evaluate whether a proposed action is likely to jeopardize the continued existence of threatened or endangered species. This PBO is based on information regarding direct, indirect, and cumulative effects (together, "consequences") of the action; conditions forming the environmental baseline; and the species' ecological status. The BLM determined that the *BLM Activities* are 'likely to adversely affect' whitebark pine. Based on the analysis presented in the BA (BLM 2024), BA addendum (BLM 2025), as well as supplemental information provided, the FWS concurs with the findings of the BLM, and it is the FWS's biological opinion that the effects associated with the proposed action are not likely to jeopardize the continued existence of the whitebark pine.

This PBO is based on information in: (1) the April 1, 2024, BA; (2) the March 7, 2025, BA addendum; (3) supplemental information received August 22, 2025; (4) the FWS's *Standing Analysis for Effects to Whitebark Pine (Pinus albicaulis) from Low Effect Projects and Whitebark Pine Restoration and Recovery Activities within Montana and Wyoming* (FWS 2023); (5) the FWS's *Species Status Assessment Report for the Whitebark Pine (Pinus albicaulis)* (FWS 2021); (6) peer-reviewed scientific literature; and (7) the best available scientific data. Literature cited in this PBO is not a complete bibliography of all literature available on the species of concern, *BLM Activities* throughout the range of the whitebark pine and their effects, or on other subjects considered in this opinion.

This PBO addresses only potential effects to whitebark pine from the proposed action undertaken by the BLM or its partners in the action area (BLM-administered lands). The action area includes all BLM-administered lands for which potential whitebark pine range has been identified. This PBO does not address potential effects to species or critical habitats other than whitebark pine, or effects to whitebark pine located in areas other than the action area.

2. CONSULTATION HISTORY

This programmatic consultation addresses ongoing and proposed *BLM Activities* throughout the listed range of the whitebark pine on BLM-administered lands. A complete decision file of this consultation is available at the FWS's Wyoming Ecological Services Field Office, Cheyenne, Wyoming.

Summary of consultation history:

September 2023 – March 2024	The BLM and FWS engaged in conversations and reviewed drafts of the BA.
April 2024	The FWS received a BA and request for initiation of section 7 consultation with the FWS regarding a streamlined consultation for the effects of BLM program activities for the threatened whitebark pine.
June 2024 – June 2025	Multiple conversations were held between the FWS and the BLM to obtain additional information to complete the PBO.
July 2024	Via email, the FWS requested additional information from BLM to complete the PBO.
October 2024	Via memorandum, the FWS requested additional information from the BLM to complete the PBO.
March 2025	The FWS received from the BLM a BA addendum with additional information.
July 2025	The FWS shared a draft of the PBO for *BLM Activities* with the BLM.
July – August 2025	The FWS received the BLM's comments on the *BLM Activities* PBO.

3. DESCRIPTION OF THE PROPOSED ACTION

3.1. Purpose and Need

Regulations implementing the ESA (50 CFR 402.02) define action as "all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by federal agencies of the United States or upon the high seas." The following is a description of the proposed action. Additional information can be found in the BA and BA addendum (BLM 2024; 2025).

The BLM is proposing to continue the authorization of *BLM Activities* on BLM-administered lands where whitebark pine trees occur. This programmatic consultation is undertaken to streamline and provide section 7 consultation for the *BLM Activities*. Many of the activities described in this consultation will remove, utilize and/or extract resource components from BLM-administered lands for their economic value. Resource products extracted will be provided to commercial industries. This final PBO is supportive of (1) the March 1, 2025, Presidential Action "Immediate Expansion of American Timber Production" and Executive Order 14225 of the same name; (2) the January 20, 2025, Executive Order 14154, entitled "Unleashing American Energy" which directs the removal of impediments imposed on the development and use of our Nation's abundant energy and natural resources; and (3) Secretarial Orders 3418 and 3419, entitled "Unleashing American Energy" and "Delivering Emergency Price Relief for American Families and Defeating the Cost-of-Living Crisis", respectively.

3.2. Proposed Action

A federal action means "all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by federal agencies in the United States or upon the high seas" (50 CFR 402.02). The proposed action for this PBO consists of *BLM Activities* that the BLM may authorize in BLM Field Offices (FOs) in California, Idaho, Montana, Nevada, Oregon, Washington, and Wyoming (Table 1).

Activity	Related Activity Components
Livestock Grazing and Range Improvements	Livestock Grazing Livestock Transportation Range Improvements – Construction and Maintenance

Lands, Realty and Cadastral Survey	Rights-of-Way
	    Communication Facilities
	    Roads and Trails
	    Transmission and Distribution Lines
	    Pipelines
	Leases, Permits, and Easements
	    Land Tenure
	    Disposal/Sales
	    Acquisitions
	    Exchanges
	    Withdrawals

Mining Development	Equipment Surface Mining Underground Mining Rock Quarries and Pits Restoration/Reclamation
Oil and Gas Development	Exploration Drilling Operations Utilization Reclamation
Geothermal Energy Development	Exploration Drilling Operations Utilization Reclamation

Forest and Vegetation Management	Prescribed Fire
	    Fire Lines
	    Staging Areas
	    Firing/Ignition
	    Mop-up

	Fuels Reduction
	Pre-commercial Thinning
	Salvage Harvest
	Commercial Thinning
	Reforestation
	Pest Management

Activity	Related Activity Components
	Herbicide Treatments Mechanical Treatment Manual Treatment Biological Control
Wild Horse and Burro Management	
Recreation	Special Recreation Permitting, Travel Management Planning and Implementation (Trails, Roads), Recreation Sites (Maintenance, Construction, Improvements)
Recovery Efforts and Research	Cones Planting
Conservation Measures Included in Proposed Action	
Reporting	
Roles of the FWS and BLM Headquarters	
Field Visits	

Table 1. Types of *BLM Activities* and their related activity components.

The BLM has committed to ensure implementation of applicable conservation measures (refer to subsections 3.2.10 and 3.2.11. below, as well as *Appendix A*) to these projects which are generally anticipated to avoid many impacts to whitebark pine. Conservation measures are applicable by activity type. If the BLM is not able to include the applicable committed conservation measures analyzed in this programmatic consultation as part of individual project proposals and the BLM determines that the action "may affect" whitebark pine, then separate section 7 consultation will be completed with the FWS on the proposed project prior to approval. Annually, by January 15 of each year, the BLM will provide the FWS (1) a list of *BLM Activities* that occurred during the previous year in whitebark pine habitat, (2) the effects to whitebark pine (acreage impacted and/or numbers of seedlings/saplings/adult tree mortality) that occurred from those projects, (3) a list of conservation measures applied to those projects, and (4) a description of the effectiveness of the conservation measures applied.

U.S. Fish and Wildlife Service staff will make every effort to perform compliance checks. Operating within FWS budget and staffing level constraints, for years 1 through 5 of this programmatic and every 5 years thereafter, local FWS staff should select a random sample of completed projects annually for project implementation compliance review. This will involve after-project compliance review of completed projects with reports submitted by November 30 of the following year that the project was completed.

3.2.1. Livestock Grazing and Range Improvements

Bureau of Land Management grazing activities include livestock grazing and constructing, operating, and maintaining livestock range improvements (fencing, stock ponds, tanks, and spring developments).

Livestock Grazing. Allotments can include grazing by cattle, horses, sheep, or bison. The number and distribution of grazing allotments are not anticipated to change in the foreseeable future. Grazing allotments include BLM-administered lands as well as other land ownerships. Not all grazing allotments have whitebark pine habitat. While managing livestock grazing on BLM-administered lands, BLM implements a variety of grazing strategies and seasons. These strategies allow grazing up to certain maximum allowable use levels, or "proper use levels." Proper use is defined as a degree of utilization of current year's growth, which, if continued, will achieve management objectives and maintain or improve long-term productivity.

Grazing management systems can include season-long grazing, deferred rotation grazing, rest rotation grazing, or intensive rotational grazing. Permits and leases generally cover a 10-year period and are renewable if the BLM determines that the terms and conditions of the expiring permit or lease are being met. The amount of grazing that occurs on BLM-administered lands each year can be affected by factors such as drought, wildfire, and market conditions. To achieve desired conditions on BLM-administered lands, the BLM uses rangeland health standards and guidelines:

- Standards describe specific *conditions* needed for public land health, such as the presence of streambank vegetation and adequate canopy and ground cover.
- Guidelines are the management *techniques* designed to achieve or maintain healthy public lands, as defined by the standards. This includes seed dissemination and periodic rest, or deferment, from grazing in specific allotments during critical growth periods.

The BLM authorize grazing permittees and lessees the flexibility to adjust their livestock grazing use to accommodate yearly fluctuations in forage production or to meet specific ecological or resource outcomes. Grazing flexibility can take many forms to help achieve or make progress towards land health standards, for example, adjusting season of use and livestock numbers to meet a specific resource outcome. Stubble height and/or utilization requirements are considered triggers to move livestock. Compliance or non-compliance with grazing use indicators are determined by end-of-growing season monitoring.

Salt, protein, and mineral blocks are used to improve distribution of livestock into areas of light use and to lessen impacts to key areas. Supplemental feed is typically not allowed other than to lure cattle into corrals or gathering areas for shipping. When used, livestock feed must be certified weed free.

Livestock Transportation. Livestock are often trailed between allotments seasonally or more frequently based on the grazing management system on each specific allotment. Trailing of livestock occurs cross country by herding with horses or with the use of trucks. Off-road or cross-country travel is authorized on a limited basis for monitoring, maintenance, project implementation, and other essential routine ranching activities.

Range Improvements. There are two kinds of range improvements on BLM-managed lands: nonstructural and structural. Non-structural improvements include vegetation management to improve grazing conditions or land health, including pinyon-juniper or sagebrush treatments, prescribed burns, or removal of invasive, non-native plant species. Types of structural range improvements include fencing, corrals, cattleguards, water pipelines, spring and well development, and installation of small dams, impoundments, and stock ponds. Construction, use, and maintenance of structural range improvements requires the use of heavy machinery and trucks to access sites to develop or implement structural or nonstructural range improvements.

Construction of New Range Improvements. The construction of new water developments is undertaken in response to drought, increased grazing pressure, land use changes, or as a minimization measure to address environmental impacts. The use of heavy machinery for excavation and construction, and limited clearing of vegetation is necessary. Construction of new fencing is done to protect sensitive areas, boundary establishment, control access. New pipeline construction enhances water distribution for livestock across the range. Post hole diggers, fence post drivers, wire stretchers/cutters, fence pliers, chain saws for clearing vegetation or cutting posts, auger, and tractors or All-terrain vehicles (ATVs) are used. The purpose for constructing new corrals is to establish controlled and secure enclosures designed for managing livestock. Corrals are essential for gathering, sorting, and handling of livestock. Construction involves the same methods and tools as for new fences or pipelines. The purpose of installing a new cattleguard is to create a barrier that prevents livestock from crossing a specific point, such as a road or a gate entrance, while allowing vehicles to pass freely. After the area is cleared and excavated, a foundation and concrete footing is set. The cattleguard structure typically is composed of spaced metal or concrete bars and is installed over an excavated trench.

Maintenance of Range Improvements. Maintenance of range improvements includes maintaining the structural integrity of water developments, fences, pipelines, corrals, dams, dugouts, ponds, or cattleguard gates. Water development (stock tank, troughs, spring developments) maintenance includes fence structure repair to protect water sources, replacing or repairing tanks and troughs, stabilizing with gravel, and replacing or repairing mechanical parts. Maintenance of fences, pipelines, and corrals includes traveling along linear paths with off-road vehicles or horses, replacing wood or steel fenceposts in existing/new holes, and tightening or replacing wire. Fence lines are cleared of downed trees or debris using chainsaws or hand tools. Limited removal of small diameter live trees occurs if they pose a hazard to the integrity of the fence. Corral maintenance includes replacing rotten, broken, or missing posts and rails, and repairing non-functional gates and chutes. Maintenance of dams, dugouts, and ponds includes removing accumulated silt to improve water storage functions, sealing with bentonite, and re-building breached dams. This work is typically done with heavy machinery such as a backhoe, tractor, or skid steer. Cattleguard gate maintenance includes repairing erosion or ponding by placing gravel or re-grading adjacent to the cattleguard. Debris, soil, and gravel may periodically be removed from underneath the cattleguard deck to maintain the full depth and promote water flow. Fences and gates that tie into cattleguard gates may be repaired or replaced as necessary.

3.2.2. Lands, Realty, and Cadastral Survey

The BLM Lands, Realty and Cadastral Survey Program provides the foundation for locating and describing parcels, transferring ownership or interests of parcels, and authorizing uses across the BLM-administered lands. Many BLM Lands, Realty and Cadastral Survey activities are undertaken to improve management of natural resources, including special status species; increase recreational opportunities; preserve open space and traditional landscapes; preserve archaeological, historical, and paleontological resources; and accomplish specific acquisitions authorized by congress. Lands are determined suitable for purchase, acquisition, sales, exchanges, or withdrawals based on the goals and objectives of the applicable resource management plan. Lands, Realty and Cadastral Survey authorizations includes rights-of-way, leases, permits, and easements supporting energy and mining development, film production, and other industrial and commercial activities.

3.2.2.1. Rights-of-Way

Rights-of-way commonly authorize electrical transmission and distribution lines, fiber-optic lines, communication sites, roads, trails, and access routes for public or private use, pipelines transporting oil, natural gas, water, or other fluids, canals, ditches, and reservoirs for water conveyance and storage, and other transportation or other systems or facilities which are in the public interest and which require rights-of-way over, upon, under, or through such lands.

Types of activities associated with rights-of-way authorizations may include the use of heavy equipment for vegetation removal and dirt work (*e.g.*, excavation, blading, trenching, and deposition and storage of topsoil, overburden, and other materials), and vegetation removal, including the use of herbicides. Areas used during construction but not needed for project operation or maintenance are restored through reclamation procedures including the replacement and stabilization of vegetation and soil stabilization. Methods for reclamation include stripping, stockpiling and reapplying topsoil material, applying soil treatments, reseeding, and restoring previously existing topography and drainage patterns.

Communication Facilities. Rights-of-way authorization activities include the construction and operation of facilities – ranging from radio and television transmitters to cellular and wireless broadband towers and other communication uses. Construction of these facilities includes vegetation removal, grading, and leveling to prepare foundations for towers, antennas, and buildings and require the use of bulldozers, trackhoes, trucks, other heavy equipment, or helicopters. Roads may be improved or built to access communication facilities, especially in more remote sites. Fences are installed at many sites to protect the facilities. Termination of communication sites and other facilities includes removal of structures; obliteration of roads, building sites, and antenna sites; and stabilization and re-vegetation of disturbed areas. Communication sites are often co-located with existing facilities.

Roads and Trails. Bureau of Land Management right-of-way holders construct, inspect, and maintain roads and trails using heavy equipment to ensure safe, sustainable access. Bulldozers, graders, and rollers clear and compact the ground, while front-end loaders and dump trucks haul soils and materials. Water bars, culverts, and sediment basins may be installed to control erosion and manage runoff.

Key activities may include:

- Construction
- Clearing trees and vegetation; excavating roadbeds
- Adding surface rock, establishing ditches, installing cross-drain and stream culverts
- Compacting with rollers and grading to design specifications

Routine maintenance may include:

- Grading and levelling surfaces; applying aggregate, chip seal, or skin patch
- Repairing and replacing drainage features (ditches, culverts, water bars)
- Managing vegetation (brushing, limbing, seeding, mulching)
- Removing small slides; snowplowing and applying calcium or magnesium chloride
- Abating dust with water or lignin sulfate
- Maintaining guardrails, signs, gates, and stream-crossing structures

Reconstruction activities may include:

- Clearing and grubbing within existing road prism
- Excavating embankments or placing fill; developing disposal sites
- Realigning roads to bypass failures; adding soil nails or retaining walls
- Widening, reconditioning surfaces (aggregate or pavement), or converting surfaces (asphalt milling)
- Stabilizing slopes
- Establishing vegetation

To construct bridges and culverts, the BLM may require the right-of-way holder to set prefabricated or cast-in-place structures and perform any necessary in-stream excavation and channel re-routing. Excavators, cranes, bulldozers, dump trucks, and pumps may be deployed to place riprap, then install culverts to regulate water flow, prevent erosion, and maintain aquatic organism passage. For larger components, cranes may be used, finishing with hand tools to ensure precise alignment and secure installation.

Transmission and Distribution Lines. The BLM also administers rights-of-way for electric transmission and distribution lines. These rights-of-way authorizations are for transmission and distribution lines; construction and maintenance of permanent and temporary access roads and staging areas; construction and maintenance of steel frame transmission structures; expansion, or modification of substations; communication systems, optical fiber regeneration stations, and/or substation distribution supply lines. Bulldozers, trackhoes, and trucks are used to remove vegetation and grade sites to obtain flat surfaces. Once towers are in place, conductors and overhead ground wires are strung using a helicopter or from equipment on the ground.

Pipelines. Pipelines generally transport salt and fresh water, natural gas, and oil. Excavation, trenching, and subsurface work for pipelines involve the use of tractor mounted mechanical rippers, rock trenching equipment, or wheel ditchers. Blasting may be required in certain terrain, subsurface rock, or to expand the size of the trench. Trackhoes are used to clean out the trench after digging or blasting. Excess rock and soil are generally removed or scattered across the area with trucks and trackhoe equipment. The depth of excavated pipeline trenches varies with the subsurface conditions encountered and the specific pipeline type and diameter. Installation of pipelines involves moving pipeline segments from storage yards to the pipeline right-of-way. Joints of pipe are strung along the pipeline trench and bent to the correct direction using a bending machine. Once bent, the portions of pipe are clamped and welded into position. After the pipe is welded and inspected, it is lowered into the trench using tractors. Backfilling begins after the pipeline is placed in the trench using a pipe padding machine, padding shaker bucket and trackhoe, or other similar equipment. Generally, the material from the original excavation is used as backfill. Grading, mowing, seeding, and other vegetation treatments may occur in the pipeline right-of-way.

3.2.2.2. Leases, Permits, and Easements

Ground disturbance under the BLM's Lands, Realty and Cadastral Survey issued leases, permits and easement activities includes any surface-altering activity – grading, excavation, trenching, borrow-pit development, pad and staging-area construction, road or pipeline installation, and related facility siting. Permittees must clearly delineate disturbance footprints and confine all heavy-equipment traffic to approved access routes and work zones. They install erosion-control best practices—sediment fences, wattles, berms, and basins—before breaking ground and maintain them until sites are fully stabilized. Phased reclamation follows construction: replacing subsoil, contouring to natural grades, applying weed-free native seed via hydroseeding or drilling, and mulching. Permit holders conduct pre- and post-project surveys of soils and vegetation, submit annual disturbance and reclamation reports, and adjust their methods if monitoring reveals excessive sedimentation or resource impacts. The BLM inspects sites periodically and retains authority to suspend operations or impose additional mitigation to ensure all ground disturbance remains compatible with land-use objectives.

3.2.2.3. Land Tenure

Disposal/Sales. Disposal/sales of selected parcels may occur only when determined through land use planning to meet one of three criteria:

- They are scattered, isolated tracts that are difficult or uneconomical to manage.
- They were acquired for a specific purpose and are no longer needed for that purpose.
- Disposing of them will serve important public objectives, such as community expansion or economic development.

The BLM sale method is determined on a case-by-case basis, depending on the circumstances of each parcel or sale. Sale notices specify the types of sale, the percentage of the full price that must be deposited with each bid, and the time allowed for full payment. Sale notices specify any federal reservations or conditions of the sale. These might include reserving mineral rights to the federal government, or allowing some currently authorized uses (grazing, rights-of-way, or easements for powerlines, pipelines). Sale notices also explain legal access to the property or any access restrictions.

Acquisitions. The BLM acquires land to facilitate resource management objectives and to acquire lands with high resource values, based on the following criteria [Section 203 of the Federal Land Policy and Management Act of 1975, as Amended (FLPMA)]:

- The preferred method for acquisition is through exchange.
- Acquisitions of private lands will be pursued only with willing landowners.
- BLM extends applicable management to acquired lands similar to adjacent or similar BLM-managed lands.
- It contains important, crucial, or critical habitat for fish, wildlife, and plants.
- It contains riparian areas and wetlands.
- Parcels that provide access to larger blocks of public land.
- It contains lands with special designation or management emphasis.
- It contains significant cultural resources.
- It provides recreation opportunities and benefits.
- It is contaminated and has physical hazard conditions.
- It has mineral development potential.

Exchanges. The BLM exchanges lands with other owners to improve management, consolidate ownership, or better meet management objectives and priorities. Environmental assessments are required to determine whether property has contamination present.

Withdrawals. The BLM withdrawal actions reserve specified public lands for a defined purpose by removing them from public land, mining, and leasing statutes. Withdrawals block new claims, entries, sales, or leases; protect resources from conflicting activities; and can shift management among agencies. The BLM issues withdrawals in accordance with orders or statutes, temporarily or indefinitely, and can amend or revoke them through rulemaking. Withdrawals align land with conservation, cultural, or project objectives.

3.2.3. Mining Development

Mining may occur in whitebark pine habitat and includes exploration, maintenance, abandonment, and reclamation activities for locatable minerals, leasable minerals, and salable minerals described below.

- Locatable minerals include ores and minerals such as bentonite, gypsum, chemical grade limestone, chemical grade silica sand and uncommon varieties of sand, gravel, building stone, and pumice also are managed as locatable minerals. All locatable mining operations require adherence to the 1872 Mining Law and BLM 3809 surface regulations which include reclamation planning.

- Leasable minerals are leased to individuals for exploration and development. The leasable minerals are subdivided into two classes, fluid and solid. Fluid minerals include oil, gas and geothermal resources and associated by-products. Solid leasable minerals are minerals such as coal and phosphates.

- Salable minerals include common varieties of sand, gravel, roadbed, ballast, and common clay. Salable minerals include all minerals that were not designated as locatable or leasable.

Mining activities and equipment vary based on material type, geographical context, and mining method. Mining for casual use includes the collection of geochemical, rock, soil, or mineral specimens using hand tools and metal detectors, hand panning, non-motorized sluicing, and suction dredging. Larger mining operations include construction and operation of excavation sites, adits, shafts, trenches, settling ponds, pipelines, equipment pads, drill hole locations, water and monitoring wells, equipment storage areas, tailings disposal sites, stockpile locations, and access routes. Mine construction and operation generally require the construction or improvement of access roads.

New mineral exploration projects include short-term mineral, energy, or geophysical investigations and their incidental support activities. Activities associated with exploration projects include geophysical data collection using shot hole, vibroseis, or surface charge methods, trenching/placer mining testing, drilling, clearing vegetation, incidental road maintenance, and reclamation. Authorized and proposed mining operations all have existing plans of operation in place, as well as reclamation performance standards and reclamation bonding and monitoring. Activities associated with ongoing mining include excavating test sites and mine pits, clearing trees and vegetation from excavation or processing sites, opening and stabilizing underground mine features, constructing ponds, roads, fords, and/or bridges, and processing and piling material as well as reclamation (concurrent and final).

Equipment. A variety of equipment can be used for construction and operation of mines including shovels, excavators, drill rigs, bulldozers, scrapers, and front-end loaders. Equipment used in exploration and mining operations ranges from hand tools, excavators, backhoes, drills, rock crushers, trommels, and generators. Loaders and hauling trucks are used to transport mineral materials away from mining sites.

Surface Mining. Surface mining involves excavating large amounts of soil and rock to access minerals through open pits or strips. Rock drills and blasting are used to prepare the mine site. Heavy machinery used during surface mining includes drilling rigs, excavators, dump trucks, and bulldozers.

Underground Mining. Underground mining includes digging or blasting tunnels to access mineral deposits. Equipment used for underground mining includes continuous miners, room and pillar mining equipment, blasting equipment, rock drills, and trucks. Mine cages transport equipment and personnel to the mine through vertical shafts.

Rock Quarries and Pits. Rock quarries and pits are developed as source areas for rock and gravel to be used for a variety of purposes including infrastructure and energy foundation, surfacing and maintaining roads, and improving and maintaining administrative and recreation sites such as campgrounds and trails. Rock quarries and pits may also be used for the sale of rock material. Quarries and pits may be large enough to supply road surface materials for a network of roads or may be small and only used to store and supply rock for local road maintenance. Quarry sites that are no longer needed to supply rock for roads may be used as waste areas for material removed from roads and ditches during road maintenance. Activities associated with the development of quarries can include removal of vegetation (understory herbs and shrubs, live and dead trees, and downed wood), segregation and storage of reclamation soils and materials, excavation, drilling, blasting, crushing, sorting, and piling of rock materials, stockpiling of rock material, and loading and hauling material. There may also be construction or reconstruction of access roads and the work site.

Restoration/Reclamation. Reclamation of mine operations occurs in three stages: interim reclamation (annual stabilization required for seasonal closure and/or environmental compliance), concurrent reclamation (ongoing reclamation of sites during mine operations), and final reclamation (reclamation of the site for closure after mining is complete). Reclamation of mines involves the use of heavy machinery for surface reconstruction and stabilization, site preparation, and repairing surface hydrology. Additionally, reclamation activities also involve revegetation, weed management, and long-term monitoring of the site.

The Abandoned Mine Lands (AML) program is responsible for the inventory, study and reclamation of land disturbed by pre-1981 historic mining activities. Heavy metals at these sites, such as arsenic, cadmium, copper, lead, mercury, and zinc can cause human health and environmental impacts. Historic placer mines may impact stream channel, floodplain, and riparian environments. Examples of AML features include adits, tunnels, shafts, stopes, portals, prospects, pits, trenches, ponds, tailings piles, waste dumps, and cabins. Reclamation activities can range from collapsing or backfilling features, installing bat gates, consolidating contaminated mine materials into repositories, and installing culverts. Restoration actions at AML sites can include addressing ecosystems and watersheds affected by past mining practices.

3.2.4. Oil and Gas Development

Oil and gas resource development is a "leasable" type of mineral management. The BLM onshore oil and gas program includes exploration, development, production, abandonment, and reclamation phases. The BLM provides operators with *The Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development* for requirements for obtaining permit approval and conducting environmentally responsible oil and gas operations on federal lands and on private surface.

Oil and Gas Exploration. Oil and gas geophysical exploration projects use physical methods to identify the locations and character of subsurface formations. Most exploration uses seismic reflection methods. These methods generate ground vibrations that travel through the subsurface as seismic waves until the wave is bounced (reflected) by subsurface formations back to the surface. Precise location, timing, and measurement of vibrations and seismic reflections allow geophysicists to estimate the location and material of subsurface formations. Two common methods of generating vibrations are vibrating plates (vibroseis) and explosives (shot holes). The vibroseis method uses large, purpose built, vibroseis trucks working in groups which create vibrations when each truck simultaneously presses metal pads into the ground surface. The shot hole method uses buggy-mounted or heli-portable drills to bore holes. Explosives are placed at the bottom of the holes and later detonated in a specific, carefully timed, pre-defined pattern to create vibrations. Though ground-based seismic reflection methods are the predominant geophysical exploration techniques, there are other methods used to locate subsurface minerals. Some of these are seismic refraction, ground-penetrating radar, airborne magnetotelluric, ground-based magnetotelluric, electromagnetic, gravity, or radiometric surveys, geochemical processing, and the poulter method which uses charges detonated at or above the ground surface.

Oil and Gas Development. Each well requires a graded well pad and access road. Roads and well pads are constructed using standard cut and fill techniques. Most often, onsite soils are sufficient for construction needs, but soils may be imported from other locations by truck. Pads may range from four to seven acres depending on how many wells are drilled from the pad. Prior to building a road or well pad, brush and other vegetation is removed. The topsoil is stockpiled on a nearby area. After grading and completion of the well, the topsoil and brush is usually re-spread on cut slopes, fill slopes, or drilling sump locations to facilitate interim restoration. If the well is exploratory, the topsoil and brush may be stockpiled for reclamation until it is determined whether abandonment of the location may be required. Drilling proceeds once grading is completed. A drilling reserve pit may be excavated on or adjacent to the well pad area, however closed loop systems and portable tanks are frequently used to temporarily store fluids and solids during drilling operations. The drilling rig includes a power system, hoisting system, rotating equipment, and circulation system. Ancillary facilities, including pipe racks, temporary storage tanks, vehicles, and the drilling supervisor's trailer are placed on the well pad or other designated staging areas. As drilling progresses and the well is deepened, steel casing is installed and cemented in the well to prevent the sides of the wellbore from collapsing or caving, protect the well bore against abnormal pressure, and protect underground water and mineral bearing formations. Drilling operations are conducted 24 hours per day and seven days per week. A well may take an average of two weeks to drill, depending upon the well depth and any difficulties encountered. Following drilling, the reserve pit is fenced and, when required by regulation, covered with netting. Prior to abandoning the reserve pit, any liquid is removed or solidified. A smaller rig, called a workover or completion rig, is usually moved in to complete the well. In many circumstances, the well is stimulated to enhance flow between the formation and wellbore. Stimulation involves treating the formation with acid or other substances to dissolve any restrictive material, to improve permeability, and to clean the area around the well. Hazardous materials associated with well stimulation are restricted to tanks.

Production and injection wells require the installation of at least one pipeline to transport fluids and gas to, or from, the well head. Most often, a series of pipelines transports fluids and gas between the well and the tank setting and compressor site. These pipelines are generally composed of steel. Manifolds or splitters are used to inter-connect pipes. Electricity may be provided through overhead or buried power lines. Power lines may also be installed to operate other equipment, such as remote communication devices. From distribution lines, spanning and service poles are installed using an auger truck and bucket truck. Off-road travel is sometimes required for spanning poles, but service poles are usually placed on disturbed surfaces. Occasionally, fiber-optic or other communication lines may be installed. These may be strung overhead on poles or be buried. Additional production facilities include separators, free-water knockouts, heater-treaters, tanks, production sumps, steam generators, oil and gas meters, gauging facilities, pumps, buildings, storage and equipment yards, gas compression plants, water treatment plants, and compressors. Grading of roads and pads is required for the installation of such facilities.

Oil and Gas Operation. Various activities are required for the operation and maintenance of approved production facilities including well extraction and injection, routine well maintenance, the removal of small amounts of stained soils from pads (fluid release of <10 barrels), routine acidizing jobs, recompletion in the same interval, and well cleanout work. Surface disturbance for these activities includes soil excavation, off-road travel, vegetation removal, and any other alteration to surface resources. Activities that may require additional approvals include re-drilling, deepening, performing casing repairs, plugging back, altering casing, re-completion in a different interval, performing water shut off, combining production between zones, converting to injection, and any non-emergency activity that would result in additional surface disturbance.

Oil and Gas Reclamation. Well abandonment and reclamation phases occur after the productive life of the well has concluded. Well abandonment and reclamation involve plugging wells and reclaiming the surface according to applicable oil and gas operating regulations. Wellheads are removed, and the surface and production casings are cut off below ground in compliance with federal and state regulations. The well pad, reserve pit, and access roads are reclaimed according to BLM and state requirements. This may include backfilling the pit, recontouring the surface to blend with natural surroundings, and redistributing topsoil. All surfaces are then reseeded as required. To ensure proper revegetation is established, the BLM reviews and evaluates all reclamation prior to issuing the final abonnement notice and releasing the location from federal bonding requirements.

3.2.5. Geothermal Energy Development

The BLM grants access to geothermal resources through a formalized leasing process. Geothermal energy development includes the following phases: exploration, drilling operations, utilization, and reclamation.

Geothermal Exploration. Geothermal exploration involves any activity relating to the search for evidence of geothermal resources. Exploration operations include, but are not limited to, geophysical operations, drilling temperature gradient wells, drilling holes used for explosive charges for seismic exploration, core drilling, or any other drilling method. Geothermal exploration activities also include related construction of roads and trails, and cross-country transit by vehicles over public land. Exploration operations do not include the direct testing of geothermal resources or the production or utilization of geothermal resources.

Geothermal Drilling Operations. Geothermal drilling operation activities include drilling wells and conducting related activities for the purposes of performing flow tests, producing geothermal fluids, or injecting fluids into a geothermal reservoir. Geothermal well pad preparation includes clearing vegetation, earthwork, and drainage. Topsoil is salvaged and stockpiled. Fence is constructed around reserve pits. Each drill site is covered with gravel. Surface facilities on-site may consist only of several valves on top of the surface casing. A motor control building may be located on the well pad to house and protect the auxiliary well control systems, motor switch gear controls and sensors, transmitters, and geothermal fluid treatment systems. Roads and powerlines may be constructed or improved for access and operation of wells, power plants, substations, office buildings, and ancillary facilities.

Geothermal Utilization. Geothermal utilization includes the construction and operation of geothermal power plants and substations. The most prominent features of power plants are the cooling condensers. Power plant consists of an array of pipes, turbine/generator set(s), and a small building to house electrical equipment. Associated buildings that house the offices, electrical room, control room and auxiliary buildings are generally rigid, steel-frame, pre-engineered structures with steel panel walls and steel rooves. Pipelines bring geothermal fluid from the production wells to the power plants and deliver the cooled geothermal fluid from the power plants to the injection wells.

Geothermal Reclamation. Well abandonment and reclamation phases occur after the productive stages of geothermal wells and/or power plants have concluded. Well abandonment and reclamation involve plugging wells and reclaiming the surface according to applicable geothermal regulations. Wellheads are removed and the surface and production casings are cut off below ground in compliance with federal and state regulations. Well pads, reserve pits, and access roads are reclaimed according to BLM and state requirements. This may include backfilling the pit, recontouring the surface to blend with natural surroundings, and redistributing topsoil. All surfaces are then reseeded as required. To ensure proper revegetation is established, the BLM reviews and evaluates all reclamation prior to releasing the location from federal bonding requirements.

3.2.6. Forest and Vegetation Management

3.2.6.1. Prescribed Fire

Prescribed fires and planned ignitions are conducted in accordance with BLM policies. A prescribed fire plan is required for each fire application ignited. The plan includes required elements that need to be addressed, including project objectives, fuels present (quantity, type, distribution, moisture content), topography (ruggedness, elevation, slope), weather parameters (temperature, wind, relative humidity), time of year, smoke dispersal, and predicted fire behavior modeling (flame length, rate of spread). In all cases, fuel models are used to set prescriptions for an area.

A primary focus of prescribed fire is to reduce conifer encroachment into the sagebrush steppe community, to improve overall ecosystem health and resilience. Prescribed fire is often associated with dry-site Douglas fir (*Pseudotsuga menziesii*) or ponderosa pine (*Pinus ponderosa*) forest types. Relevant impact-minimizing measures to limit the impact of these treatments on whitebark pine are developed through site-specific, interdisciplinary team approaches. Impact minimizing measures include steps to exclude whitebark pine stands from the burn units, removing fuels from around individual whitebark pine trees, and developing prescribed fire prescriptions and objectives that avoid high intensity crown fire, resulting in low to moderate fire behavior scenarios.

Site preparation prior to the prescribed fire includes several activities. Examples of site-preparation could include constructing roads, fire lines, and camps; or conducting aerial pre-treatments.

Fire Lines. Constructing fire lines involves removing vegetation down to the bare soil. Fire lines are typically created using hand tools, tractors, or vehicles with plows or brush rakes.

Other activities include: black lining, foam or wet lining, and brush beating or thinning. Mechanized fire lines can be created by using bulldozers, tractors with plows, excavators, and road graders. A wet line can include chemical retardant sprayed along the ground, serving as a temporary control line from which to ignite or stop a low-intensity fire. Wet lines involve spraying water or foam on vegetation to increase moisture content or limit fire spread. Wet lines are often used in short vegetation (*e.g.*, grass, pine needles, mowed area) where flame lengths are short. Wet lines require large, reliable amounts of water to support operations drawn from ponds, streams, or lakes using portable pumps, wildland fire engines, or tenders.

Fire lines may be constructed with dozers, by hand (Pulaski, McLeod, rake, *etc.*), or with a combination of dozers and hand lines (mixed lines). A cup trench may be used across the bottom of steep slopes of the fire to catch rolling debris. Most often, hand tools and chainsaws are used for line construction, though heavy equipment (including, but not limited to dozers, tracked excavators, feller-bunchers, masticators, chippers, log skidders), or explosives may be used. Fireline explosives can be used to construct firelines and fell hazard trees when approved. Helicopters and planes may be used to bring buckets suspended from the aircraft, filled with water (usually 75-250 gallons) obtained from nearby water sources to pre-treat certain areas prior to ignition.

Staging Areas. Staging areas are places where personnel and equipment are placed for rapid deployment on large fires and typically less than one acre. These areas have sanitation facilities and places to safely park personnel carriers and equipment. Some fueling and light maintenance may be performed on equipment. Food and sleeping facilities are normally not provided at staging areas. Staging areas are short-term and for temporary use only. Staging areas and other similar areas are typically located in established areas that require minimal maintenance.

Firing/Ignition. Firing operations such as burning out or back burning is defined as setting a fire inside a fire line to consume fuel between the edge of the fire line and the fire. Burning out is commonly used to consume unburned islands of fuel. Equipment used to light these burnouts are handheld drip torches (filled with a mixture of diesel and gasoline), fuses, flare guns, terra torches (truck mounted flame throwers), and aerially applied plastic spheres (filled with potassium permanganate mixed with liquid ethylene glycol) that combust upon delivery to the ground. During implementation of firing operations, it can be difficult to control or predict the outcomes. The BLM can ignite prescribed fires using ground or aerial ignition equipment. Ground ignition equipment includes: (1) terra torch devices, (2) drip torches, (3) fuses, and (4) flares and flare launchers mounted in a pickup bed or ATVs/utility terrain. Unmanned aircraft systems are also becoming more common for the use of fire ignitions using plastic spheres.

Mop-up. Mop-up involves patrolling the area after ignitions are complete. Hot spots are extinguished. Accumulated fuels are removed around the bases of trees to reduce burn severity. Various resources (*e.g.*, engines, hose lays, and hand and mechanical tools) can be used during mop-up.

3.2.6.2. Fuels Reduction

The purpose of hazardous fuels reduction is to reduce the risk of wildfire. Fuels reduction projects (1) reduce the wildfire hazard, (2) decrease tree crown density and increase canopy base heights and crown spacing to lower the risk of crown fires, (3) reduce ladder fuels that provide vertical and horizontal fuel continuity, thereby decreasing the risk of crown fires, (4) reduce surface fuel loading to decrease surface fire intensity, and (5) lower overall horizontal and vertical fuel bed continuity to decrease fire hazards.

Fuels reduction includes manual and mechanical vegetation treatments, such as thinning, pruning, and slash treatment, to manage hazardous fuels. Manual treatments involve the removal of brush, small diameter trees, and dead and down surface fuels. Retained trees are those with fire-resistant characteristics, such as larger trunk diameter and lack of low branches. After thinning, stands should be moderately open, with material scattered, chipped, piled, or otherwise mitigated to reduce fire hazard. Seeding of disturbed ground and suppression of noxious weeds will occur as needed.

3.2.6.3. Pre-commercial Thinning

Pre-commercial thinning involves non-commercial silvicultural treatments for young stands to increase tree growth, control understory vegetation, or for other resource benefits such as fuels management, wildlife habitat, disease control, and improving tree vigor. This involves the following silvicultural activities: tree release and weeding, pruning, fertilizing, understory burning, and other stand tending. To complete these activities, techniques include marking, girdling, felling, bucking, skidding, yarding, cabling, end lining, loading, slash treatment by means of mechanical or hand treatments, and hauling material.

3.2.6.4. Timber Sales/Harvest (Salvage Harvest and Commercial Thinning acres) of whitebark pine range

(Timber sales/harvest projects also covered previously in separate programmatic consultation FWS/2025-0004194 dated June 18, 2025)

Bureau of Land Management timber harvest methods usually implement: (1) "Group Selection" of removing small groups of trees (one to three acres) to create openings sufficient for regeneration of shade intolerant trees, (2) "Single-Tree Selection" of removing individual trees to achieve a prescribed species composition and stand structure, and/or (3) "Regeneration Harvest" of removing most trees in a stand to prepare the regeneration of a new stand. Timber harvest projects include the use of large machinery to fell and yard trees. Felling will be done by a chainsaw or feller-buncher. Timber can be yarded to a landing area using a rubber-tired or tracked skidder, farm tractor, horses, or carried on a forwarding machine. Forwarding machines are equipped with a hydraulic loading boom and have a bunk for holding logs. At landing areas, material will be delimbed, topped, bucked, or slashed into product lengths; debarked, chipped, or ground and blown into a van; or loaded directly onto a trailer before being transported across haul roads to a mill or other site. Landing equipment includes chainsaws, processors, chippers, or tub grinders.

Haul roads, skid trails, and landings will be constructed throughout project areas, although the BLM generally uses existing roads and limits building new temporary and/or permanent roads. Haul roads usually are permanent roadways designed to drain and prevent the flow of precipitation on the road surface to minimize erosion. These roads provide access for trucks to specific points for hauling logs or other management purposes. Skid trails are temporary routes that enable skidders, forwarders, or horses to transport logs from the interior of the stand to the landing. Landings are areas used for processing (such as sorting products, delimbing, cutting logs to shorter lengths, and debarking) and for loading timber products onto trucks. Heavy equipment including trucks, dozers, and graders are used when developing timber harvest project areas.

3.2.6.5. Reforestation

Reforestation may occur following disturbance harvest, wildfire, insects, or disease. Reforestation site preparation includes manipulating or clearing competing vegetation or woody debris through manual, mechanical, or chemical (herbicide) methods. Prescribed burning may also be used for site preparation (refer to Prescribed Fire subsection 3.2.6.1). Following reforestation site preparation, direct seeding or planting of seedlings of any tree species, including whitebark pine (refer to Recovery Efforts and Research section 3.2.9), may occur if natural regeneration is not anticipated to meet desired stocking levels. Post-planting inspections involve conducting survival and stocking surveys. When subsequent stand management is necessary, management methods may include follow-up release treatments to control competing vegetation implemented through manual, mechanical, or herbicide applications.

3.2.6.6. Pest Management

Bureau of Land Management pest management activities include control of invasive plant and animal species. The strategy to control invasive species includes elements of prevention, detection, treatment and eradication. Priority is given to early detection and rapid response to control or eradicate them quickly before they get established. There are two broad categories of invasive plant control that are included in this PBO: chemical control and mechanical control. Chemical control uses herbicides (or pesticides) to kill or inhibit growth of invasive species. Mechanical control is the physical removal of invasive species. Mechanical treatments include pulling and digging, solarizing, cutting, and mowing.

Herbicide Treatments. Herbicides are chemical formulations that kill or injure plants by disrupting their biochemical processes. Typically, herbicides are applied as liquids mixed with water or oil carriers, which are sprayed onto vegetation, although some are applied in solid form as granules. Herbicide formulations include an active ingredient, which is the chemical that kills the target plant, and one or more inert ingredients that make the herbicide more effective. Inert ingredients may improve herbicide effectiveness by improving the solubility of the active ingredient, improving its ability to stick to plants or penetrate protective layers on the plant surface, or by limiting unintended drift of the herbicide mixture when it is sprayed. Herbicides may be applied aerially by helicopter or fixed-wing aircraft. Aerial applications do not disturb the soil or protective organic layers and are not limited by inaccessibility or rugged terrain. Manual applications of herbicides are suited for treatments of small areas or at sites that are inaccessible by vehicle. Manual spot treatments target individual plants through herbicide injections, applications on cut surfaces, or granular application to the surrounding soil (hand crank granular spreader). Application using backpack sprayers is another means of spot treatment, in which the herbicide applicator directs a spray hose at target plants. Herbicides can also be applied using a spray boom or wand attached to a truck, ATV, or other type of vehicle. Truck-mounted spraying is primarily limited to roadsides and flat areas that are accessible. All-terrain vehicles can be used to treat weeds in areas that are not easily accessible by road.

Mechanical Treatment of Pests. Mechanical methods involve the use of tractors or other types of vehicles with attached implements (e.g., plows, harrows, rangeland drills, mowers). These tend to remove all vegetation in the path of travel and often uproot vegetation and disturb the soil. Mechanical treatment activities commonly occur in old agricultural areas, industrial sites, and roadsides. The BLM authorizes chaining, tilling and drilling seed, mowing, roller chopping and cutting, blading, grubbing, and feller-bunching all of which use various types of heavy equipment or tractors.

Manual Treatment of Pests. Manual treatment of pest species involves the use of power tools and hand tools to cut, clear, or prune herbaceous and woody species. Plants may be cut at or above ground level, their root systems may be dug out to prevent sprouting and regrowth, or mulch may be placed around desired vegetation to limit competitive growth. Several hand tools may be used during manual treatments including hand saws, axes, shovels, rakes, machetes, grubbing hoes, mattocks (a combination of axe and grubbing hoe), brush hooks, and hand clippers. Power tools, such as chainsaws and power brush saws, may also be used, particularly on thick-stemmed plants.

Biological Control Treatments. Biological control methods involve the use of living organisms (biocontrol agents) to selectively suppress, inhibit, or control herbaceous and woody vegetation. Biological control is often selected as an alternative to other treatment methods that cause more surface disturbance. The most common biological control agents are domestic animals and parasitic insects that are host-specific to target weeds, although mites, nematodes, and pathogens are also used occasionally. Biological control treatments are not intended to eradicate the target species, but may cause some mortality or weaken undesirable plants, thereby decreasing their vigor or competitive abilities in an ecosystem. The activities associated with biological control include the collection and release of biological control agents, transport of agents by vehicle, and inventory and monitoring of released agents to determine treatment success.

3.2.7. Wild Horse and Burro Management

The BLM manages free-roaming wild horses and burros on BLM-administered lands with the goal of supporting healthy populations and habitats. Wild horse and burro management includes the installation, removal, or modification of fences to allow free movements among herd populations.

The BLM manages the population growth of wild horse and burro herds by periodically gathering and removing excess animals. Gathers are conducted using corrals, round-up pens, bait-traps, and transport vehicles or helicopters. Trucks pulling stock trailers are necessary to transport corral panels, capture equipment, saddle horses, and captured animals. Gather sites are selected based on location of wild horses or burros and local topography. Generally, gather sites are in areas that have been previously disturbed. Helicopter and vehicle refueling involves a fuel truck, which is restricted to existing roads. Helicopter landings occur on flat, previously disturbed areas, if available.

Bait traps and temporary capture corrals are generally located on or adjacent to existing roadways and designated routes of travel. Areas of disturbed ground or washes are used to limit the areas of disturbance and follow protective stipulations for cultural and wildlife resources.

Corrals are not set up in BLM Wilderness or Wilderness Study Areas (WSA). Boundary roads and areas excluded from Wilderness or WSAs may be suitable locations for trap sites and temporary corrals. Traps, corrals, and related structures are removed upon completion of the gather.

3.2.8. Recreation

BLM recreation activities include recreation management, special recreation permitting, and public access. There are 259 recreational features (*e.g.*, campsites, access points/trailheads, toilets) within the listed range of whitebark pine on BLM-administered lands. Recreation-related activities on BLM-administered lands includes construction and maintenance of hiking trails, trailheads, parking lots, picnic areas, campgrounds, restrooms, warming shelters, boat landings, observation decks, foot bridges, guard rails, signs, fences, and other similar facilities. Heavy equipment may be used during construction of recreation facilities.

Use of recreation facilities includes motorized use of trails (*e.g.*, snow machines, ATVs, utility vehicles, motorcycles, electric bikes, mountain bikes), firewood consumption, Special Recreation Permits (*e.g.*, commercial outfitting, vending, group events, and competitive events), and horseback riding. The BLM may also designate off-highway vehicle (OHV) use areas for recreationists.

Maintenance and new facility construction activities occur any time during the year and at a variable frequency that depends on level of use, accessibility, weather conditions, and other factors. Trees may be felled in developed areas or along trails where public safety is a concern (typically an annual activity). Recreation facility maintenance includes road and site maintenance, hazard/danger tree removal, revegetation where necessary, general cleanup, and repair (tables, fire rings, toilets, signs, barrier (re)placement, water systems, pumps, foot bridges, paths and steps, fences). Toilet repair/replacement and maintenance involves digging new vaults and vegetation removal.

Several new wells may be drilled within campgrounds. Heavy maintenance involves extended use of mechanized equipment. Minor maintenance activities in campgrounds or other developed sites include lawn mowing, weed eating, leaf blowing, sign placement, kiosk development, roadway sweeping, and trash collection. Equipment used ranges from road equipment for road maintenance to chainsaws, lawn mowers, augers, small power tools, and hand tools. Heavy equipment may be used during construction of recreation facilities. Maintenance activities occur any time of the year and at varying frequencies that are dependent on level of use, accessibility, weather conditions, and other factors.

Trail construction and maintenance can require the use of chainsaws, small power tools, hand tools, and trail machines such as small excavators and tractors. Some understory clearing may occur. General trail maintenance includes the following: clearing fallen logs with chainsaws (in non-Wilderness areas) or cross-cut saws (Wilderness areas); brushing; tread maintenance; repair of cribwalls and puncheons; maintenance or installation of drainage features by hand or power tools (*e.g.*, installing a water bar in a trail tread); removing overhead limbs and brush; and installing rock armored stream crossings. Trail maintenance in Wilderness areas is performed with hand tools, as power tools are prohibited (blasting is permitted). Equipment used for trail maintenance outside of Wilderness includes chainsaws, motorized wheelbarrows, and weed eaters. On rare occasions, mature trees might be removed if they are considered a hazard to trail users. Trail decommissioning is the intentional conversion of a trail back to a natural state by implementing wildland restoration actions. These actions may include scarifying compacted tread, placing boulders, seeding with native plants, and constructing water bars. Trails that have been created by users may be decommissioned to reduce impacts to resources as funding and staffing allows.

The most common recreational activities in remote areas or designated Wilderness areas are dispersed backcountry activities, such as backpacking, horse packing, hike-in fishing, photography, and nature study (Cole 1990). Dispersed camping sites are not tracked in databases. These sites are generally user-created primitive camping areas that are minimally maintained. Other recreation-related activities in these remote areas include trail maintenance, relocation, reconstruction, and decommissioning as well as replacement and reconstruction of trail bridges and construction of new trails.

3.2.9. Recovery Efforts and Research

Bureau of Land Management conservation and restoration activities for whitebark pine include (1) cone collection, (2) pollen collection, (3) scion collection, (4) planting seedlings or sowing seeds, (5) insecticide and/or pheromone application (*e.g.*, protection from mountain pine beetles), (6) marking trees to protect them, and (7) regeneration efforts. Research activities can include progeny testing for blister rust (*Cronartium ribicola*) resistance, cold hardiness, and drought tolerance, collecting needles from trees, taking punches of phloem, coring the tree, and molecular analysis for genetic structure.

Cones. Cones will be collected for genetic preservation, propagation in seed orchards, and to advance white pine blister rust resistance, drought tolerance, and cold hardiness in future outplantings. To collect cones, cone-bearing trees are climbed in the spring/summer using ropes and/or ladders. Tools such as telescoping poles with hooks on the end may be used to collect female cones (megastrobili). Spikes will not be used for climbing to avoid damaging trees. Cages are placed over cones to protect them from predation by birds and squirrels. Trees are climbed again in the late summer or fall when cones are mature to remove the cages and collect the cones. Any cones that are collected from 'plus' trees will be included in rust screening trials, to produce seedlings for out planting, in direct seeding projects, and for gene conservation. 'Plus' trees are those that are suspected to have genetic resistance to white pine blister rust. During transportation, cones are placed in burlap bags (no more than 1 bushel per bag) for temporary storage and placed on drying racks that allow air circulation. Cone tags with required details of the collection are placed inside and outside of each bag for tracking purposes. Burlap bags are tied near the top to allow maximum air circulation in the bag. Cones are transported to the nursery or other seed extraction site in vehicles or trailers in a manner that allows air circulation between bags to prevent heat and moisture build up. This may require interstate transport of seed. At the nursery, cones are stored on drying racks 1-4 months until late fall/early winter when the cones are dry enough for seed extraction. Seed predator prevention/control measures are used to minimize seed predation by rodents.

Planting. Planting of whitebark pine restores depleted populations, benefiting the recovery of the species by outplanting rust resistant seedlings, seedlings from operational collections, or direct sowing of previously collected, cleaned, and extracted whitebark pine seeds. Planting includes operational planting of whitebark pine seed or seedlings.

Direct seeding of whitebark pine involves placing seeds, collected from sources with proven rust resistance, when possible, directly in bare mineral soil approximately 1 inch deep (DeMastus 2013; Tomback 1982). No site preparation is done. Seeds are planted next to material that creates a protected microsite (*e.g.*, down logs) when possible. Number of seeds needed depends on site conditions (Pansing and Tomback 2019). In some cases, markers are placed next to a sample of planted seed to facilitate monitoring of germination and growth.

Prior to planting, seedling storage, transport, and handling is done with great care to prevent heating and damage to the seedlings. Transport of seedlings to the planting site generally occurs in trucks equipped with some type of cover or tree cooler to keep seedlings cool. During planting procedures, seedlings are planted outside the drip line of any live trees that may be present. Containerized seedlings are planted using hand tools (*e.g.*, hoedad) or power augers to create the planting hole and plant the tree by hand. Seedlings placement should be near logs or other material, when possible, to ameliorate environmental conditions immediately around the seedling (micro-siting). When utilizing a planting contract, administration is also paramount to ensure planted seedlings establish and survive. A sample of the planted seedlings should be monitored for survival and growth. During seedling monitoring efforts, a sample of newly planted seedlings are re-visited at the end of the first and third growing seasons to document survival rates. In some cases, wooden stakes or other markers are placed next to the sample of the planted seedlings to facilitate survival and growth monitoring.

Before planting seedlings, the site is prepared by removing competing vegetation to increase likelihood of seedling survival using hand scalping, mechanical treatments or prescribed fire. Hand scalping is the most common means of site preparation for planting. A hand tool such as a hoedad is used to scrape away competing vegetation below its root collar (generally 2 inches or less of soil is removed in the process). Burned sites have been shown to produce higher levels of survival than unburned sites, likely because it reduces competition, provides a flush of nutrients, and the blackened soil may extend the growing season. Existing whitebark pine are avoided and often considered as part of the target spacing of planted seedlings. Plantings of whitebark pine often occurs on areas recently (0-10 years post fire) burned from wildfires. The amount of planting conducted annually is variable as is the number of acres that have been identified as suitable for planting where there is an opportunity after a wildfire.

During insect prevention actions, Verbenone pouches (1-2 per tree) are stapled to 'plus/elite'[1] trees, high value trees, and/or mature cone bearing whitebark pine trees in June-July to prevent mountain pine beetle (*Dendroctonus ponderosae*) from colonizing trees. Verbenone is an anti-aggregating pheromone that simulates the insect communication that the tree is "full" of beetles. Any 'plus' trees and known 'elite' trees should be prioritized for verbenone treatment. 'Elite' trees are those that are known to have genetic resistance to white pine blister rust.

[1] Individual trees that are known to have genetic resistance to white pine blister rust.

Information on the BLM conservation and restoration goals and priorities is included in the BLM 2016 whitebark pine conservation strategy (Perkins *et al*. 2016) and is included in the Proposed Action through inclusion of it into BLM's 2025 BA Addendum. Access to whitebark pine habitats to conduct conservation and recovery efforts may occur on foot, by trucks on existing roads and tracks, using OHVs, or by helicopter. The BLM's conservation, recovery, and research actions are proactive and intended to benefit whitebark pine and their habitats.

3.2.10. Conservation Measures in the Proposed Action

As described in the BLM BA, BA addendum, and committed conservation measures, conservation measures help avoid or minimize adverse effects of *BLM Activities* on whitebark pine. For all activities covered under this programmatic consultation, every reasonable effort will be made to avoid removing or damaging whitebark pine. If the BLM is not able to include the relevant committed conservation measures (applicable by activity type) analyzed in this programmatic consultation as part of individual project proposals and the BLM determines that the action "may affect" whitebark pine, then section 7 consultation will be completed with the FWS on the proposed project prior to approval.

An example activity reporting form is provided (*Appendix C*) to assist in reporting of the effectiveness of the BLM committed conservation measures. BLM committed conservation measures included as part of the proposed action include, but are not limited to, the following:

Conservation Measures

1. Conduct pre-project surveys to identify five-needle pine seedlings and saplings and mature whitebark pines. If not feasible, conduct surveys using appropriate agency protocols to estimate the number of whitebark pine individuals of all age classes.
2. When marking is appropriate, all mature whitebark pine trees or clusters of other age class trees will be marked in a manner that does not cause damage to the tree or introduce disease.
3. Damaging or killing a 'plus', 'elite', or phenotypically resistant tree will only occur in situations where human health and safety are at risk or when restoration actions such as pruning are occurring.
4. Avoid ground disturbance from heavy equipment within whitebark pine stands and within 10 meters (33 feet) of known whitebark pine trees, which will protect the roots and soil within the drip line of large, mature trees.
5. If using heavy equipment in whitebark pine stands cannot be avoided, equipment will be used sparingly and will be cleaned before entering and leaving work sites to prevent the spread of invasive species, pathogens, and pests.
6. Avoid off road motorized travel in whitebark pine habitat (including using over snow vehicles in thin snowpack). Live whitebark pine trees will not be used as trail markers.
7. Trail and other infrastructure maintenance activities will avoid removing mature whitebark pine trees where possible and focus on pruning trees to acceptable heights to maintain cone bearing branches and allow for continued seed production.
8. Herbicide spot treatments for trail maintenance and other infrastructure activities will maintain a minimum distance of 1 meter (3.3 feet) from a whitebark pine tree. Ground-based broadcast applications will maintain a minimum distance of 3 meters (10 feet) from the trunk of a whitebark pine tree.

9. Train project personnel to identify the five-needle pine seedlings and saplings and mature whitebark pines to ensure project activities do not result in more adverse effects than described in the project description.
10. Educate back country users (*e.g.*, skiers, climbers, hikers, campers, and special recreation permit holders) about whitebark pine ecology, importance, protection, and recovery.
11. Avoid removing or damaging healthy, unsuppressed whitebark pine trees, particularly those that are potentially resistant to blister rust or determined to be 'plus' or 'elite' trees.
12. Avoid or limit cutting of mature whitebark pine trees in areas where there is sufficient cone-bearing whitebark pine habitat based on best available science to support Clarks' nutcracker use of the area.
13. Unless the objective is restoration of whitebark pine, avoid timber cutting or ground disturbing activities that may damage or kill whitebark pine individuals of all age classes, especially in stands with evidence of natural regeneration or reproductive whitebark pine individuals.
14. Grazing permits, corresponding Allotment Management Plans and Annual Operating Instructions will adopt relevant avoidance measures, including but not limited to avoiding removal of whitebark pine when determining placement of rangeland improvements and avoiding, to the extent possible, concentrating livestock in whitebark habitat, especially in regenerating stands.
15. Limit soil disturbance and compaction by limiting the use of mechanical equipment such as heavy equipment and vehicles. Control runoff of soil during project activities and avoid using machinery in wet soils and areas prone to ruts. Use of ground-based equipment will adhere to any additional local, state, or regional standards.
16. Minimize creation of dust when using mechanical equipment (heavy equipment and vehicles).
17. Avoid placing skid trails within 10 meters (33 feet) of mature whitebark pine trees to prevent soil compaction, and to minimize crushing and destroying undetected whitebark pine seeds, and removal of whitebark pine seedlings and saplings.
18. If damage or removal of potential or known plus or elite whitebark pine trees cannot be avoided, collect genetic material (*e.g.*, cones, scion, or pollen) prior to damage or removal, as directed by authorities responsible for the selective breeding program, and make every reasonable effort to avoid removing or damaging healthy, unsuppressed whitebark pine trees.
19. If genetic material collection cannot occur, contact the FWS to explore additional options, which may include replanting in accordance with current whitebark pine replanting guidelines or best practices, or suitable alternative with whitebark pine seedlings or seeds stock of known superior parentage ('plus' or 'elite' whitebark pine). Whitebark pine used for replanting should be of the same seed zone as the mature trees that were removed.
20. Consider using Verbenone, Carbaryl, or other chemical treatments on high value whitebark pine trees (*e.g.*, plus, elite, or close to recreation sites) to prevent mountain pine beetles from successfully infesting the tree.
21. Consider whitebark pine restoration areas adjacent to mosaic habitats that specifically include moderate levels of Douglas fir habitat to maintain adequate food sources for Clark's nutcracker populations.
22. Restoration projects will maintain mature whitebark pine trees during project activities.

23. Restoration projects will avoid crushing and damaging live whitebark pine seedlings and saplings to the extent possible. Maintaining some dead trees (this does not apply to mountain beetle infested trees) in the project area can provide habitat for wildlife.
24. Retain lands in federal status where populations or individual adult whitebark pine trees occur unless the sale, exchange, or disposal of lands benefits whitebark pine. If retention of lands is not feasible, mitigate the loss of these lands to a net benefit result for whitebark pine in accordance with the BLM Mitigation Handbook (H-1794-1).
25. Avoid high-intensity prescribed crown fires in occupied or suitable whitebark pine habitats wherever feasible.
26. Consider using vegetation treatments that minimize wildland fire in whitebark pine habitat and that prevent wildfire from spreading.
27. Continue the implementation of Conservation Measures from the BLM 2016 Whitebark Pine Conservation Strategy (Perkins *et al*. 2016; *Appendix A*).
28. The BLM will implement conservation commitments across the range of the species which includes recommendations from the Service's (USFWS 2023) standing analysis. The specific committed conservation measures will be identified and applied at the project level as appropriate when the BLM evaluates and issues decisions approving or authorizing projects.
29. The BLM will track any projects in the range of the whitebark pine, and provide an annual summary to the FWS (based on the fiscal year, ending September 30):
    - Fiscal year annual reports will be sent to the FWS's Wyoming Ecological Services Field Supervisor Office (WyomingES@fws.gov) no later than January 15 for the first 5 years, and every 5 years thereafter. Reviews by FWS will evaluate the extent to which the PBO is meeting section 7 consultation requirements and adequately addressing impacts on whitebark pine.
    - It is recommended that the BLM meet with the FWS to review implemented projects and effects no later than February 15 annually.
    - The BLM National Threatened and Endangered Species Program Lead or designated representative will be the responsible party for finalizing the report to the FWS and scheduling annual meetings.

Conservation measures (applicable by activity type) described above, as well as in *Appendix A*, will be implemented as part of the proposed action to avoid or minimize adverse effects to whitebark pine and to proactively conserve whitebark pine. Certain conservation measures (surveys, cone collection, scion collection, and pollen collection) are described in detail below, and later in the Effects Analysis section of this PBO, because, when implemented, they will likely result in adverse effects to whitebark pine individuals.

Marking trees with flagging tape, stakes in the ground, paint, and other marking techniques are examples of what can be used to identify areas or trees for avoidance. Surveying of whitebark pine and inclusion of those data into a BLM database also provides a valuable resource for tracking projects and future project scoping. Seed cones will be collected as part of the BLM's committed conservation measures for those potential or known 'plus' or 'elite' whitebark pine trees where adverse impacts cannot be avoided. Refer to section 3.2.9 above for description of cone collection activities.

Scion may be collected as part of the BLM's committed conservation measures only for those potential or known 'plus' or 'elite' whitebark pine trees where adverse impacts of project activities cannot be avoided. Scion from whitebark pine is collected for use in seed and breeding orchards to speed up the process of cone production and clone banks to archive valuable genotypes in managed, administrative sites. Scion collection includes: climbing the tree and/or pruning approximately 20 to 30 branch tips approximately 4 to 8 inches in length from the top third portion of top-performing trees in late fall or early winter; grafting scion on to white pine blister rust resistant tree rootstock of similar diameter and from the appropriate seed zone; and transportation of scion and grafts with appropriate documentation. General scion collection guidelines emphasize the avoidance and minimization of effects of scion collection on whitebark pine through minimizing any unnecessary reduction of branches available for future cone production and climbing trees without the use of spikes or spurs to avoid the tree. Measures will be taken while the scion are in transport to allow air circulation to prevent heat and moisture build up.

For known 'plus' or 'elite' whitebark pine trees where adverse impacts of project activities cannot be avoided, pollen will be collected for genetic preservation and to advance white pine blister rust resistance in seed and breeding orchards. This includes (1) pollen collection and processing, (2) pollen storage, and (3) transportation of pollen. Pollen collection and processing are done in early summer by removing male cones (pollen catkins) at the ends of lower branches from the ground or by climbing the tree with ropes. Pollen, when dried to appropriate moisture content and stored in long-term freezers, if done in long-term freezers and when dried to appropriate moisture content, typically stays viable for many years. Transportation of pollen will be done with appropriate documentation regarding removal from federal land and may include interstate and international transport. Generally, pollen is collected from trees with high levels of white pine blister rust resistance (*e.g.*, 'elite' trees), in appropriate quantities, while minimizing the unnecessary reduction of branches available for future pollen production and climbing trees without the use of spikes or spurs to avoid damaging the tree. To prevent molding and decomposition, pollen will be placed in a cooler when shipped or hand delivered.

Plant material collection for genetic confirmation or research activities involves non-destructive removal of small samples of material from live trees and may include, but is not limited to needle/branch material, cones/seeds, pollen, bark, core, and phloem samples. Research activities can also include canker growth (insertion of pins into the margins of existing whitebark pine cankers to monitor growth) and/or resin flow (removal of a small section of bark and collection of resin via a funnel and tubing) monitoring. Collection methods are similar to those listed above (cone, scion, pollen), and are minimally invasive.

3.2.11. Reporting

Annual reporting to the FWS will occur post project or after each phase of multi-year projects. The purpose of annual reporting to the FWS is to ensure that the effects of the proposed action remain within the scope of the analysis for this consultation.

On an annual basis, the BLM will calculate/estimate the number of whitebark pine individuals and/or number of acres of whitebark pine encountered within each project and the number killed by each project for the last fiscal year (or for large-scale multi-year projects, the number killed by the activities completed in the last fiscal year for the project), and information on conservation measures applied and their effectiveness. Projects that may affect whitebark pine that occur in the action area for this consultation will be included in the report. This information will be compiled into a spreadsheet that forms the basis of an annual report that is sent to the FWS before January 15 each year (*e.g.*, the fiscal year 2025 activities will be reported by January 15, 2026) (*Appendix D*).

The purpose of reporting is to compile documentation of effects to whitebark pine from activities analyzed in this consultation across all BLM Field Offices within the range of whitebark pine in a central location so the total number of affected trees can be tallied to ensure that effects do not exceed those analyzed. Reporting will be completed for each year of the first 5 years of this programmatic and every 5 years thereafter for the previous 5-year period.

To summarize, by each year the BLM will send the FWS the following information for all new and on-going projects in whitebark pine habitat:

> List of implemented/completed Livestock Grazing and Range Improvements; Lands, Realty and Cadastral Survey; Mining; Oil and Gas; Geothermal; Forest and Vegetation Management; Wild Horse and Burro Management; Recreation; and Recovery Efforts and Research Activities from the past fiscal year: Past project activities completed under this programmatic from the past fiscal year will be monitored and reported on, with the following information:

1) Basic information about all Livestock Grazing and Range Improvement; Lands, Realty and Cadastral Survey; Mining, Oil and Gas; Geothermal; Forest and Vegetation Management; Wild Horse and Burro Management; Recreation; and Recovery Efforts and Research Activities: The name of the activity, the year that pre-activity surveys for whitebark pine were completed, the year of implementation, the BLM FO for the project, the name of the agency contact person responsible for providing the information for that fiscal year, and the acres of whitebark pine modeled habitat within the project. For large, multi-year activities, post-project monitoring should be completed annually each year.
2) Estimated number and/or acres of whitebark pine trees by age class identified in pre-activity surveys for each activity. Information from these surveys will be used to determine the number and/or acres of whitebark pines not killed by project activities. We will use total trees and/or acres from pre-activity surveys (Item 2 here), minus total trees killed and/or acres impacted (Item 3 below) to assess trees remaining post-activity. Separate from FWS reporting, locations should also be input into a BLM database for updating to a species distribution model.
3) Number of whitebark pine trees killed by age class for all Livestock Grazing and Range Improvement; Lands, Realty and Cadastral Survey; Mining; Oil and Gas; Geothermal; Forest and Vegetation Management; Wild Horse and Burro Management; Recreation Activities; and Recovery Efforts and Research Activities.

4) List of conservation measures applied and their effectiveness for each activity/project.

Reports should be sent to the following Wyoming Ecological Services Field Office email address: WyomingES@fws.gov.

<u>3.2.12. Role of U.S. Fish and Wildlife Service and Bureau of Land Management Headquarters</u>

For reporting Planned and Completed Livestock Grazing and Range Improvements; Lands, Realty and Cadastral Survey; Mining; Oil and Gas; Geothermal; Forest and Vegetation Management; Wild Horse and Burro Management; Recreation; Recovery Efforts and Research Activities, the FWS and BLM Headquarters (HQ) will:

1) Ensure all effects to whitebark pine for Livestock Grazing and Range Improvement; Lands, Realty and Cadastral Survey; Mining; Oil and Gas; Geothermal; Forest and Vegetation Management; Wild Horse and Burro Management; Recreation; and Recovery Efforts and Research Activities in the previous fiscal year are reported using a tabular tracking format, and include the following information: (1) basic information about each activity/project, (2) number of whitebark pine trees and/or acres present by age class, (3) number of whitebark pine trees killed by age class, and (4) effectiveness of conservation measures and details of planting of whitebark pine seeds and seedlings, if applicable.
2) The BLM HQ will compile an annual report for the FWS or use current technology to achieve the same process (*e.g.,* Information for Planning and Consultation [IPaC]), which is due by January 15 each year (refer to section 3.2.11 on Reporting).

<u>3.2.13. Field Visits</u>

As time and staffing allow, field visits should be conducted by selected FWS staff each year (estimated to be approximately 1 to 2 percent of authorized *BLM Activities)* to ensure that the reported effects accurately reflect on-the-ground effects. Specific activities selected for site visits will be determined by FWS staff. Once FWS staff have identified sites to be visited, local BLM and FWS staff will be notified, and the logistics of the site visit should be arranged by local FWS staff. Any FWS or BLM staff member can attend field visits to exchange ideas and learn from others' experiences.

BLM Activities covered in this consultation will be the focus of field visits. Follow up visits are encouraged, as are additional local field trips not associated with this consultation's reporting procedures. The local staff selected for site visits will send a report of the outcome of their field visit to the Wyoming Ecological Services Field Supervisor and BLM HQ by November 30 of each year following visits.

3.3. Bureau of Land Management Program Implementation

Implementation of individual *BLM Activities* will be reported by appropriate BLM personnel for all activities rangewide. Reporting of activities of this PBO and the effects considered will be completed by filling out reporting forms, an example of which is included as *Appendix C* of this PBO, or by using future streamlining tools. A summary of all activities that fall within the scope of the PBO will be reported to the FWS, by fiscal year, by January 15 (*Appendix D*) for the first 5 years of this programmatic consultation, and every five years thereafter. A joint annual meeting between the BLM and the FWS is recommended to review all activity reporting forms and discuss relevant updates to the baseline. Any proposed activity that falls outside the scope and intent of this PBO will be analyzed in separate consultations under section 7 of the ESA (*e.g.*, stand-alone consultation for that activity, or inclusion in a different programmatic approach).

4. ANALYTICAL FRAMEWORK FOR THE JEOPARDY DETERMINATION

In accordance with the FWS's regulations (83 FR 50333 [September 25, 2019]), the jeopardy determination in this PBO relies on the following four components:

1. The Status of the Species, which evaluates the species' current rangewide condition relative to its reproduction, numbers, and distribution; the factors responsible for that condition; its survival and recovery needs; and explains if the species' current rangewide population is likely to persist while retaining the potential for recovery (refer to the Endangered Species Consultation Handbook; FWS and NMFS 1998).

2. The Environmental Baseline, which evaluates the current condition of the species in the action area relative to its reproduction, numbers, and distribution absent the consequences of the proposed action; the factors responsible for that condition; including the anticipated condition of the species contemporaneous to the term of the proposed action; and the relationship of the action area to the survival and recovery of the species.

3. Effects of the Action, which evaluates all consequences to the species that are reasonably certain to be caused by the proposed action, including the consequences of other activities that are caused by the proposed action (*i.e.*, the consequences would not occur but for the proposed action and are reasonably certain to occur) and how those impacts are likely to influence the survival of and recovery role of the action area for the species.

4. Cumulative Effects, which evaluates the effects of future state or private activities, not involving federal activities, that are reasonably certain to occur within the action area of the federal action subject to consultation, on the species and its habitat, and how these consequences are likely to influence the survival and recovery of the species.

In accordance with policy and regulation, the jeopardy determination is made by formulating the FWS's opinion as to whether the proposed federal action, including its consequences, taken together with the status of the species, environmental baseline, and cumulative effects, reasonably would be expected to reduce appreciably the likelihood of both the survival and recovery of the species in the wild by reducing the reproduction, numbers, or distribution of that species.

5. STATUS OF THE SPECIES

The Status of the Species evaluates the species' current rangewide condition relative to its reproduction, numbers, and distribution; the factors responsible for that condition; its survival and recovery needs; and explains whether or not the species' current rangewide population retains sufficient abundance, distribution, and diversity to persist and retains the potential for recovery. This section presents information about the regulatory, biological, and ecological status of whitebark pine at a rangewide scale and provides context for evaluating the significance of probable effects caused by the proposed action. This information provides the background for analyses in later sections of the PBO.

A species status assessment (SSA) was completed for the whitebark pine in December of 2021 (FWS 2021). The SSA is an in-depth review of the species' biology and threats, an evaluation of its biological status, and an assessment of the resources and conditions needed to maintain populations over time (*i.e.*, viability). Much of the information presented in this section is derived from the SSA. For detailed information on the whitebark pine refer to the SSA report, Recovery Outline, and the final listing rule. These documents are accessible from the following website: https://ecos.fws.gov/ecp/species/1748.

5.1. Legal Status

The whitebark pine was first petitioned for listing in 1997; however, the FWS determined that listing was not warranted at the time. A second petition for listing was received in 2008, and the subsequent 90-day finding determined that listing may be warranted. A 12-month status review in 2011 found that listing as threatened or endangered may be warranted, but that listing was precluded by higher priority actions. The whitebark pine was placed on the candidate list in 2011. In December of 2020, the FWS proposed listing the whitebark pine as a threatened species with a section 4(d) rule. On December 15, 2022, the FWS published a final rule for the whitebark pine, listing the species as threatened under the ESA along with the special rule (FWS 2022a). Designating critical habitat was determined not to be prudent at the time. The listing rule became effective on January 17, 2023.

Section 4(d) Rule. The FWS developed a species-specific 4(d) rule to address the whitebark pine's specific threats and conservation needs. Although the statute does not require the FWS to make a "necessary and advisable" finding with respect to the adoption of specific prohibitions under section 9 of the ESA, the FWS found that this rule was necessary and advisable to provide for the conservation of whitebark pine, as explained below. As discussed in the listing rule, the FWS has concluded that the whitebark pine is at risk of extinction within the foreseeable future primarily due to the continued increase in white pine blister rust infection and associated mortality, synergistic and cumulative interactions between white pine blister rust and other stressors, and the resulting loss of seed source. The provisions of the 4(d) rule promote conservation of the whitebark pine by encouraging management of the landscape in ways that meet land management considerations while meeting the conservation needs of the whitebark pine, as explained further below.

Provisions of the Section 4(d) Rule. The section final 4(d) rule provides for the conservation of whitebark pine by prohibiting the following activities (except in the case of the exceptions listed below) unless otherwise authorized or permitted, and applies to whitebark pine trees and any of its parts, such as cones, tree cores, seeds, branches, needles, etc.:

- Import or export of the species;
- Remove and reduce to possession from areas under federal jurisdiction;
- Maliciously damage or destroy the species on areas under federal jurisdiction;
- Remove, cut, dig up, or damage or destroy the species on any area under federal jurisdiction in knowing violation of any law or regulation of any state or in the course of any violation of a state criminal trespass law;
- Deliver, receive, carry, transport, or ship the species in interstate or foreign commerce in the course of commercial activity; or,
- Sell or to offer for sale the species in interstate or foreign commerce.

Exceptions from the prohibitions identified above include:

- Activities authorized by a permit under 50 CFR 17.72;
- Forest-management, restoration, or research-related activities conducted or authorized by the federal agency with jurisdiction over the land where the activities occur;
- Removal, cutting, digging up, or damage or destruction of the species on areas not under federal jurisdiction by any qualified employee or agent of the FWS or state conservation agency which is a party to a Cooperative Agreement with the FWS in accordance with section 6(c) of the ESA, who is designated by that agency for such purposes, when acting in the course of official duties; and,
- Collection of whitebark pine seeds from areas under federal jurisdiction for Tribal ceremonial use or traditional Tribal consumption if the collection is conducted by members of federally recognized Tribes and does not violate any other applicable laws and regulations.

The FWS may issue permits to carry out otherwise prohibited activities. Regarding threatened plants, a permit may be issued for the following purposes: scientific purposes, enhance propagation or survival, economic hardship, botanical or horticultural exhibition, educational purposes, or for other purposes consistent with the purposes of the ESA. Additional statutory exemptions from the prohibitions are found in sections 9 and 10 of the ESA. The 4(d) rule does not preclude section 7(a)(2) consultation, which is still required by the ESA.

Broadly, the forest management, restoration, or research-related activities referred to above include, but are not limited to, silviculture practices and forest management activities that address fuels management, insect and disease impacts, and wildlife habitat management (*e.g.*, cone collections, planting seedlings or sowing seeds, full or partial suppression of wildfires in whitebark pine communities, allowing wildfires to burn, survey and monitoring of tree health status), as well as other forest management, restoration, or research related activities.

Prohibitions related to removing and reducing to possession; maliciously damaging and destroying; or removing, cutting, digging up, or destroying the species in the 4(d) rule only apply to areas under federal jurisdiction. Therefore, the exceptions to those prohibitions also only apply to areas under federal jurisdiction.

Recovery Planning. A recovery outline was finalized in December 2022 and serves as an interim recovery guidance document to direct recovery efforts for the whitebark pine until a full recovery plan is developed and approved (FWS 2022b). The interim recovery strategy identified five steps where recovery efforts should initially be focused:

1. Continued inventories of existing stands to determine where to most effectively direct conservation and restoration efforts.
2. Avoiding impacts that could kill 'elite' trees (trees confirmed to have genetic blister rust resistance) and 'plus' trees (trees identified as potentially rust- resistant) or that could reduce reproduction or recruitment of seedlings and saplings into populations.
3. Further researching the effects of climate variability on the effectiveness of restoration activities and the health of existing populations.
4. Maintaining large stands of healthy adult trees specifically to support Clark's nutcrackers (*Nucifraga columbiana*).
5. Engaging partners (including but not limited to the U.S. Forest Service, National Park Service, BLM, Tribal Nations, Whitebark Pine Ecosystem Foundation, and American Forests) to develop and implement conservation plans that alleviate the key threats (white pine blister rust, wildfire, mountain pine beetle, and climate variability) to whitebark pine.

5.2. Taxonomy

Whitebark pine is a five-needled conifer species placed in the genus *Pinus*, subgenus *Strobus*, which also includes other five-needled white pines. No taxonomic subspecies or varieties of whitebark pine trees are recognized.

5.3. Range and Distribution

Whitebark pine is a widely distributed conifer in western North America (Figure 1). The species' range is broad both latitudinally (occurring from a southern extent of approximately 36° north in California to 55° north latitude in British Columbia, Canada) and longitudinally (occurring from approximately 128° west in British Columbia, Canada to an eastern extent of 108° west in Wyoming) (McCaughey and Schmidt 2001, p. 34). The whitebark pine range extends across about 80.6 million acres in western North America and roughly 70 percent of the species' range is in the United States and the remaining 30 percent in British Columbia and Alberta, Canada (FWS 2021, 2022a). In the United States, approximately 88 percent of its range is federally owned or managed with 29 percent designated as Wilderness under the Wilderness Act of 1964.

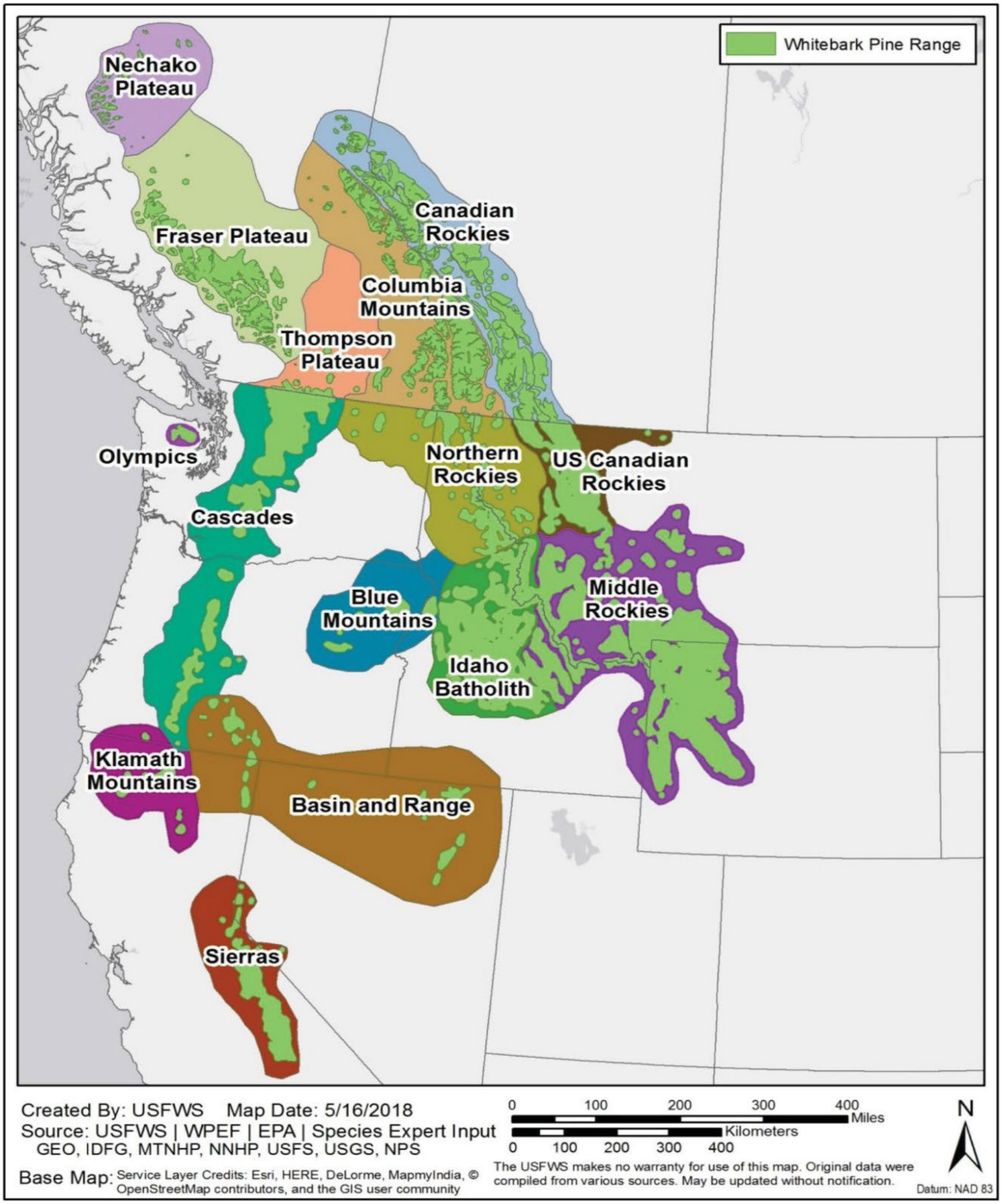


Figure 1. Rangewide distribution of the whitebark pine with analysis units used in the U.S. Fish and Wildlife Service 2021 Species Status Assessment. Reprinted from the whitebark pine Final Recovery Outline (FWS 2022b).

5.4. Habitat

Whitebark pine occurs in relatively cold, high-elevation sites in western North America. It is a hardy conifer that tolerates poor soils, steep slopes, and windy exposures. The species is found at alpine tree line and subalpine elevations. Whitebark pine is slow-growing and shows an intermediate level of shade tolerance (Arno and Hoff 1989, p. 6). In general, the upper elevational limits of whitebark pine decrease with increasing latitude throughout its range. The elevational limit of the species ranges from approximately 2,950 feet at its northern limit in British Columbia up to 12,000 feet in the Sierra Nevada Mountains in California (McCaughey and Schmidt 2001, p. 33). Whitebark pine grows under a wide range of average annual precipitation levels, from about 20 to over 100 inches per year. It is considered drought tolerant compared to other high elevation conifer species (Arno and Hoff 1989, pp. 2, 7). It occurs in pure or nearly pure relatively open canopied stands at high elevations and on certain aspects and slopes, as well as in stands of mixed species in a variety of forest community types, including moderately and densely stocked stands dominated by lodgepole pine (*Pinus contorta*), Engelmann spruce (*Picea engelmannii*), subalpine fir (*Abies lasiocarpa*), and mountain hemlock (*Tsuga mertensiana*). The factors that result in pure or nearly pure stands of whitebark pine are not well understood, but may include a combination of climate (temperature, precipitation, solar and wind exposure), slope, aspect, and soil.

Whitebark pine on BLM-administered lands occurs primarily in Idaho, Montana, and Wyoming, and to a lesser extent in California, Nevada, Oregon, and Washington. The BLM's whitebark pine populations are often different than those on U.S. Forest Service and National Park Service lands because they include communities of whitebark pine trees at the species' lower-elevation range (Perkins *et al*. 2016). These include marginal habitats, disjunct populations, and geographically distinct mountain islands that serve as valuable seed sources for distant populations. Individual whitebark trees at lower tree line, and at high-elevation sagebrush-whitebark pine ecotones may be especially drought resistant and provide potential sources of genetic diversity. Whitebark pine has historically not been a species of commercial interest and comprises a small component of forests on BLM-administered lands (Perkins *et al*. 2016).

Bureau of Land Management whitebark pine populations have small population sizes, isolated stands, generally semi-arid sites, different plant community associates, as well as exhibiting genetic differences (Anderson *et al*. 2009; Mahalovich and Hipkins 2011; Vergeer and Kunin 2012). Depending on aerial distance from other whitebark pine populations in relation to Clark's nutcracker seed dispersal flight distances, BLM's isolated disjunct stands may be at an elevated risk for local extinction after a severe disturbance event, because of the possible scarcity of replacement seeds from local sources (Perkins *et al*. 2016).

On BLM-administered lands, 76 percent of potential and actual whitebark pine habitat is in designated Wilderness or WSAs (Perkins *et al*. 2016). Other areas that may have whitebark pine include BLM Areas of Critical Environmental Concern (ACECs) and Research Natural Areas (RNAs). These designations pose challenges, both legal and philosophical, for BLM whitebark pine conservation and management efforts. From a practical standpoint, management activities are logistically challenging in areas that have no roads and where motorized equipment, and mechanical transport is prohibited or highly restricted (Perkins *et al*. 2016).

As of 2016, the BLM had identified 51 whitebark pine 'plus'-tree candidates in Idaho, Montana, Oregon, and Wyoming (Perkins *et al*. 2016).

5.5. Life History

There are four stages in the life cycle of the whitebark pine: seed, seedling, sapling, and mature trees (*i.e.*, reproductive adults). Like other tree species, all four life stages require adequate amounts of sunlight, water, and soil for survival and reproduction (mature trees only). Additionally, whitebark pine is considered an obligate ectomycorrhizal mutualist and the formation of ectomycorrhizal associations is thought to be required for survival (Southam *et al*. 2022, p. 2).

Whitebark pine seeds are produced in female cones. Seeds may take two years to eleven years to germinate once they have been dispersed from the cones. Whitebark pine seedlings are defined as germinated seeds that are between 3 to 4 inches tall with a 5-to-7-inch taproot and 7 to 9 cotyledons (embryonic first leaves) (Arno and Hoff 1990, p. 272). They may persist for multiple years, depending on growing conditions, until they die or reach the sapling stage of the life cycle. Saplings are non-reproductive trees greater than 4.5 feet inches height. At maturity, whitebark pine is typically 16 to 66 feet tall. On more open sites, it typically forms a rounded or irregularly spreading crown shape with multiple stems. In more densely forested areas, it tends to grow as tall, single-stemmed trees. It is monoecious, producing both male pollen and female seed cones on the same tree. Its seed cones are dark brown or maroon when mature, with purple highlights. Mature cones are typically 2 to 3 inches long and grow at the outer ends of upper branches.

Whitebark pine is a slow-growing, long-lived tree with a maximum known life span of more than 1,270 years (Perkins and Swetnam 1996, p. 2127). There is no systematic study of the average age at which whitebark pine produce cones, and it is likely highly variable. Krugman and Jenkinson (1974, p. 610) stated that the minimum age of cone production is 20 to 30 years, but without supporting data. The minimum age of cone production for most whitebark pines is likely older and at 100 to 200 years of age based on tree-ring data. For example, Keane *et al*. (2007) reported whitebark pines 0.4 to 4 inches diameter at breast height (DBH) being on average 103 years old (range 49 to 190 years old).

Whitebark pine is often described as a masting species, which is a term used to describe plants that have large interannual variation in cone production. In the only formal study of masting to date, Crone *et al*. (2011) found mostly weak pulses in cone production among years and cone masting varied spatially; some populations displayed more distinct variation in cone production among years whereas other population showed interannual consistency in cone production. One hypothesis is that cone production is dependent on local site productivity, and more productive sites allow for more consistent cone production. This hypothesis is supported by a couple of studies, including Morrill (2000), who found that cone production was corelated with available soil nutrients and soil pH. Additionally, Sala *et al*. (2012) found that masting depleted stored nitrogen and phosphorus reserves in individual whitebark pines for at least one full growing season after cone production.

Whitebark pine has indehiscent seed cones (scales remain closed at maturity) and wingless seeds that remain fixed to the cone and cannot be dislodged by the wind. Primary seed dispersal is attributed to the bird Clark's nutcracker (Hutchins and Lanner 1982). Nutcrackers are considered 'scatterhoarding' animals, which is a term used to describe animals that use hyper-dispersion to store large amounts of food. Food is scattered, or "cached," in many sites to eliminate the need to defend a large, central larder of food. Nutcrackers cache seed above and below ground. Above ground caches may be placed in dead or live trees, in branch tips, wedged into bark, and in clusters of foliage and lichen on trees and snags. Below ground caches may be placed in soil, pumice, and rock. Nutcrackers retrieve seed caches in winter and spring and therefore likely prefer sites that do not accumulate large amounts of snow, or that melt quickly in spring, such as low elevation forests and steep slopes. Clark's nutcrackers will also consume whitebark pine seedlings as they germinate in summer, tracking snow melt in subalpine regions and pulling newly emerging seedlings from the soil (Vander Wall and Hutchins 1983, pp. 209-210; Lorenz and Sullivan 2009, p. 333).

Clark's nutcrackers can transport an estimated 65 to 150 whitebark pine seeds at a time from harvest trees to cache sites in a pouch beneath their tongue, called a sublingual pouch (Bock *et al*. 1973). Nutcrackers sometimes cache seeds in the harvest stand at the base of harvest trees (Vander Wall 1988, p. 628; Lorenz *et al*. 2011, p. 242). At the other extreme, they may transport seeds 20.3 miles distant (Lorenz *et al*. 2011, p. 242), or above or below the whitebark pine zone and in other elevation forest types, like ponderosa pine forests (Tomback 1978; Lorenz *et al*. 2011). Lorenz *et al*. (2011, p. 242) used radio telemetry to track dispersal distances and found a median seed dispersal distance of 1.3 miles for whitebark pine, with a range of 0.0 miles (for caches placed at the base of harvest trees) to 20.3 miles. Lorenz *et al*. (2011, p. 242) found individual nutcrackers harvested seeds over a 21.2 square mile geographic area each year (range 0.4 to 108.5 square miles) but cached most seeds centrally within a 1.0 square mile home range.

In addition to Clark's nutcracker, many other animals forage on whitebark pine seed, including pine squirrels (*Tamiasciurus* spp.), chipmunks (*Tamias* spp.), grizzly bears (*Ursus arctos*), black bears (*Ursus americanus*), woodpeckers (*Picidae* spp.), and many species of songbirds (*Passeriformes*) (reviewed in Lorenz *et al.* 2008, p. 5). Some of these species may also contribute to seed dispersal, including Steller's jays (*Cyanocitta stelleri*), chipmunks and mice.

The vast majority of naturally produced and dispersed whitebark pine seed is not able to germinate or survive to reproductive maturity, either because it is consumed (pre- or post-dispersal) or because it is cached by animals in a site not suitable for seed germination or tree maturation.

5.6. Population Level Ecology

Populations are typically defined by the potential for genetic exchange among their members to the exclusion of members of other populations (in the absence of immigration or emigration). For whitebark pine, genetic exchange is limited by the dispersal distance of pollen, which is carried by wind, and the seed caching behavior of animals (Lanner 1996, pp. 30-47).

In the absence of stressors, each individual tree may produce millions of seeds over its lifespan of potentially 1,000 or more years (Arno and Hoff 1989, pp. 5-6). Successful recruitment of young trees becomes increasingly critical as mature trees are eliminated by disease, mountain pine beetle, or large severe wildfire. If all trees in a population manage to replace themselves during their lifetime, on average, the population will persist. Where this average rate is exceeded, the population will grow, but repeated failures of individuals replacing themselves, or catastrophic losses, can lead to population declines or losses.

Substantial genetic differentiation has been found even at sites relatively close in proximity. For example, Six *et al*. (2021, p. 12) found genetic differentiation between sites located approximately 17 miles apart. Six *et al*. (2021) concluded that such genetic differentiation likely reflects a combination of selection during the seedling and sapling stage (mostly influenced by temperature and precipitation, and more recently white pine blister rust) and afterwards, by periodic 'episodic' disturbances such as mountain pine beetle during a whitebark pine's long-life span. Overall, it appears there is high genetic diversity and little geographic structure across the range of the species. There is currently no known effort to formally define discrete whitebark pine populations.

5.7. Species Level Ecology

At the species level, whitebark pine needs multiple, connected populations in a breadth of ecological settings across its range to be viable. Populations need to be able to withstand disturbances, including stochastic events such as fires, and perturbations including normal year-to-year variation in temperature and precipitation. Populations must have high diversity in terms of geographic location, ecological settings, genetic identity, and/or niche fulfillment, as well as morphological and genetic variation.

5.8. Population Size and Trends

A complete and accurate assessment of the size of the rangewide whitebark pine population and number of individuals is lacking, as is information on the numbers of individuals that have died due to various factors. Challenges include the fact that whitebark pine is widespread and occupies remote and sometimes inaccessible terrain. Mature trees are easy to see when they occur in open climax stands, but they are harder to count when they co-occur in mixed stands with other conifers. Seedlings and saplings are small, often hidden by vegetation, and can occur outside the elevation zones occupied by adults.

The SSA (FWS 2021) modeled impacts to whitebark pine from blister rust, mountain pine beetle, and fire, and estimated the percent of the range affected by these stressors by analysis unit (Table 2). The impact of these stressors differs throughout the species range although considered together, the northern portions of the Rocky Mountains (Idaho and Montana) and Cascade Range (Oregon and Washington) have been impacted the most severely. White pine blister rust infection levels are highest in the northern portions of the Rocky Mountains (Idaho and Montana) and Cascade Range (Oregon and Washington), infecting 42 to 74 percent of whitebark pines in those analysis units. Mountain pine beetle is also most prevalent across the Rocky Mountains and Cascade Range, impacting approximately 20 percent of whitebark pine's range in analysis units in those mountain ranges. Percent area burned is highest in central Idaho (43 percent), followed by the Blue Mountains (27 percent), Rockies (9 to 24 percent), and Cascades (17 percent).

Analysis Unit	Percent of WBP infected with WPBR	Percent of WBP impacted by MPB	Percent of WBP burned within AU	Percent of WBP burned at high severity
Middle Rockies	22.6	22.1	14.6	4.3
Idaho Batholith	22.5	21.0	42.6	10.1
Cascades	41.7	22.1	16.8	4.9
US Canadian Rockies	73.9	6.7	24.0	8.0
Northern Rockies	62.2	20.1	9.0	2.2
Sierra Nevada	2.3	5.1	6.9	0.7
Basin and Range	18.0	21.7	13.6	2.1
Blue Mountains	38.8	10.4	27.0	6.3
Klamath Mountains	15.2	7.0	12.8	2.6
Olympics	27.6	0.0	1.2	0.0
Rangewide Average	32.5	13.6	16.9	4.1

Table 2. Percent of whitebark pine (WBP) infected with white pine blister rust (WPBR), impacted by mountain pine beetle (MPB), burned, and burned in high severity fire within the whitebark pine analysis units (AU) delineated in the SSA (FWS 2021, pp. 70, 78, 81).

The SSA projected future losses for the next 180 years from the main stressors of blister rust, beetles, fire, and indirectly, variations in climate. Under the most optimistic scenario where current trends continue, the loss of whitebark pine from fire will increase 6-fold after 180 years, while white pine blister rust infection rates will double, and acres lost to mountain pine beetle triple. Focusing on the next 60 years, which has less uncertainty than 180-year projections, this equates to fire impacting 15 percent of whitebark pine's range, blister rust impacting 61 percent, and mountain pine beetle impacting 31 percent in 60 years (FWS 2021, pp. 106-110). In the U.S. portion of whitebark pine's range, losses are predicted to be greatest in the Cascade Range of Oregon and Washington, and in the northern and middle Rocky Mountains. Under scenarios where these three stressors increase through time (increasing rate of severe wildfire, increasing blister rust infection rates, and increasing acres of mountain pine beetle mortality), the losses become greater, and in 60 years, fire will impact 24 to 32 percent of whitebark pine's range, blister rust will impact 52 to 88 percent, and mountain pine beetle will impact 15 to 40 percent (FWS 2021, pp. 106-110).

5.9. Ecology of the Main Stressors

The four main stressors leading to the decline of the whitebark pine are white pine blister rust, mountain pine beetle, wildfire, and climatic variability (FWS 2021, pp. 34-63). Interactions between these factors have further exacerbated the species' decline. The final listing rule found that the continued increase in white pine blister rust infections and associated mortality of mature trees, in combination with synergistic and cumulative interactions between these other stressors, and the resulting loss of seed source will limit reproduction and reduce the species' ability to regenerate following disturbances (FWS 2022a, p. 76914).

White Pine Blister Rust. White pine blister rust is a fungal disease of five-needle pines (*Pinus* spp.) caused by a nonnative pathogen (Geils *et al*. 2010). The fungus was inadvertently introduced into western North America around 1910 near Vancouver, British Columbia from eastern white pine nursery stock imported from Europe (McDonald and Hoff 2001, p. 198) and now occurs throughout the range of the whitebark pine. Whitebark pine is highly susceptible to blister rust. Blister rust's rate and intensity of spread is influenced by microclimate and other factors. The incidence of white pine blister rust at stand, landscape, and regional scales varies with environmental suitability for its development, and these factors are not well understood.

The white pine blister rust fungus has a complex life cycle. It does not spread directly from one tree to another, but alternates between primary hosts (*i.e.*, five-needle pines) and alternate hosts. Alternate hosts in western North America are typically woody shrubs in the genus *Ribes* (gooseberries and currants) but also may include herbaceous species of the genus *Pedicularis* (lousewort) and the genus *Castilleja* (paintbrush) (McDonald and Hoff 2001, p. 193; McDonald *et al*. 2006, p. 73).

On five-needle pines, spores enter through openings in the needle surface, or stomates, and move into the twigs, branches, and tree trunk, causing swelling and cankers to form. Cankers may eventually spread around the bole of infected trees, effectively girdling them (McDonald and Hoff 2001, p. 195). White pine blister rust infects seedlings, saplings, and mature trees. White pine blister rust typically takes years or decades to kill larger, mature whitebark pines and while trees can continue to live for decades, their cone-bearing branches may die first, thereby eliminating their ability to reproduce (Geils *et al*. 2010, p. 156). In addition, the inner sapwood moisture decreases, making trees prone to desiccation and secondary attacks by insects (Six and Adams 2007, p. 351).

Some whitebark pines naturally show partial resistance to white pine blister rust. These trees are able to slow or halt the progression of the disease at various stages of infection. Blister rust resistance in whitebark pine manifests itself phenotypically in many ways and has been characterized as a form of "quantitative resistance," which means that different resistance mechanisms are located on different genes. Some resistant whitebark pines may slow the progression of the disease along their stem, whereas other resistant trees are able to prevent the disease from spreading to their bole. Still others may be able to compartmentalize cankers and prevent cankers from girdling their main stem. Whitebark pines that are highly ranked in blister rust resistance screening trials show at least one of these traits and have fewer stem symptoms than the most susceptible families. Such resistant trees are expected to have improved overall survival (Sniezko *et al*. 2007; 2011; 2024; Johnson and Sniezko 2021). In species with quantitative resistance like whitebark pine, trees have not been found that show complete immunity from infection; all whitebark pines show some symptoms of infection (*e.g.*, needle spots) if they are properly inoculated in nurseries. Resistance to blister rust is caused by a combination of genetics, certain endophytic microorganisms (*i.e.*, a tree's fungal microbiome), and defensive compounds (terpenes) within needle tissue (Bullington *et al*. 2018).

Quantitative resistance differs from the other important resistance mechanism for blister rust, which is called major gene resistance (or qualitative resistance). Qualitative resistance has been found in other North American five-needle pines including limber pine (*Pinus flexilis*), sugar pine (*Pinus lambertiana*), and western white pine (*Pinus monticola*) (Sniezko and Liu 2022). Quantitative resistance is expected to be more durable at a population scale over the long term compared to major gene resistance and thus lead to better outcomes as blister rust adapts and evolves with North American five-needle pines (Sniezko *et al*. 2011; Johnson and Sniezko 2021; Sniezko and Liu 2022). This means the prognosis for durable resistance and for whitebark pine adapting to white pine blister rust is more hopeful than for species like sugar pine (Sniezko and Lui 2021; Sniezko *et al*. 2024). It also means that whitebark pines that are visibly infected with blister rust in natural settings should not be assumed to have genetics that predispose them to blister rust infection. Such trees could have relatively high levels of resistance to white pine blister rust but have become infected due to site-specific environmental factors that favored the spread of or infection by blister rust. It is just as important to consider that trees with blister rust infections could have resistance to other threats like mountain pine beetle. While planting of blister rust resistant trees is one tool to help whitebark pine recovery, all naturally occurring whitebark pines on the landscape may contain valuable genetics and are important for recovery (Kichas *et al*. 2020; Six *et al.* 2018).

A key component of BLM's whitebark pine conservation and management program is the planting of rust-resistant seeds and seedlings for reforestation (Keane and Parsons 2010; Mahalovich and Dickerson 2004; Mahalovich *et al*. 2006). Ensuring adequate genetic variation of seeds and seedlings is important because they provide the raw material for adaptation to new or changing environments.

Mountain Pine Beetle. Whitebark pine trees are fed upon by a variety of insects although none has had a more widespread impact in the last century than the native mountain pine beetle. The mountain pine beetle is recognized as one of the principal sources of whitebark pine mortality in recent decades (Raffa and Berryman 1987, p. 234; Arno and Hoff 1989, p. 7). These beetles colonize trees en masse and kill whitebark pine within one or two years by consuming the phloem (living vascular tissue) and effectively girdling the tree.

The beetle's life cycle starts with adult females locating suitable host (*i.e.*, large diameter tree with sufficient resources for brood production success). Adult female beetles emit pheromones that attract adult males and other adult females to the host tree. This attractant pheromone initiates a synchronized mass attack for the purpose of overcoming the host tree's sap defenses. Once a tree has been fully colonized, the beetles produce an anti-aggregation pheromone that signals to incoming beetles to pass on to nearby unoccupied trees. Almost all host trees, even stressed individuals, will mount a physiological defense against these mass attacks; however, given a sufficient number of beetles, a healthy tree's defensive mechanisms can be exhausted (Raffa and Berryman 1987, p. 239).

Following pheromone-mediated mass attack, male and female beetles mate in the phloem (living vascular tissue) under the bark of the host tree. Females then excavate vertical galleries where they lay eggs. Larvae hatched from these eggs feed on the phloem, pupate, and emerge as adults to initiate new mass attacks of nearby suitable trees (Gibson *et al*. 2008, p. 3). Mountain pine beetle development is strongly linked to temperature. The entire mountain pine beetle life cycle (from egg to adult) can take between 1 and 2 years depending on ambient temperatures. Warmer temperatures promote a more rapid development that enables beetle larvae to develop into adults in a 1-year, or univoltine, life cycle (Amman *et al*. 1997; Gibson *et al*. 2008, p. 4).

There is evidence of mountain pine beetle outbreaks in the prehistoric record, indicating whitebark pine has evolved with mountain pine beetle (Brunelle *et al*. 2008). The most recent mountain pine beetle outbreak is concerning because it is occurring in concert with white pine blister rust and the effects of severe wildfire and climate variability (Gibson *et al*. 2008; Kegley *et al*. 2011; FWS 2021).

Current management and research continue to explore methods to control mountain pine beetle, mainly with the use of the pesticide Carbaryl and the anti-aggregation pheromone Verbenone (*e.g.*, Eglitis 2015). Both methods can be effective for limited time periods (Progar 2007, p. 108). However, use of either control method can be prohibitively expensive and challenging given the scale of mountain pine beetle outbreaks (millions of acres) and the inaccessibility of much of whitebark pine habitat. Moreover, Carbaryl is a non-selective pesticide that kills all insects, including beneficial species and pollinators, and would have major unacceptable ecological impacts if used on a broad scale. Verbenone deters beetle attack by mimicking an anti-aggregate pheromone that signals to dispersing beetles that the marked tree is colonized to its maximum potential. Unfortunately, Verbenone is not always successful; some Verbenone protected trees are attacked and killed. Currently, Carbaryl and Verbenone are being suggested for use in targeted protection of high-value trees, such as individuals resistant to white pine blister rust, rather than as a large-scale restoration tool (Keane *et al.* 2012, p. 83).

In any given outbreak, some mature whitebark pines survive. Six *et al*. (2018, entire) studied genetic profiles of surviving whitebark pines and found survivors had distinct genetic profiles, evidence for natural genetic resistance to mountain pine beetle. However, there are no efforts currently underway to select for and propagate resistance to mountain pine beetle, unlike blister rust. Six *et al*. (2018, p. 1) describes the most recent outbreak as “a natural selection event, removing trees most susceptible to the beetle and least adapted to warmer drier conditions.”

Maintaining naturally occurring genetic variation is important to species representation and should be a key consideration in management plans and recovery planning (Six *et al*. 2018, p. 9). Additionally, and contrary to conventional wisdom, Six *et al*. (2021) and Kichas *et al*. (2020) found that beetle-killed whitebark pines had faster growth rates and suggest that management activities that increase whitebark pine tree vigor may have the unintended consequence of increasing susceptibility to mountain pine beetle attack. The most concerning threat to whitebark pine is not from mountain pine beetle alone, which has coevolved with whitebark pine, but instead is from the synergistic effects of multiple significant stressors acting at the same time: blister rust, mountain pine beetle, severe wildfire, and variations in climate (FWS 2021, p. 110).

Wildfire. Fire is an important landscape-level disturbance in many forested systems (Agee 1993, p. 259; Morgan and Murray 2001, p. 289; Spurr and Barnes 1980, p. 422), and is relevant to whitebark pine both as a stressor that causes mortality and as a mechanism that affects forest succession. Fire regimes in whitebark pine systems are often characterized as mixed severity, with a mosaic of low- and high-severity fire effects (Arno *et al*. 2000, p. 226; Arno 2001, p. 83; Campbell and Antos 2003, p. 393; Larson *et al*. 2009, p. 283), or high severity, with long fire return intervals (Romme 1982, p. 208; Campbell and Antos 2003, p. 393).

Whitebark pine is easily killed by fire, including low intensity fire, because it lacks adaptations such as thick bark and self-pruning, and it is short in height (Stevens *et al*. 2020, p. 948). Conifer species that are well-adapted to and survive low intensity fire like ponderosa pine have thicker bark, self-prune their lower branches as they age, and grow to substantial heights to reduce the probability of fire reaching the crown. Stevens *et al*. (2020) rated whitebark pine 27 out of 29 western North American conifers in fire resistance based on fire-adapted traits, making it one of the most susceptible species to fire in North America. Keane and Parsons (2010, p. 56) reported over 40 precent whitebark pine mortality on prescribed burns, similar to subalpine fir mortality. In an unpublished white paper, Keane *et al*. (2020, p. 8) suggested that blackening the bole of whitebark pine in a prescribed fire results in a high probability of mortality, even if the blackening is a portion of the base of the tree. Given these findings, large scale applications of prescribed fire in whitebark pine habitat are likely to result in considerable mortality at a time when it is important to preserve genetic diversity in the remaining individuals on the landscape.

It has been postulated that fire suppression is resulting in a transition from whitebark pine-dominated forests to forests dominated by subalpine fir and Engelmann's spruce, which are more shade-tolerant conifers (Arno 1980, p. 460; Arno 2001, p. 82; Keane *et al*. 2017a, p. 3; Keane and Parsons 2010, p. 57; Flanagan *et al*. 1998, p. 307). However, no empirical evidence is available to support the fire suppression-caused densification hypothesis. Dolanc *et al*. (2013, p. 270) documented an increase in the number of small diameter trees, including whitebark pine, in subalpine forests of the central Sierra Nevada over an 80-year period. However, Dolanc *et al*. (2013, p. 272) attributed the densification of small trees in their study areas to climate variations, which they suggested may be moderating extreme temperatures and reducing snowpack, thereby providing better growing conditions for small trees. Dolanc *et al*. (2013, p. 271) did not attribute the observed densification of small trees to fire suppression, because fire suppression policies have only been in effect for 75 to 100 years, which was a relatively short period of time compared to the fire return intervals of subalpine forests in their study areas (Dolanc *et al*. 2013, p. 270). In Washington, Amberson *et al*. (2018) did not find evidence of successional replacement by subalpine fir and Engelmann spruce over twenty years (Amberson *et al*. 2018, p. 1). In Montana, Larson (2009, pp. 99, 156) found that subalpine fir had established in whitebark pine stands at least 130 to 300 years ago, prior to modern fire suppression, and there was no evidence of successional replacement or deviations from the historic range of variability.

Additionally, some small subalpine fir 'saplings' were found to be greater than 200 years old (Larson 2009, p. 98), showing that size class could not be used to determine tree age for assessing successional stages associated with fire suppression. Campbell and Antos (2003, p. 395) noted that successional replacement in whitebark pine forests is more complex than indicated in earlier studies. For example, they found that subalpine fir readily established after fire in their British Columbia, Canada, study areas, contrary to earlier suggestions. They estimated that succession to subalpine fir dominated communities would take more than 500 years. Campbell and Antos (2003, p. 395) reported that whitebark pine in their study area could survive long periods of suppressed growth and was able to release upon reaching the main canopy after more than 150 years of low growth rates. Whitebark pine has lower resistance to fire than subalpine fir and Englemann spruce (Stevens *et al*. 2020). It is also easily killed by fire.

Keane and Parsons (2010) found that fire killed whitebark pine at the same rate as, and sometimes at higher rates than, subalpine fir. This is further evidence that a frequent fire regime would not maintain whitebark pine over other subalpine species.

Some aspects of these historical dynamics have been altered due to white pine blister rust. This novel stressor makes the species more vulnerable to the impacts of fire. Blister rust has infected and killed many mature whitebark pine trees, reducing or eliminating seed sources. It also reduces seedling survival. Additionally, the length of the wildfire season is expected to increase with variations in climate and increases in human population density in the western U.S., as are the number of fires, the area burned, and the intensity of fires (Keane *et al.* 2017b, pp. 34-35; Westerling 2016, pp. 1-2). These factors together are major concerns and are expected to negatively impact whitebark pine's ability to persist in the future (FWS 2021).

In summary, wildfire has been an important ecosystem process in high elevation forests throughout the whitebark pine's evolutionary history. Mixed- and high-severity fire have historically been conducive to the maintenance of whitebark pine ecosystems at the landscape scale. In contrast to low elevation ponderosa pine forests, there is no evidence that frequent low severity wildfire is a disturbance process associated with whitebark pine persistence or tree health or that management activities designed to mimic such a process would benefit the species. Moreover, implementing management practices such as thinning and prescribed fire within stands occupied by whitebark pine have the potential to increase regeneration of competing conifers, increase whitebark pine mortality from prescribed fire and equipment operations, and increase risk of insect and mountain pine beetle attack (Waring and Six 2005; Maher *et al*. 2018; Murray *et al*. 2021; Six *et al*. 2021, p. 19).

Climate. Habitat loss from variations in climate are anticipated to occur across the whitebark pine range, with current habitats potentially becoming unsuitable for the species as a result of both direct and indirect impacts from climatic factors (Bartlein *et al*. 1997, p. 788; Hamann and Wang 2006, p. 2783; Schrag *et al*. 2007, p. 87; Aitken *et al*. 2008, p. 103; Loehman *et al*. 2011, pp.185-187; Rice *et al*. 2012, p. 31; Chang *et al*. 2014, p. 10). Researchers have hypothesized that there may be significant habitat loss as (1) temperatures become so warm that they exceed the thermal tolerance of whitebark pine, (2) warmer temperatures favor other species of conifer that currently cannot compete with whitebark pine in cold high-elevation habitats, and (3) variations in climate may be altering the frequency and intensity of fire and insect outbreaks to such an extent that whitebark mortality may exceed its regeneration potential.

The pace of predicted climatic variability may outpace many plant species' abilities to evolve and adapt. Whitebark pine is potentially particularly vulnerable to warming temperatures because it is a slow growing tree that is outcompeted in warmer and less severe growing conditions. Therefore, warming is expected to make its current habitat unsuitable by favoring competitors, such as subalpine fir or mountain hemlock. The rate of migration needed to respond to predicted climate variability will be significant (Malcolm *et al*. 2002; McKenney *et al*. 2007, p. 941). It is not known whether whitebark pine is capable of successfully migrating in response to climatic variations, or the degree to which Clark's nutcracker could facilitate this migration. In addition, the presence of significant white pine blister rust infection in the northern range of whitebark pine could serve as a barrier to effective northward migration. Whitebark pine survives at high elevations already, and there is little remaining habitat for the species to migrate to in higher elevations. Adaptation by the species in response to a warming climate could also be unlikely as whitebark pine is a long-lived species with a long generation time.

As a result of the threats to the whitebark pine, it was estimated that as of 2016, 51 percent of all standing whitebark pine trees were dead (Goeking and Izlar 2018). Currently, restoration efforts focus on producing and planting whitebark pines with genetic resistance to white pine blister rust, and protecting existing trees, especially those that produce cones and those that have potential or known white pine blister rust resistance.

6. RECENT SECTION 7 CONSULTATIONS

Please refer to the following link to search for section 7 consultations for whitebark pine: https://reports.ecosphere.fws.gov/FWSPublicReports/Reports/Index?reportname=BiologicalOpinionReport

Several federal agencies have requested consultation for effects of their management activities on whitebark pine, ranging from forest management, prescribed burning, road and right-of-way upgrades and management to facilities maintenance. These projects have varied in scale from the removal of seven mature whitebark pine trees as part of a ski resort operation to affecting up to 50,000 acres of occupied whitebark pine habitat through timber harvest and prescribed burning projects. Each of these separate consultations reached a "not likely to jeopardize" conclusion due to the scale and scope of the project and their adverse effects as well as the implementation of avoidance and minimization measures to ensure these projects did not impede the recovery of whitebark pine.

Generally, those activities with completed section 7 consultations on effects to whitebark pine have caused removal of a small fraction of mature whitebark pine trees relative to the number that are known to occur within each project's action area. Additionally, these activities have led to trampling, crushing, and burial of some unknown number of seed, seedling, and sapling life stages. Given its large range and efforts to minimize effects of project activities on whitebark pine, our records indicate that section 7 consultations for whitebark pine to date have resulted in the removal of a total of approximately 0.001 percent of the total modeled habitat acreage of the species in the U.S.

7. ENVIRONMENTAL BASELINE

Regulations implementing the ESA (50 CFR 402.02) define the environmental baseline as the condition of the listed species in the action area, without the consequences to the listed species or designated critical habitat caused by the proposed action. The environmental baseline includes the past and present impacts of all federal, state, or private actions and other human activities in the action area, the anticipated impacts of all proposed federal projects in the action that have already undergone formal or early section 7 consultation, and the impact of state or private actions which are contemporaneous with the consultation in process. The impacts to listed species or designated critical habitat from federal agency activities or existing federal agency facilities that are not within the agency's discretion to modify are part of the environmental baseline.

7.1. Current Condition of the Species in the Action Area

The action area is defined at 50 CFR 402.02 to mean "all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action." The action area includes all BLM-administered lands for which potential whitebark pine range has been identified. This includes the potential range of whitebark pine on BLM-administered lands across seven states where BLM-authorized activities will occur. For the purposes of this consultation, the FWS follows the detailed action area as described in the BA addendum (BLM 2025), as well as supplemental information received.

The action area encompasses 2,402,820 acres (or approximately 4 percent) of the species potential range (58,126,376 acres) (BLM 2025) (Figure 2, Table 3). Within the action area, modeled whitebark pine habitat (Figure 3) is approximately 138,681 acres, which is 5.8 percent of the action area. Modeled whitebark pine habitat acreage is the sum of modeled habitat acreage across seven states: 14 acres in California, 83,503 acres in Idaho, 27,073 acres in Montana, 376 acres in Nevada, 1,335 acres in Oregon, up to 32 acres in Washington, and 26,348 acres in Wyoming. The modeled habitat is a combination of results from the 2009 Westwide Forest Inventory and Analysis model and the Warwell *et al*. (2006) Bioclimate model as described and cited in BLM (2025).

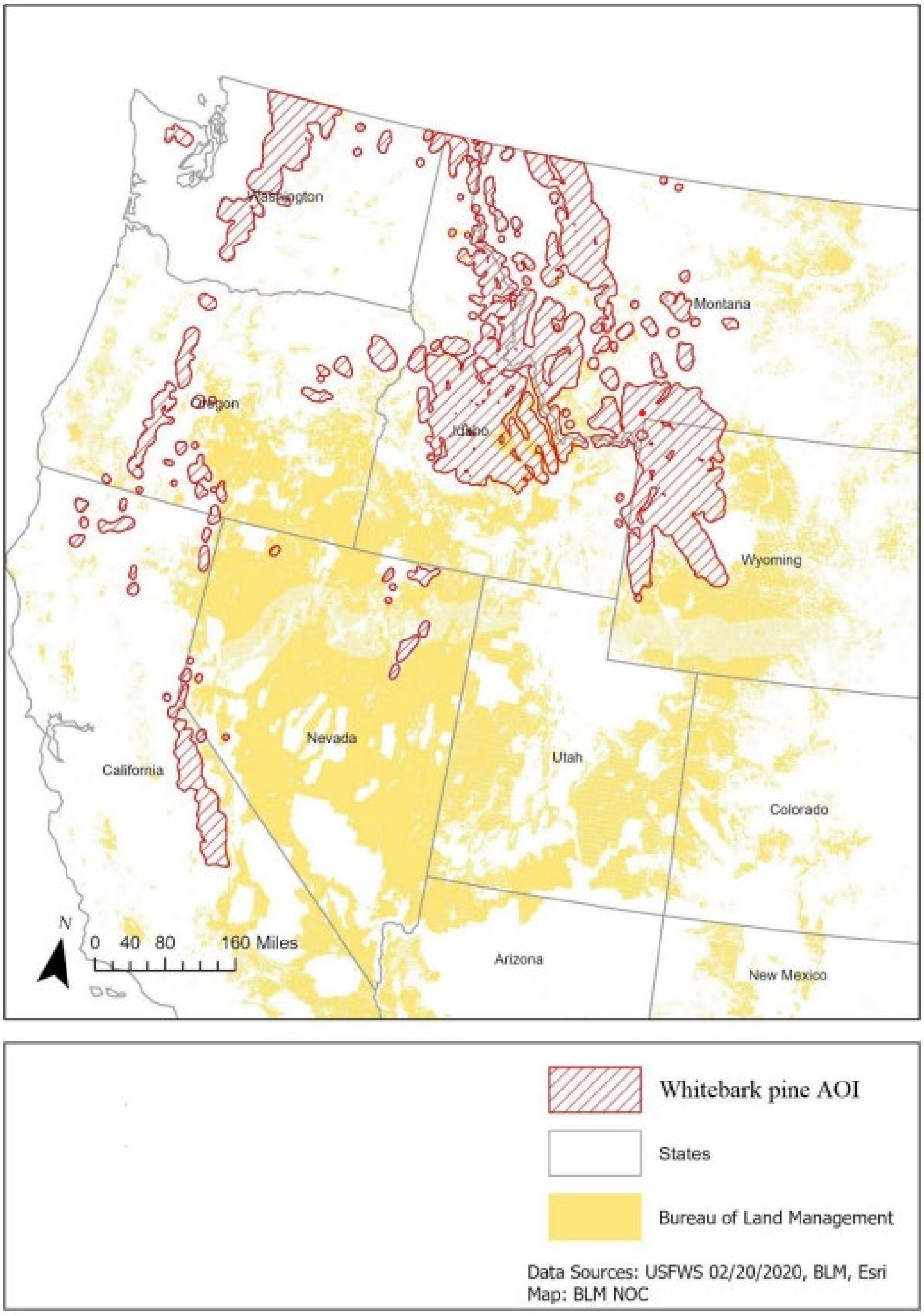
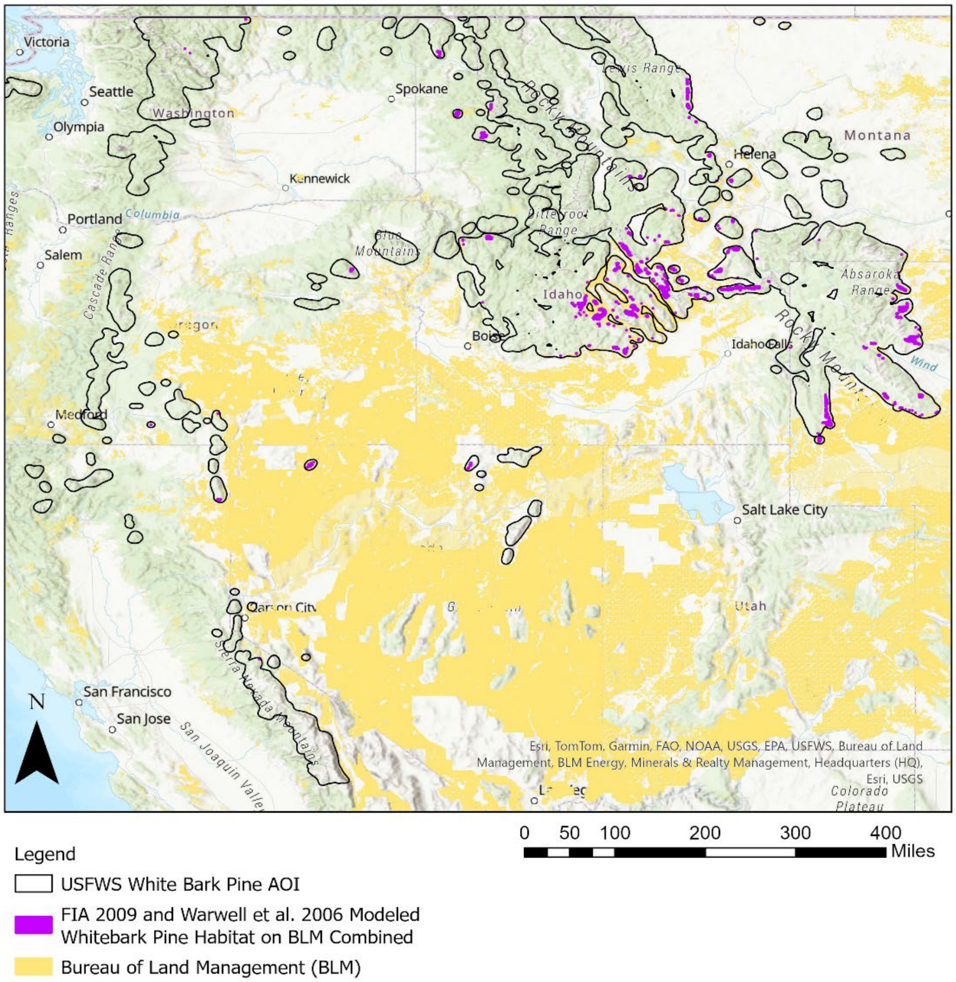


Figure 2. Map of whitebark pine potential range [Area of Influence (AOI)] overlain on BLM-administered lands (action area).

State	**Total Potential Range (acres) of WBP in the U.S.**	**Total Potential Range (acres) of WBP that intersects BLM Land**	**Percent of WBP Potential Range on BLM Land**
California	4,029,112	59,818	1.48
Idaho	16,112,157	1,445,828	8.97
Montana	17,323,141	370,404	2.14
Nevada	1,183,111	105,234	8.89
Oregon	4,065,854	61,996	1.52
Washington	5,903,872	17,036	0.29
Wyoming	9,509,129	342,504	3.60
Total	58,126,376	2,402,820	4.13

Table 3. Total potential range (acres) of whitebark pine in the U.S. that intersects BLM-administered lands (*i.e.*, the action area) by state (BLM 2025).



No warrantee is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of the data layers shown on this map. The official land records of the data providers should be checked or current status on any specific tract of land.

Figure 3. A map showing the modeled whitebark pine habitat on BLM-administered lands. The modeled habitat is a combination of results from the 2009 Westwide Forest Inventory and Analysis model and Warwell *et al*. (2006) Bioclimate model as cited in BLM (2025).

While the total number of individual whitebark pine within the action area is unknown, BLM provided modelled estimates for seedlings, saplings, and adults across BLM-administered lands within the range of the species (BLM 2025, p. 131). Challenges include the fact that the action area is large (2,402,820 acres), whitebark pine is widespread and can co-occur in mixed stands with other similar-looking conifers, seedlings and saplings can easily be hidden by tall vegetation and occur outside the expected elevation zone adults occupy, and it occupies remote and sometimes inaccessible terrain.

Whitebark pine occurs marginally on BLM-administered lands. Whitebark pine on BLM-administered land, as well as rangewide, have been affected by mountain pine beetle, white pine blister rust, fire, fire suppression, and variations in climate that have caused mortality of whitebark pine and other trees occurring on BLM-administered lands. Of the whitebark pine's range that does occur on BLM-administered lands, the majority (76 percent) is found in Wilderness areas or otherwise inaccessible areas where BLM-authorized activities are typically prohibited or highly restricted (Perkins *et al*. 2016). Other areas that may have whitebark pine include BLM ACECs and RNAs. These designations pose challenges, both legal and philosophical, for BLM whitebark pine conservation and management efforts. From a practical standpoint, management activities are logistically challenging in areas that have no roads and where motorized equipment and mechanical transport is prohibited, or highly restricted (Perkins *et al*. 2016).

As of 2016, the BLM had identified 51 whitebark pine 'plus'-tree candidates in Idaho, Montana, Oregon, and Wyoming (Perkins *et al*. 2016).

7.2. Status of and Factors Affecting Whitebark Pine Within the Action Area

The environmental baseline is a discussion of the health and status of the species **in the action area**, but it does not include the effects of the proposed action.

Within the action area, the status of the threats to the species are similar to those throughout the range of whitebark pine. Whitebark pine has suffered direct losses from three major threats: white pine blister rust, mountain pine beetle, and fire (FWS 2021). Information on the extent of those losses in the SSA was compiled from many individual studies (FWS 2021). In the SSA, the FWS defined fifteen analysis units within the range of whitebark pine, for the purpose of allowing meaningful assessment of viability across the broad listed range of the species. Rangewide estimates of whitebark pine mortality estimate that just over half (51 percent) of standing whitebark pines in the U.S. are dead (Goeking and Izlar 2018).

Considered together, within the action area, the majority of whitebark pines are impacted by at least one of these factors, with blister rust being the most prevalent, followed by mountain pine beetle and then fire. While climate was also identified as a stressor in the SSA, the impacts of climate were not analyzed directly in terms of acres or percentages impacted, because climate works synergistically with mountain pine beetle and fire. Teasing out the impacts of variations in climate alone was not feasible. Future projections are for all three stressors to continue to impact whitebark pine, with the rate remaining the same or increasing, leading to increased losses of whitebark pine over the next 180 years. The greatest projected whitebark pine losses are anticipated to occur from increasing rates of blister rust infection, followed by mountain pine beetle and fire (FWS 2021, pp. 102-104).

We know that there is some level of white pine blister rust infection in most stands within the action area. The BLM has identified at least 51 'plus' tree candidates identified across the action area (Perkins *et al*. 2016). Regarding mountain pine beetle, outbreaks peaked between 2008 and 2013, with low levels of activity detected until 2020 when increasing infection and mortality were again detected in the action area. Mountain pine beetle and white pine blister rust have affected whitebark pine populations more than the other factors of fire regime and climate variation. Variations in climate may be affecting whitebark pine throughout the action area, specifically through exacerbating existing threats, and could continue to cause shifts in areas of suitable habitat for whitebark pine regeneration.

The status of and threats to the species in the action area are the same as those affecting whitebark pine throughout its range. Activities included in Livestock Grazing and Range Improvements; Lands, Realty and Cadastral Survey; Mining; Oil and Gas; Geothermal; Forest and Vegetation Management; Wild Horse and Burro Management; Recreation Management and Recovery Efforts and Research Activities; and committed conservation measures (BLM 2024) are currently being implemented by the BLM. While these activities do not pose substantial threats to the species and in some cases may produce benefits to the species (FWS 2021, 2022a), they contribute to the environmental baseline condition for whitebark pine. Our ability to predict with reasonable certainty the future baseline conditions of whitebark pine is limited given the trajectory of the species and its habitat in response to the aforementioned threats.

7.3. Conservation and Protection

White pine blister rust has been recognized as the major threat to whitebark pine conservation for nearly a century. Early attempts in the 1930s to limit the incidence of blister rust by eradicating *Ribes* plants, the alternate host, were costly and unsuccessful. Conservation efforts therefore have focused on identifying, producing, and planting seedlings of parents that show genetic resistance. Trees are identified for genetic testing if they show no symptoms of blister rust in natural settings, despite occurring in heavily infected stands. Seeds from these trees are collected and sent to specialized nurseries, where seedlings are exposed to heavy loads of blister rust spores.

Parents whose progeny show few blister rust symptoms are then targeted for seed collection and used for producing large numbers of seedlings for outplanting. It is also possible to plant whitebark pine seeds, which saves cost and effort, but the success of seed planting is unknown. Many planted seeds are removed by rodents and likely many are consumed.

Programs to select and outplant blister rust resistant seedlings have been on-going since the 1990s and early 2000s (Mahalovich 2015; Sniezko *et al*. 2024). Not all seedlings survive. Rangewide estimates of survival of planted seedlings average 63 percent in the first three years post-planting. Survival decreases to 37 percent after 10 years (Scott and McCaughey 2006; Izlar 2007; McCaughey *et al*. 2009; Asebrook *et al*. 2011; Jenkins 2017; Cripps *et al*. 2018). There is no published data on long-term survival.

Current genetic restoration programs are limited to testing for and producing seedlings with resistance to white pine blister rust, and not resistance to mountain pine beetle, drought, and other factors. Trees with high levels of blister rust resistance may not have resistance to mountain pine beetle and other threats. Therefore, protecting as many naturally occurring trees as possible is important for whitebark pine conservation. Management efforts should prioritize protection as the first and most important conservation tool (Kichas *et al*. 2020; Six *et al*. 2021), and planting of rust resistant seedlings second, and as an ancillary conservation tool. If managers focus only on planting rust resistant seedlings at the expense of losing naturally occurring trees, the genetic pool would be narrowed because seedlings from nurseries are the offspring of a limited number of individuals (Kichas *et al*. 2020; Six *et al*. 2021). Protecting and planting seedlings alone would likely result in a more restricted genetic pool compared to protecting naturally occurring trees, which are the progeny of millions of individuals. A restricted genetic pool could result in the loss of adaptive capabilities while the species is facing multiple simultaneous threats (Kichas *et al*. 2020; Six *et al*. 2021).

Where activities are deemed necessary in whitebark pine stands, protection of whitebark pine at the project-level can include surveys to avoid impacts to individuals and to minimize the use of heavy equipment within the root zone of trees. Protective avoidance measures can be incorporated into grazing plans, recreation management, and other programs of work, such as by requiring infrastructure (*e.g*., stock tanks, mineral licks, trail re-routes) to be placed away from or to avoid existing whitebark pines and promoting pruning instead of felling trees when impacts to trees cannot be avoided.

Isolated whitebark pine individuals and small populations on BLM-administered lands may represent the best-adapted trees for survival in the BLM's unique, characteristically dry and lower-elevation habitats. These trees may hold important genetic resources for future changing landscapes (Perkins *et al*. 2016). The BLM's stated goal for whitebark pine is to conserve and maintain whitebark pine forests and potential habitats experiencing white pine blister rust, mountain pine beetle, wildland fire, and a changing climate (Perkins *et al*. 2016). The BLM's conservation objectives for whitebark pine are: (1) protect and maintain the genetic diversity of whitebark pine, (2) increase white pine blister rust resistance in future whitebark pine populations, (3) document conditions of current and potential whitebark pine habitats, (4) protect known or potential rust-resistant seed sources, and (5) use silvicultural practices, including prescribed fire, to restore and maintain populations (Perkins *et al*. 2016).

7.4. Impacts of Federal, State, and Private Actions

The environmental baseline also includes past and present impacts of federal, state, or private actions in the action area. The BLM has conducted routine activities in whitebark pine habitat over the last half century, including Livestock Grazing and Range Improvement; Lands, Realty and Cadastral Survey; Mining; Oil and Gas; Geothermal; Forest and Vegetation Management; Wild Horse and Burro Management; and Recreation Activities. Given that whitebark pine is not a target species for Livestock Grazing and Range Improvements, Lands, Realty and Cadastral Survey, Mining, Oil and Gas, Geothermal, Forest and Vegetation Management, Wild Horse and Burro Management, Recreation; and Recovery Efforts and Research Activities deliberate losses of whitebark pine individuals from this activity likely has been minimal, although inadvertent losses have likely occurred. For example, heavy thinning can cause mortality of residual whitebark pine trees due to blow-down, and scorch from prescribed burning can kill trees due to the whitebark pine's intolerance of fire. Past activities by private entities that are permitted on BLM-administered lands include recreation, firewood collection, mining, grazing, and special use permits. It is expected that these activities, at times, may have caused localized effects to individual whitebark.

The BLM completed a proactive conservation strategy for whitebark pine in 2016 (Perkins *et al.* 2016) and initiated multiple efforts to monitor whitebark pine. There have also been efforts to protect high value trees from mountain pine beetle mortality with applications of Verbenone, a beetle anti-aggregation pheromone. These activities improve the survival of individual whitebark pine in the action area.

Because of the diversity of BLM whitebark pine populations, especially those disjunct stands on the species' range margin, it has been recommended that, as funding becomes available, the BLM continue to support a rangewide genetic survey of whitebark pine populations on BLM-administered lands, emphasizing those disjunct, potentially unique stands along the range margins and at lower elevations. It is anticipated that this work would further identify unique populations that may require priority restoration efforts (Perkins *et al.* 2016).

7.5. Climate

Consistent with FWS policy, analyses under the ESA include consideration of ongoing and projected variations in climate. The term "climate" refers to the mean and variability of different types of weather conditions over time, with 30 years being a typical period for such measurements, although shorter or longer periods also may be used (IPCC 2014a, pp. 119-120). Various types of climatic variations can have direct or indirect effects on species and critical habitats. These effects may be positive, neutral, or negative, and they may change over time. The nature of the effect depends on the species' life history, the magnitude and speed of climate variation, and other relevant considerations, such as the effects of interactions of climate with other variables (*e.g.*, habitat fragmentation) (IPCC 2014b, pp. 64, 67- 69, 94, 299). In our analyses, we use our expert judgment to weigh relevant information, including uncertainty, in our consideration of various aspects of climate variation and its effects on species and their critical habitats. We focus in particular on how climate variation affects the capability of species to successfully complete their life cycles.

In whitebark pine ecosystems, changes in precipitation associated with climate variability can result in longer fire seasons, altered fire regimes, changes in biomass growth and accumulation (*e.g.*, fuels), and exacerbate both wetter and drier conditions. Increasing temperatures are predicted to increase forest pest damage; increase fire frequency, size, and intensity; lengthen the growing season; and increase drought stress. Therefore, the consequences of climate variation, if current projections are realized, are likely to exacerbate the existing primary threats to whitebark pine (FWS 2021).

Habitat loss is anticipated to occur across the whitebark pine range, with current habitats possibly becoming unsuitable for the species as a result of both direct and indirect impacts from variations in climate. These impacts are expected to affect whitebark pine throughout the action area and its range. In general, researchers have hypothesized that there will be significant habitat loss as (1) temperatures exceed the thermal tolerance of whitebark pine and the species is unable to survive, (2) warmer temperatures favor other species of conifer that currently cannot compete with whitebark pine in severe, cold high-elevation habitats, and (3) alterations of climate can modify the frequency and intensity of disturbances (*e.g.*, fire, disease) to such an extent that whitebark cannot persist. Shifts in the optimum elevation for many high-elevation plant species have already been documented under current climatic trends (Lenoir *et al*. 2008, p. 1770). Elevational migration could enable whitebark pine to persist in some locations. However, elevational migration as a refuge from temperature increase has limits, because eventually, habitat may not be present even on mountaintops due to continuing temperature increases and resulting conditions that favor whitebark pine competitors like subalpine fir, Engelmann spruce, or mountain hemlock.

Numerous models indicate climatic variations may significantly decrease the probability of persistence of whitebark pine. For example, projections from an empirically based bioclimatic model for whitebark pine showed a rangewide distribution decline of 70 percent and an average elevation loss of 1,093 feet for the decade beginning in 2030 (Warwell *et al*. 2006). At the end of the century, less than 3 percent of current habitat is expected to remain suitable (Warwell *et al*. 2006). Similarly, climate envelope modeling on whitebark pine distribution in British Columbia, just to the north of the action area, estimated a potential decrease of 70 percent of currently suitable habitat by the year 2055 (Hamann and Wang 2006, p. 2783). We recognize, however, that there are many limitations to such modeling techniques, specifically for whitebark pine and that new modeling techniques may be developed in the future that may improve the accuracy of whitebark pine distribution analysis. Generally, there is a high degree of uncertainty inherent in any predictions of species responses to a variety of climate scenarios. This is particularly true for whitebark pine given it is long lived, has a widespread distribution, has complex interactions with other competitor tree species, relies on Clark's nutcracker for both distribution and regeneration, and has significant threats from disease, predation, and fire. Although research results are not definitive concerning specifics of anticipated direct and indirect impacts from climatic variation, the projected impacts from variations in climate will likely contribute substantially to the ongoing decline of whitebark pine (Hamann and Wang 2006, p. 2783; Warwell *et al*. 2006; Aitken *et al*. 2008, p. 103; Loehman *et al*. 2011, pp. 185–187).

8. EFFECTS OF THE ACTION

In accordance with 50 CFR 402.02, effects of the action are "all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of all other activities that are caused by the proposed action but that are not part of the action." A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action.

Effects of the action are a reasonable prediction of the likely reaction of, and biological effect to, individuals of a species to the environmental changes brought about by implementation of the chosen proposed action. It is not an exploration of alternatives to the proposed action. As with any prediction of a species' response to environmental impacts, there are many uncertainties associated with it. The prediction must be a reasoned prediction that is informed by science (if available). But because scientific literature reports on the results of controlled experiments and purposefully restricts its findings to the conditions and circumstances of the study, its findings can only be used to inform a predicted result from a future proposed action—it cannot determine the outcome. Therefore, additional information from observations on other species, from other environments, and based on the professional judgment of biologists familiar with the species, also plays a role in arriving at a reasoned prediction.

8.1. Effects to Whitebark Pine from *Bureau of Land Management Activities*

The potential effects to whitebark pine due to the *BLM Activities* are described below. The temporal effects on the species are anticipated to extend up to 150 years. According to the BLM's 2025 BA addendum, BLM modeled habitat for the species on BLM-administered lands has been estimated to be 138,350 acres, while the species' listed-range includes roughly 2,402,820 acres on BLM-administered lands. Effects may occur to the species inside the modeled habitat areas, as well as outside of these areas. Table 4 is provided as a summary of the estimated acreage of whitebark pine affected by the *BLM Activities* and the percentages of potential acreage of (1) whitebark pine modeled habitat on BLM-administered lands, (2) whitebark pine species range on BLM-administered lands, (3) modeled whitebark pine habitat (19,039,010 acres) across the species range in the U.S., and (4) whitebark pine range (58,126,376 acres) in the U.S. potentially affected by the *BLM Activities* as described in this PBO.

	WBP Modeled Habitat on BLM Lands potentially affected by *BLM Activities*	Percent of WBP Modeled Habitat on BLM Lands potentially affected by *BLM Activities*	Percent of WBP Range on BLM Lands potentially affected by *BLM Activities*	Percent of WBP Range in U.S. potentially affected by *BLM Activities*
Livestock Grazing	122,113 acres	88.3%	5%	0.2%
Lands, Realty and Cadastral Rights-of-Way	929 acres	0.67%	0.04%	0.002%
Lands, Realty and Cadastral Survey-Disposal	1984 acres	1.4%	0.08%	0.003%
Lands, Realty and Cadastral Survey-Acquisition	4904 acres	3.5%	0.8%	0.008%
Mining	1000 acres	0.72%	0.04%	0.002%
Oil and Gas	250 acres	0.18%	0.01%	0.0004%
Renewable Energy	3,500 acres	2.5%	0.15%	0.006%
Forest and Vegetation Management	55,350 acres	40%	2.3%	0.1%
Wild Horse and Burro Management	10,511 acres	7.6%	0.4%	0.02%
Recreation	26,669 acres	19.2%	1.1%	0.05%
Recovery and Research	No estimate	--	--	--

Table 4. Summary of the estimated acreage of whitebark pine (WBP) affected by *BLM Activities* and the percentages of potential acreages affected (BLM 2025).

Habitat modeling is informative but not 100 percent accurate and we expect that some whitebark pine trees are present and would be affected outside the modeled habitat areas. Clark's nutcrackers may distribute whitebark pine seeds to areas outside of modeled or expected habitat. The BLM committed conservation measures (applicable by activity type) are expected to minimize effects to whitebark pine whether they occur inside or outside of the modeled habitat.

Appropriate staff working in the range of whitebark pine on BLM-administered lands will be trained in the identification of whitebark pine of all age classes. If whitebark pine individuals are known to occur in, or are identified outside of, modeled habitat, the BLM will employ conservation measures during implementation of work for whitebark pine of all size classes. The BLM committed conservation measures (applicable by activity type) apply to *BLM Activities* regardless of location to avoid effects to whitebark pines, even those outside of modeled habitat.

8.1.1. Livestock Grazing and Range Improvements Effects

Livestock grazing activities and range improvement projects in modeled whitebark pine habitat are estimated to cover roughly 122,113 acres of BLM-administered lands (BLM 2025). This equates to approximately 0.2 percent of 58,126,376 acres of the whitebark pine range in the U.S. potentially having impacts to whitebark pine by BLM livestock grazing and range improvement activities.

It is anticipated that livestock grazing will occur annually on 122,113 acres of modeled whitebark pine habitat on BLM-administered lands. This represents 88 percent of the species' modeled habitat on BLM lands (Table 4). The BLM has determined that livestock grazing within whitebark pine habitat would likely have effects to the species. Livestock grazing and range improvement activities may affect whitebark pine seedlings or saplings due to inadvertent grazing or trampling by livestock, horses and equipment, and installation of range improvements. The BLM has identified possible impacts to whitebark pine from livestock grazing activities including (1) soil disturbance and compaction from development and use of range improvements, (2) interruptions in draining, limitations to tree rooting, and direct damage to seedlings, (3) livestock trampling, use of horses for gathering, or equipment/vehicle use resulting in soil disturbance and compaction and the destruction of seedlings, saplings, and microsites for cached seed, (4) destruction or injury to young or regenerating whitebark pine from improper timing or overutilization of grazing, (5) livestock using mature whitebark pine trees for rubbing and as shade and bedding cover, and (6) livestock foraging in understories of whitebark pine stands and ingesting seeds, seedlings, or saplings.

Livestock. Livestock can cause mortality and damage to seedlings, saplings, and the branches and root systems of trees by grazing and trampling. Trampling can also affect seeds in the soil seed bank due to direct damage or by burying seeds to a depth that seeds are no longer able to germinate. In general, research indicates that effects to tree species from cattle are more likely to be caused by trampling and effects from sheep are more likely to be due to browsing. Most livestock (*e.g.*, cattle, sheep) grazed currently on BLM lands prefer grazing grasses and herbaceous plants instead of conifers but may cause trampling mortality to conifer seedlings in areas where they concentrate or bed down (reviewed in Adams 1975). We expect that conservation measures will result in avoidance of some effects from trampling and bedding down by prohibiting livestock concentrations in whitebark pine habitat. In general, whitebark pine often occurs on higher elevation, dry or harsh sites that are less productive rangeland compared to lower elevation areas. This is especially true of whitebark pine habitat composed of open stands with scattered trees among rock and with sparse grass understory. Site conditions do not preclude livestock from using less productive areas; however, they may be less likely to do so compared to more productive sites and this is expected to reduce the likelihood of effects to whitebark pine from livestock grazing.

Range Improvements. Effects to whitebark pine may also be caused by range improvement and maintenance activities, including repair, construction and installation of stock tanks and other water features, fences, corrals, and cattleguards. These activities may cause trampling, cutting, or crushing of whitebark pines or disturbance to the soil seed bank that destroys or buries seeds or otherwise precludes seed germination. Effects from these activities are expected to be largely avoided by implementation of the conservation measures. Conservation measures are expected to protect whitebark pines of all size classes from damage in the majority of situations and Allotment Management Plans and annual operating instructions will include avoidance of whitebark pine removal when determining placement of rangeland improvement projects. Conservation measures will restrict ground disturbance near mature whitebark pines, minimizing adverse effects to the root system and soil around these trees.

Conservation Measures. Conservation measures are expected to further reduce grazing damage by stipulating that whitebark pine trees will be protected from damage and (1) grazing permits, (2) corresponding Allotment Management Plans, and (3) annual coordination/communication with permittees will identify relevant avoidance measures including avoiding concentrating livestock in whitebark pine habitat. Overall, we expect livestock effects on whitebark pine to be limited due to protections offered by the conservation measures and because livestock grazing and range improvement activities occur mostly outside of whitebark pine habitat, and the terrain and low abundance and quality of forage in whitebark pine habitat will result in low use by grazing livestock. Conservation measures will also protect seeds in the soil seed bank. Conservation measures are similarly expected to protect most trees via avoidance (avoiding removal of whitebark pines of all age classes) and conservation measures are expected to result in the avoidance of damage from trampling by range improvement activities. Conservation measures will be communicated to permittees during pre-season meetings, along with information on how to identify whitebark pine and maps of its known and modeled distribution. Collectively, conservation measures are expected to reduce effects to whitebark pine of all age and size classes from livestock grazing impacts, as well as range improvement activities. Livestock grazing may also occur in areas with whitebark pine individuals outside of modeled whitebark pine habitat. All personnel working with whitebark pine on BLM lands will be trained in the identification of whitebark pine of all age classes. Also, if whitebark pine individuals are known to occur or are identified in marginal habitat or outside of modeled habitat, the BLM will employ conservation measures during implementation of all work in known and potential whitebark pine habitat of all size classes. These conservation measures (applicable by activity type) apply to activities regardless of location to avoid effects to whitebark pines outside of modeled habitat and the effects to the species will be minimized in these areas, as well.

8.1.2. Lands, Realty, and Cadastral Survey Effects

Land use authorizations such as rights-of-way with potential effects to whitebark pine are estimated to cover roughly 929 acres of modeled whitebark pine habitat on BLM-administered lands over the next 10 years. This equates to approximately 0.002 percent (929 acres of 58,126,376 acres) of the whitebark pine range in the U.S. (Table 4). The authorization and use of rights-of-way may include the development, operation, and maintenance of facilities including communication towers, pipelines, roads, utility lines, transmission lines, oil and gas, and other infrastructure.

Placement/Construction/Installation. The placement of infrastructure has the potential to result in the loss and fragmentation of habitat and the loss of individual whitebark pine seedlings, saplings, or adult trees from the use of heavy equipment, excavation, blading, and trenching activities by causing soil disturbance and compaction and destroying microsites for cached seeds, interrupting drainage, limiting tree rooting, introducing or spreading invasive species, or damaging or killing seedlings and saplings. There are some activities that may bury seeds or seedlings, or cause soil disturbance, contribute to compaction, alter root mycorrhizal systems, or otherwise impact the below-ground portions of living whitebark pines but not visibly affect above ground portions. These activities include installation of ditches, signs, gates, guard rails, culverts, and other barriers, as well as small slide removal, embankment excavation, installation of riprap or retaining walls, and other earth moving activities. In these cases, root systems near the soil surface could be damaged and seed banks buried or entirely removed. Other effects could occur from soil compaction, soil erosion, and fugitive dust. Conservation measures are expected to result in the minimization of most of these effects to whitebark pine by minimizing ground disturbance in whitebark pine stands. Activities like culvert and bridge installation are less likely to impact whitebark pine because whitebark pine is not normally found in riparian areas, however it is possible that seeds could be cached in these areas by Clark's nutcrackers.

Maintenance. Maintenance of infrastructure within rights-of-way may be needed to ensure that whitebark pine or other tree roots do not disrupt pipelines or crack pavement areas and that adult trees do not grow into powerlines resulting in outages or wildfires. Maintenance of existing infrastructure may include mowing activities that could harm or remove whitebark pine seedlings and saplings. Removal or pruning of some individual adult whitebark pine trees may also be necessary to avoid damage to infrastructure or address human safety. Whitebark pine normally do not mature and start producing seeds until at least 40 years of age, and in most cases the removal of undesirable vegetation occurs at more frequent intervals (*e.g.*, 10 to 15 years or less); therefore, more seedlings and saplings may be removed compared to adult trees. A mature tree could be at risk of falling into a power line or onto a roadway; however, removal of mature trees is expected to happen infrequently and typically would involve dead or dying trees that have no or little reproductive potential. Construction and maintenance activities may also benefit the species where they remove vegetation that competes with whitebark pine. The reduction in competition, change in the canopy cover, and reduction of competition for water resources, could have beneficial effects to the species due to increases in vigor and reproductive fecundity of whitebark pine.

Effects to whitebark pine from rights-of-way activities could include injury and mortality of seedlings and saplings that are cut during brushing, clearing, mowing, grubbing, and other roadside maintenance. In general, these effects should be limited because roadside vegetation maintenance is a regularly occurring activity and sapling-sized trees are the largest size class that are likely to be cut for this activity. Trees larger than sapling-sized trees would normally not have been able to establish from previous mowing cycles. Mature trees might be limbed or pruned if they begin to encroach on the regularly maintained roadway footprint. Conservation measures are expected to lessen effects to mature whitebark pine by requiring pre-project surveys and avoiding ground disturbance from heavy equipment within 33 feet of mature trees.

Maintenance or improvements to road surfaces also include grading, asphalt repair, chip sealing, rocking, plowing, dust abatement, ripping of the road surface, and bridge and culvert installation. These activities occur within the road's footprint. Some effects to whitebark pine from these activities are fugitive dust from heavy machinery and vehicle use during road construction and maintenance. Effects from fugitive dust include dust particles settling onto leaf surfaces causing stress through reduction in metabolic processes (photosynthesis, respiration, and transpiration) (Farmer 1993). Fugitive dust may reduce terminal bud growth and increase chlorosis (a condition that affects the green pigmentation of plants, primarily manifested through yellowing leaves) in second-year needles in other conifer species (Manning 1971). We expect that effects from fugitive dust will be insignificant because they will be localized and occur only during active work on a road, which is periodic and normally occurs less frequently than annually. Portions of roads may be maintained or have portions reconstructed, but this is followed by years or decades passing before maintenance or other work is conducted again. Therefore, effects from fugitive dust are expected to be short term. We expect that most affected whitebark pine trees will recover during the many years following maintenance or reconstruction work. Other rights-of-way and infrastructure activities are expected to have minimal impacts on whitebark pine because they are restricted to the road surface, where whitebark pine does not grow. Also, whitebark pine trees are normally not found in riparian areas and therefore they would be unlikely to be impacted by culvert or bridge installation and repair.

Road construction could result in the loss of individual adult trees when rerouting transportation routes and could result in the inadvertent loss of whitebark pine seedlings and saplings when hand or mechanized equipment is used to restore/reclaim routes or install access barriers. These impacts are expected to be insignificant.

Effects to whitebark pine also may be caused by the use of calcium and magnesium chloride in winter for the purpose of de-icing heavily traveled roads. The application of calcium and magnesium chloride to de-ice roads is well known for causing foliar damage, injury, and death to roadside vegetation and is expected to affect whitebark pine if applied near these trees. Magnesium chloride, in particular, has been found to be far more damaging than sodium chloride in a study with ponderosa and lodgepole pine (Trahan and Peterson 2008, p. 171). The effects of these chemicals on whitebark pine have not been studied, but studies with other plant species have found conifers to be particularly susceptible to injury and death (reviewed in Goodrich and Jacobi 2014, p. 3) from these chemicals. When calcium and magnesium chloride are applied to roads, these chemicals inevitably run-off, permeate nearby soils, and are taken up by tree roots. The excess concentrations of these chemicals in plant tissues are thought to cause toxicity similar to sodium chloride, via reduced chlorophyll content in leaves and reduced photosynthetic activity, inhibited enzymatic activity, and subsequent necrosis and dieback (reviewed in Goodrich and Jacobi 2012, p. 856). Effects can be observed at least as far as 330 feet from treated roads. Despite the toxicity of these chemicals, we expect that effects to whitebark pine from de-icer chemicals to be discountable because roads where these chemicals are applied are typically well-traveled roads in lower elevation areas and not roads in remote, high elevation locations where whitebark pine typically occurs. Most roads in whitebark pine habitat are not maintained or de-iced in winter and use of these road chemicals in whitebark pine habitat is expected to be very rare.

Whitebark pine seeds may also be affected from roadside activities and soil disturbance which could result in crushing or disturbance to the soil such that seeds are unable to germinate. However, it is expected that the majority of seeds (hundreds of thousands to millions) will remain undisturbed in the seed bank outside of the maintained footprint of roads and these seeds will not be affected by road maintenance activities. The probability of any one seed germinating and surviving to reproductive maturity is also infinitesimally small even in undisturbed settings, so impacts to the species in the action area from loss of a very small number of seeds along roadsides are insignificant.

Other Land Use Authorizations. Other rights-of-way, leases, permits, and easements may include operations, maintenance, and construction of seismic and environmental equipment and monitors, cell and radio towers, and weather stations. These land use authorizations have the potential to cause adverse effects during site operations, maintenance, and construction activities, including removal or cutting of vegetation, whitebark pine trees and saplings encroaching on established sites, pruning branches or otherwise damaging trees, as well as crushing of seedlings. Ground disturbing activities that could result in adverse effects include the use of heavy machinery or hand tools that crush individuals, affect root systems or soils, and disturbed seeds or otherwise preclude seed germination. These activities are more likely during new equipment installation but could also occur less commonly as part of site maintenance. Some land use authorization non-linear sites are maintained free of vegetation. Trees are not allowed to establish at these sites and therefore effects to mature whitebark pines at existing sites are expected to be rare. Effects to seeds, seedlings, or small saplings are possible if seeds are cached and germinate within the established and disturbed footprint, because these seedlings at some point will be removed during site maintenance.

Conservation Measures. The BLM commits to conservation measures, including those relevant to infrastructure development and maintenance, avoiding and minimizing the risk to whitebark pines. The FWS acknowledges that there may be situations where conservation measures cannot be applied and killing or severely injuring a mature whitebark pine is possible. These types of situations will be documented during the reporting phase of this consultation and if the individual tree is a 'plus' tree, then conservation measures stipulate that efforts will be made to collect cones, pollen, and/or scion of these trees. The FWS also recommends planting in these situations to help restore the whitebark population in the affected areas. Conservation measures will result in the avoidance of ground disturbing activities near mature whitebark pines adjacent to special use sites, which is expected to protect the root systems of nearby whitebark pine. Inadvertent damage to whitebark pines from felling of other tree species within the permitted footprint will be avoided by implementation of conservation measures. Effects from fuel or oil spills are expected to be avoided by the implementation of conservation measures, as well as best management practices (BMPs) that through a history of practice have been successful in avoiding impacts. Where effects to mature whitebark pine cannot be avoided, and avoiding killing or injuring an individual is impossible, the FWS recommends that 100 seedlings be planted for every individual killed or injured.

8.1.3. Land Tenure Effects

Disposal activities within whitebark pine modeled habitat are estimated to cover roughly 1,984 acres BLM-administered lands (Table 4). This equates to approximately 0.003 percent of 58,126,376 acres of the whitebark pine range in the U.S. potentially affected over the next 10 years by BLM Lands, Realty and Cadastral Survey disposal activities.

Acquisition activities in whitebark pine modeled habitat are estimated to cover roughly 4,904 acres BLM-administered lands (Table 4) over the next 10 years. This equates to approximately 0.008 percent of 58,126,376 acres of the whitebark pine range in the U.S. potentially affected over the next 10 years by the BLM Lands, Realty and Cadastral Survey through acquisitions.

Lands, Realty and Cadastral Survey actions, including withdrawals, alone do not generally incur any impacts to the landscape. However, these types of actions could have impacts to whitebark pine if lands harboring whitebark pine populations are sold or leased for activities that ultimately result in the loss of habitat or individuals, vegetation or soils removal, compaction, or alteration.

Conservation Measures. To avoid or minimize potential local stressors, the BLM commits to conservation measures, including those relevant to land sales, exchanges, disposal, or withdrawals, avoiding and minimizing the risk to whitebark pines. To avoid or minimize impacts, the BLM commits to retain lands in federal status where populations or individual adult whitebark pine trees occur unless the sale, exchange, or disposal of lands benefit whitebark pine. If retention of lands is not feasible, the BLM will mitigate the loss of these lands to a net benefit result for whitebark pine in accordance with existing policies.

8.1.4. Mining Development Effects

Mining (except oil and gas) activities in whitebark pine modeled habitat are estimated to cover roughly 1000 acres BLM-administered lands over the next 10 years. This equates to approximately 0.002 percent of 58,126,376 acres of the whitebark pine range in the U.S. potentially affected by BLM mining development. Activities included in mineral management that could cause effects to whitebark pine include the following: excavation of test sites and mine pits; opening and stabilization of underground mine features; construction of ponds, roads, fords, bridges; and processing and piling material. Mining construction and maintenance activities could cause soil disturbance and compaction, destroy microsites for cached seeds, interrupt drainage, limit tree rooting, or damage seedlings or saplings. Effects to whitebark pine from mineral management include many ground-disturbing activities resulting in the removal, cutting, or crushing of seedlings, saplings, or mature trees from heavy machinery or hand tools (*e.g.*, chainsaws). Additional effects from minerals management include damage to trees from clogging of stomata (impedes photosynthesis) from airborne fugitive dust from operations. Fugitive dust effects are expected to be isolated and not rise to the level of severely harming or killing trees. The effects may temporarily reduce photosynthetic ability on some branches of mature trees or saplings but are not expected to have long term negative measurable impacts.

Reclamation. Mining reclamation activities may also affect whitebark pine by causing temporary soil disturbance and compaction, destroying microsites for cached seeds, interrupting drainage, and limiting tree rooting via soil disturbance or compaction. Reclamation activities can also create disturbance that facilitates the establishment or spread of invasive plant species, which could outcompete whitebark pine seedlings. Abandoned mine sites may contain chemical contaminants that can persist in the environment and impact whitebark pine. However, the goal of reclamation activities is the reclamation of areas that have been disturbed by past mining activities, and this may improve future conditions for whitebark pine including direct planting through revegetation requirements.

Conservation Measures. To avoid or minimize potential local stressors, BLM has committed to conservation measures, including those relevant to mineral and oil/gas exploration and development, avoiding and minimizing risks to whitebark pines. In general, conservation measures are expected to result in the avoidance of adverse effects to whitebark pine due to the requirement of surveys and avoidance of whitebark pine prior to new mineral exploration. Where effects cannot be avoided and a whitebark pine is killed or severely injured, the FWS recommends planting of whitebark pine to aid in conservation of the species. Conservation measures are expected to limit some of these effects to whitebark pine by (1) protecting trees from damage whenever possible and pruning trees rather than removing them, if possible, and (2) using heavy equipment sparingly and minimizing soil compaction and runoff where possible.

8.1.5. Oil and Gas Development Effects

The BLM anticipates that there will be 250 acres of oil and gas development activities in modeled whitebark pine habitat over the next 10 years. This equates to approximately 0.0004 percent of 58,126,376 acres of the whitebark pine range in the U.S. potentially affected by BLM renewable energy development-geothermal authorizations. It is possible that whitebark pine may occur outside of BLM whitebark pine modeled habitat. If oil and gas development activities occur in areas outside of whitebark pine modeled habitat, but those areas are found to be occupied by whitebark pine during pre-project surveys, then effects could occur to the species, and all applicable conservation measures will be followed, and effects to whitebark pine will be reported to the FWS.

8.1.6. Renewable Energy Development Effects

Renewable energy development-geothermal is estimated to cover roughly 3,500 acres of whitebark pine modeled habitat on BLM-administered lands over the next 10 years (Table 4). This equates to approximately 0.006 percent of 58,126,376 acres of the whitebark pine range in the U.S. potentially affected by BLM renewable energy development-geothermal authorizations.

Overall, potential impacts on whitebark pine from renewable energy development could be incurred during site characterization, site preparation, and construction phases, and continue throughout the operational life of the facility, typically extending over several decades. Much of the area used for renewable energy facilities is impacted throughout the life of the project and some impacts may continue after decommissioning, especially where restoration of habitats could take many years. Impacts on whitebark pine during site characterization could occur from the operation of vehicles transporting equipment to off-road locations. The construction of access roads would remove vegetation, possibly including whitebark pine mature trees, seedlings and saplings, and compact soils within the roadway footprint and impact nearby areas from altered drainage patterns, runoff, sedimentation, and increases in non-native, invasive plant species. Soil compaction and altered drainage patterns could reduce the ability of whitebark pine seedlings and saplings to survive. Siting and construction impacts include the long-term loss of whitebark pine if trees are not avoidable in site-specific locations, removal or alteration of vegetation, or modification or disruption of ecological processes resulting from siting and construction of renewable energy and transmission projects. Site preparation activities include land clearing, grading, or excavation of soils to provide a level working area for buildings, transmission towers, access roads, substations, and other equipment installation, potentially resulting in losses of habitat and whitebark pine individuals. Ground disturbance from construction may make habitat more susceptible to infestations by noxious weeds or invasive plants, which may adversely affect whitebark pine through competition. Increases in noxious and invasive plant communities can also result in increased fire frequencies. To avoid or minimize potential impacts, the BLM has committed to conservation measures avoiding and minimizing risks to whitebark pines.

8.1.7. Forest and Vegetation Management Effects

Forest and vegetation management is estimated to cover 55,350 acres of BLM-administered lands over the next 10 years (Table 4). This equates to approximately 0.1 percent of 58,126,376 acres of the whitebark pine range in the U.S. potentially affected by BLM forest and vegetation management.

8.1.7.1. Prescribed Fire

Prescribed fire is expected to occur over 5,000 acres of whitebark pine range on BLM-administered land over the next 10 years. Prescribed fire can result in significant whitebark pine mortality (Keane and Parsons 2010), depending on the circumstances. Large swaths of land can be burned in a single event. Effects from prescribed burning include direct injury or mortality to all whitebark pine age classes from scorch (crown or bole) and direct combustion. Whitebark pine has thin bark and other attributes indicating it is not adapted to be highly fire-resistant and is not able to survive most fires, including low intensity fire. The goal of prescribed burning is to limit the extent of wildfire effects and therefore prescribed burning theoretically should result in overall fewer acres of whitebark pine habitat burned and fewer individual lost, compared to if prescribed burning did not occur and wildfires burned without such control measures. Adverse effects to whitebark pine are expected to be significant from prescribed fire because large numbers of acres can be affected and because whitebark pine lacks adaptations to fire.

There may be situations where prescribed fire can be used to benefit whitebark pine by reducing stand density and increasing growth and vigor (Perkins *et al*. 2016). However, prescribed fire can also result in significant whitebark pine mortality and not achieve restoration outcomes (Keane and Parsons 2010), depending on the circumstances. For example, high-intensity prescribed crown fires are difficult to implement and control because of the extreme conditions required for ignition (Perkins *et al*. 2016).

Forest and vegetation management activities can be important to maintaining the health and resiliency of ecosystems that include whitebark pine (FWS 2021, p. 34; 87 FR 76882,76914, [December 15, 2022]; FWS 2023, p. 32). However, the effects of prescribed fire on whitebark pine were monitored by Keane and Parsons (2010) on five sites in Idaho and Montana. Some whitebark pine trees that survived prescribed fire were later killed by *Ips* spp. (true weevils) and mountain pine beetles originating from unburned slash piles (Baker and Six 2001, p. 501). Overall, from these studies, prescribed fire was found to be detrimental to whitebark pine and responsible for significant mortality of all age classes.

Impacts to whitebark pine from the establishment of firelines or staging areas could include, (1) soil disturbance and compaction from the use of heavy equipment or foot or vehicle traffic, (2) removal of whitebark pine trees within a fireline, (3) interruptions in draining, limitations to tree rooting, and direct damage to seedlings, (3) compaction and the destruction of seedlings, saplings, and microsites for cached seed, and (4) destruction or injury to young or regenerating whitebark pine. While these activities cause adverse effects, they are implemented with the goal of reducing fire effects and extent, which overall may benefit whitebark pine compared to not implementing these actions. Effects from prescribed burning (backfiring, burnout, or backburning) include direct mortality to all age classes from scorch (crown or bole) and direct combustion. Whitebark pine has thin bark and other attributes indicating it is not adapted to be highly fire-resistant and is not able to survive most fires, including low intensity fire.

8.1.7.2. Fuels Reduction

The BLM estimates 5,000 acres of potential fuels reduction projects will occur on BLM-administered lands over the next 10 years. Fuels reduction includes manual and mechanical vegetation treatments such as thinning, pruning, and slash treatment to manage hazardous fuels. Hand mechanical treatment includes the removal of brush, small diameter trees, and dead and down surface fuels. Material is scattered, chipped, piled, or otherwise mitigated to reduce fire hazard. Seeding of disturbed ground and suppression of noxious weeds would occur as needed. All activities including all those that disturb the soil have the potential to disturb seeds in the soil seed bank by crushing or by inverting and disturbing the soil to such an extent that seeds are buried too deeply or displaced to the soil surface where germination cannot occur, or where seeds are subject to predation by animals. Heavy thinning may create drier and more exposed conditions, or lead to a flush of shrub growth, that may impede or alter the microclimate of forested stands to the detriment of seedling survival. Although BLM will implement the committed conservation measures of this program to minimize impacts, some adverse effects to whitebark pine may occur due to removal, or damage to white bark pine needles, roots, limbs, boles, seeds, or seedlings.

8.1.7.3. Pre-commercial Thinning

The BLM estimates 3,800 acres of potential pre-commercial thinning will occur on BLM-administered land over the next 10 years. Thinning can have variable effects on whitebark pine. Thinning activities can be important to maintaining the health and resiliency of ecosystems that include whitebark pine (FWS 2021, p. 34; 87 FR 76882, 76914 [December 15, 2022]; FWS 2023, p. 32). However, thinning can be detrimental to whitebark pine. Murray *et al*. (2021) found it caused mortality and Maher *et al*. (2018) found it led to increases in density of competing conifers. Thinning may increase growth rates for surviving whitebark pines (Maher *et al*. 2018; Keane *et al.* 2007) -- a short-term beneficial effect. However, increased growth rates may also predispose whitebark pine trees to future mountain pine beetle attacks (Six *et al*. 2018). Given the research currently available, thinning should not be expected to increase whitebark pine regeneration or consistently reduce mortality (Maher *et al*. 2018) and may increase

regeneration of competing conifers and cause whitebark pine mortality from insects and windthrow events (Waring and Six 2005; Maher *et al*. 2018; Murray *et al*. 2021).
All activities including all those which disturb soil have the potential to disturb seeds in the soil seed bank by crushing or by inverting and disturbing the soil to such an extent that seeds are buried too deeply or displaced to the soil surface where germination cannot happen, or where seeds are subject to predation by animals. Relative to the millions of seeds that are dispersed within a mast seed year across the landscape, the effects of thinning operations on whitebark pine populations are expected to be extremely small because these activities occur on a small footprint compared to the vast amount of land area available to Clark's nutcrackers for caching seeds.

Conservation Measures. To avoid or minimize potential local stressors, the BLM commits to conservation measures, including those relevant to thinning, avoiding and minimizing risks to whitebark pines. One of the primary objectives of the BLM 2016 conservation strategy for whitebark pine is to use silvicultural practices to restore and maintain populations (Perkins *et al*. 2016) (*Appendix A*).

8.1.7.4. Timber Harvest (Salvage Harvest and Commercial Thinning)

Timber harvest/sale projects covered by this PBO are estimated to occur on roughly 14,300 acres of whitebark pine range in Idaho, Montana, and Wyoming on BLM-administered lands over the next 10 years. This equates to approximately 0.02 percent (14,300 acres of 58,126,376 acres) of the whitebark pine range in the U.S. potentially affected by BLM timber harvest/sale projects.

Direct effects to whitebark pine from timber harvest/sale projects and the associated road construction, road maintenance, and road rehabilitation are expected to occur due to the use of heavy equipment, including but not limited to skidders, feller bunchers, harvesters, dozers, and tractors. Most heavy equipment usage is associated with commercial, salvage, and regeneration harvest and is rarely used with pre- and non-commercial thinning. Heavy equipment can wound and kill trees by direct impact or cutting, or by felling trees adjacent to whitebark pines that subsequently fall onto and injury or crush whitebark pines. Non-lethal effects include damage to bark or loss of cone bearing branches which would cause a reduction in reproductive output. Smaller trees including seedlings and saplings can be damaged and killed by crushing, if other trees are felled on top of them.

Whitebark pine trees can also be harmed by soil compaction associated with the use of heavy equipment within stands, and indirectly if heavy equipment damages soil mycorrhizae (a fungus that grows in association with a plant's roots), which help support whitebark pine growth and survival. Additional effects include damage to trees or soil from inadvertent spilling of fuel or oil, as well as clogging of stomata (impedes photosynthesis) from airborne fugitive dust from harvest operations. There are additional effects that may occur later in time and not immediately during timber harvest/sale operations. Timber harvest/sale projects that remove most trees within a stand (except for whitebark pine) can cause lethal effects to whitebark pine trees left-in-place due to wind throw and wind snap where these whitebark pine trees did not develop the necessary support and root systems to withstand the force of winds that occur in open stand conditions. Sudden changes in the microclimate of forest stands (associated with removing large proportions of the trees) can also predispose the remaining whitebark pine trees to stress, increasing vulnerability to subsequent insect attack, typically resulting in death. This is due to exposure that they did not adapt to during their lifetime, and can be caused by increased solar radiation, increased soil exposure and drying, and decreased climatic buffering lost via the harvest of surrounding trees. Trees that survive these effects may also be impacted because extra energy will be needed to compensate for these stressors; energy necessary for healing, survival, and defense. Over a longer term, remaining whitebark pines in thinned and harvested stands may experience increased growth rates due to a decrease in competition for light or nutrients, although this may predispose them to insect attack in the future. Research indicates that fast-growing whitebark pines are more susceptible to mountain pine beetle mortality than slow-growing whitebark pines (Six *et al*. 2021).

In addition to heavy equipment usage, timber harvest/sale projects are expected to also involve the use of hand and small power tools including chain saws. Use of these tools is expected to result in fewer and lower impact effects, although there may be damage to whitebark pine seedlings or small saplings due to inadvertent crushing or felling of trees onto small whitebark pines. Most effects are expected due to heavy machinery and associated with commercial and regeneration harvest which remove high proportions of dominant and co-dominant trees.

Timber harvest/sale projects and the associated road construction, maintenance, and rehabilitation, especially heavy equipment use, can also impact seeds in the soil seed bank. Compaction due to heavy equipment use may preclude germination or seedling survival, and seeds may also be directly crushed by equipment, or driven too deep into the soil to allow for germination. Seeds may also be displaced to the soil surface where germination is not possible or where they are consumed by animals. Some research has found that germinating seedlings experience higher survival rates near protected microsites and shelter objects (*e.g.*, Lonergan *et al*. 2014) and heavy thinning may create drier and more exposed conditions, or lead to a flush of shrub growth, that may impede or alter the microclimate of forested stands to the detriment of seedling survival. Despite these possible outcomes, we expect that hundreds or thousands of seeds will remain undisturbed in the seed bank even in the footprint of timber harvest/sale projects. Additionally, seeds will occur widely distributed over the entire landscape within and surrounding project footprints, ensuring the possibility of future regeneration of whitebark pine. Clark's nutcrackers are known to distribute seed caches widely over a given area; a small population of 12 birds in Lorenz *et al*. (2011, p. 244) distributed seeds over 129,236 acres. It is also noteworthy that Clark's nutcrackers often cache seeds in areas that are unlikely to be included in harvest prescriptions, such as cliffs and talus slopes. The probability of any one seed germinating and surviving to reproductive maturity is also infinitesimally small, such that we expect any disturbance to seeds (which will be rare) would have no measurable impact on the future occurrence or distribution of the species. Clark's nutcrackers can transport seeds great distances, and to locations well below the elevation of mature whitebark pines and into low elevation project footprints. These seeds may germinate but may be unable to mature to full size because of unsuitable climatic conditions or other factors. For these reasons, while we expect a small number of seeds may be disturbed by timber harvest/sale projects, we expect no measurable effects to the species as a whole.

Opening a stand and removing a portion of the canopy is likely to increase understory growth which could result in more favorable conditions for the establishment or growth of *Ribes* plants or other alternate hosts for white pine blister rust. *Ribes* and other alternate hosts for white pine blister rust are too abundant and widespread for cost-effective control. However, it is important to ensure equipment is cleaned before entering and leaving work sites to not spread this pathogen. Studies of the incidence of white pine blister rust have found infection rates to be influenced by site and climatic factors, including elevation, aspect, spring solar radiation, humidity, and late summer snowpack (*e.g.*, Kovalenko *et al*. 2024), and not all *Ribes* species are good alternate hosts for the white pine blister rust fungal pathogen *Cronartium ribicola* (Maloy 1997, p. 92). The relationship between the amount of sunlight available for shrub growth and the likelihood of improved conditions for the proliferation of alternate hosts is affected by many factors. On the other hand, we cannot rule out that thinning or other vegetation management activities could increase white pine blister rust infection rates because few studies have investigated the effect of thinning on this pathogen. Maher *et al*. (2018) found there was greater infection of whitebark pines by blister rust in treated stands compared to nearby untreated stands, but with large margins of error so this result was not definitive. Overall, we expect in some cases thinning could increase blister rust infection rates although we do not expect this to occur in every case. While thinning may favor shrub growth, it is not necessarily expected to result in substantial changes to the populations of hosts at a population scale because hosts are already common and widespread.

There are a variety of activities involved in timber harvest/sale projects including fell-and-leave, yarding, hauling, and landings. Actions, such as creating roads, skid trails and landings to move and load logs, have the potential to injure or kill individual trees and stands of whitebark pine trees by removing or cutting them. Individual whitebark pine trees that occur along roads, skid trails or adjacent to landings could also be subject to damage from machinery bumping into them, which would wound the affected trees. Impact minimization actions include using existing skid trails and landings when available and placing skid trails in landings in locations that avoid whitebark pine trees whenever possible. These would effectively cause avoidance of many impacts. In addition, implementing the associated conservation measures for other aspects of timber harvest/sale projects will effectively reduce many of the potential exposure to, or injury from these associated activities.

Creation of roads and hauling and moving of logs on roads has the potential to injure or kill whitebark pine individuals by removing and/or cutting mature trees, saplings and seedlings. Ingress and egress to and from a project area may extend the action area well beyond the area where logging of timber actually occurs. Implementation of project committed conservation measures will avoid and minimize these impacts by providing communication between those responsible for whitebark pine conservation (biologists, botanists and silviculturists) and the individuals responsible for designing and implementing projects. It is expected that any road placement for hauling will rarely lead to loss of mature whitebark pine trees because of BLM's commitment to the conservation measures. However, in some instances, it may be difficult to place roads in a way that avoids all trees, saplings, and/or seedlings, so some whitebark pine removal avoidance may not be possible.

Hauling during dry conditions can also spread dust from dirt or gravel roads to stands of whitebark pine adjacent to haul routes. Effects from fugitive dust are not well understood, but once suspended dust particles settle onto leaf surfaces, plants can undergo stress through reduction in critical metabolic processes (*i.e.*, photosynthesis, respiration, and transpiration)

(Farmer 1993). Intensive fugitive dust was demonstrated to reduce terminal bud growth and increase chlorosis (a condition that affects the green pigmentation of plants, primarily manifested through yellowing leaves) in second-year needles in conifer species (Manning 1971). However, we expect that fugitive dust effects will be minor because they will be localized along roads used for log hauling, and occur only during active logging, which generally occurs over no more than a 1- to 2- year period followed by many decades passing before an area is logged again. Therefore, exposure to fugitive dust is expected to be minor and short term (*e.g.*, exposure and response to fugitive dust is likely limited by varied hauling routes for any given project and other factors including wind/precipitation). We expect that most affected whitebark pine will recover relatively quickly during the longer time periods when fugitive dust is not present.

Activities that disturb the soil such as yarding, hauling and landings have the potential to disturb seeds in the soil seed bank by crushing or by inverting and disturbing the soil to such an extent that seeds are buried too deeply or displaced to the soil surface where germination cannot happen, or in areas where seeds are subject to predation by animals. Relative to the millions of seeds that are dispersed within a mast seed year across the landscape, the effects of associated harvest operations on whitebark pine populations are expected to be extremely small because these activities occur on a tiny footprint compared to the vast amount of land area available to Clark's nutcrackers for caching seeds.

Conservation Measures. Effects from these activities are expected to be minimized by conservation measures. Surveys for all age classes of whitebark pine will be conducted prior to project implementation and impacts to individuals of all age classes will be minimized during timber cutting and ground disturbing activities. Felling of non-whitebark pines will be done in a manner to minimize damage to whitebark pine (all age classes). To avoid effects to whitebark pine due to misidentification with western white pine, damage to all five-needle pines will be minimized. These committed conservation measures are expected to ensure that naturally occurring whitebark pines are protected from mortality and injury during harvest operations. Effects due to soil compaction are expected to be reduced because of the conservation measure which minimize ground disturbance within 33 feet of the drip line of mature whitebark pine crowns. Effects from fuel or oil spills will be avoided by adhering to BLM policy, which has been demonstrated through years of implementation and refinement to effectively minimize and avoid effects to plants from oil and fuel spills. Whitebark pine planting is recommended and may offset direct effects that result in mortality. Monitoring project activities with annual reports will ensure that effects do not exceed those analyzed.

8.1.7.5. Reforestation

Restoration strategies for whitebark pine are broadly defined by two actions: propagation, screening, and planting of seedlings from genetically rust-resistant parent trees; and fuel reduction treatments designed to reduce fire severity in whitebark pine stands. Ensuring future generations of whitebark pine are genetically resistant to white pine blister rust is the most critical action for achieving long-term recovery of this species (Perkins *et al*. 2016, p. 31). Reforestation projects to be covered by this PBO are estimated to cover roughly 2,600 acres of whitebark range on BLM-administered lands over the next 10 years. Effects to whitebark pine from reforestation activities across the action area are expected to be minimal due to the scope and scale of the work, as well as the implementation of conservation measures. Reforestation activities are completed primarily by hand and have in the past represented a small number of acres reforested relative to the range of whitebark pine. Planting of conifer species involves using a hoedad to scalp bare ground and create a small planting hole. Effects including reduced vigor, damage, or mortality of whitebark pine individuals could occur through increased competition for resources if trees are planted near existing whitebark pine individuals. Effects are expected to be avoided through implementation of committed conservation measures, which require set-back distances for planting and ground disturbance near whitebark pine of all age classes. Cone collection from other conifer species has little potential for effects to whitebark pine. If certain trees are felled for the purpose of retrieving cones, they could damage adjacent whitebark pine, although the practice of felling trees for cone collection is rare. Injury to seeds from reforestation activities (planting/seeding and site preparation) are expected to be infrequent and localized. This is because tools used for reforestation rarely disturb the ground to the extent that seeds would be unable to germinate and because the acres on which activities occur are small relative to the amount of land over which Clark's nutcrackers cache seeds (many hundreds of acres). Herbicide treatments used to prepare areas for planting may injure or kill whitebark pine individuals. Due to the small number of acres expected to be reforested and the implementation of conservation measures requiring minimum set back distances for herbicide spraying, any adverse effects would be minimal.

8.1.7.6. Pest Management

Pest management is anticipated on 13,000 acres of BLM-administered lands over the next 10 years. This represents 9.4 percent of the species modeled habitat on BLM-administered lands.

Herbicide Treatment. Effects to whitebark pine from invasive plant treatments are more likely from chemical treatments than manual or mechanical treatments. Many chemical herbicides are toxic to conifers. Herbicide application in whitebark pine habitat has the potential to injure or kill seedlings and sapling whitebark pines, and more rarely, mature trees. Herbicide treatments can also predispose conifers to injury from other environmental stress (Radosevich *et al*. 1980).

While conifers including the whitebark pine are not directly or intentionally sprayed in invasive plant treatments on BLM lands, injury and death could occur from chemical drift because treatments are done using backpack sprayers and, in some cases, broadcast from the back of vehicles or ATVs. Strict measures are taken to avoid transient drift by herbicide applicators. Best management practices for herbicide application include monitoring weather conditions and revisiting decisions about spraying throughout the day based on weather and wind. While it is impossible to completely avoid herbicide drift because weather and conditions can change rapidly, there have been no known adverse effects to whitebark pine over a 10-year period on BLM-administered lands from herbicide application to invasive plants within whitebark pine habitat (BLM 2025). Therefore, it is expected that implementation of BMPs and conservation measures will result in likely discountable effects to whitebark pine from transient drift of herbicides. Conservation measures will further reduce the likelihood of effects to whitebark pine from this activity.

Manual Treatment. Manual treatments involve direct hand pulling of individual or patches of invasive plants, as well as efforts to suppress invasive plants by covering with plastic or landscape fabric. During these activities, seeds may be compacted by personnel. Foot traffic will not bury seeds to the point of inhibiting germination, thus effects to seeds will be insignificant.

Mechanical Treatment. Mechanical treatments are uncommon but include using weed eaters and similar hand tools to cut seed heads from invasive plants. There are no direct or indirect adverse effects to whitebark pine expected from this activity because of the benign nature of this work and because personnel on the ground and on foot will be trained on identification of and therefore be able to see and avoid whitebark pine trees, saplings, and seedlings.

Biocontrol. No adverse effects are expected from biocontrol of invasive species. Biocontrol agents are only released into the environment after thorough testing to ensure that biocontrol agents will only affect their host species.

8.1.7.7. Special Wood Products

Special wood products include the harvest of firewood, Christmas tree cutting, wreath harvesting, and other special forest products (*e.g*., teepee poles) by hand or with hand tools by the public on BLM-administered lands. Effects from these activities to whitebark pine are expected to be minimal. The public collects these products from a widely dispersed area across the landscape. They are not focused in a targeted area, making it likely that effects to whitebark pine individuals would be isolated and rare. Whitebark pine trees are not a target or preferred plant species for any of these activities.

Firewood or special forest products gathering may affect whitebark pine on rare occasions where snag felling is permitted, and a target snag is felled in a manner that damages or crushes a nearby whitebark pine. Because of the dispersed nature of these activities, they are expected to be isolated and rare. Additionally, firewood or special wood product gathering often occurs close to roads and therefore the effects would largely occur within a hundred feet of a road. These activities are focused on dead trees (snags and fallen logs) and whitebark pine is not a firewood species or special forest product that is sought after. Live whitebark pine are not expected to be cut or felled. Once firewood tree snags are felled, they are typically cut on-site and removed immediately for home firewood use.

Christmas tree cutting is not expected to affect the whitebark pine because cutting occurs at accessible lower elevations from November through December when most whitebark pine habitat is inaccessible to the public. Whitebark pine is not a species that is sought after for Christmas trees as it has an open and sparse growth form. Christmas tree harvesting is typically focused on sapling sized tree species that have a dense growth form, symmetrical conical shape and desirable branching. Wreath harvesting has the potential to cause effects to individual whitebark pine trees by removing branches. These effects would not likely be fatal but could lead to subsequent stress through the loss of stored carbon and photosynthetic ability. However, the possibility of rare or isolated effects to whitebark pine from these activities is expected to be avoided by implementation of conservation measures and stipulations on special wood product collecting permits.

8.1.7.8. Forest and Vegetation Management Effects Summary

Effects to whitebark pine from forest management activities may occur due to the use of heavy equipment. Heavy equipment can wound and kill trees by direct impact or cutting, or by felling trees adjacent to whitebark pines that subsequently fall onto and crush whitebark pines. Non-lethal effects include damage to or loss of cone bearing branches which would cause a reduction in reproductive output. Smaller trees including seedlings and saplings can be damaged and killed by crushing and masticating, if other trees are felled on top of them. Whitebark pine trees can also be harmed by soil compaction associated with the use of heavy equipment within stands, and indirectly if heavy equipment damages soil mycorrhizae (a fungus that grows in association with a plant's roots), which help support whitebark pine growth and survival. Additional effects include damage to trees or soil from inadvertent spilling of fuel or oil, as well as clogging of stomata (impedes photosynthesis) from airborne fugitive dust from harvest operations.

There are additional effects to whitebark pine that may occur later in time. Thinning may remove most trees within a stand and can cause lethal effects to residual whitebark pine trees due to windthrow and wind snap where the residual trees did not develop the necessary support to withstand the force of winds that occur in open stand conditions. Sudden changes in the microclimate of forest stands (associated with removing large proportions of the trees) can also predispose the remaining whitebark pine trees stress, increasing vulnerability to subsequent insect attack, typically resulting in death. This is due to exposure that they did not adapt to during their lifetime, and can be caused by increased solar radiation, increased soil exposure and drying, and decreased climatic buffering lost via the harvest of surrounding trees. Trees that survive these effects may also be impacted because extra energy will be needed to compensate for these stressors; energy necessary for healing, survival, and defense. Over the longer term, remaining whitebark pines in thinned and harvested stands may experience increased growth rates due to a decrease in competition for light or nutrients, although this may predispose them to insect attack in the future.

In addition to heavy equipment usage, forest management activities may also involve the use of hand and small power tools including chain saws. Use of these tools is expected to result in fewer and lower impact effects and occur most often as part of pre- and non-commercial thinning, although there may be damage to whitebark pine seedlings or small saplings due to inadvertent crushing or felling of trees onto small whitebark pines. Most effects are expected due to heavy machinery and associated with commercial and regeneration harvest which remove high proportions of dominant and co-dominant trees. In contrast, pre- and non-commercial thinning removes smaller trees in the under- and mid-story of stands and is often completed with hand tools, all resulting in fewer effects.

Opening a stand and removing a portion of the canopy through thinning is likely to increase understory growth which could result in conditions that increase the establishment or growth of *Ribes* plants or other alternate hosts for white pine blister rust. *Ribes* and other alternate hosts are too abundant and widespread for cost-effective control. Therefore, while thinning may favor shrub growth, it is not necessarily expected to result in substantial changes to the populations of alternate hosts at a population scale because they are already common and widespread. Studies of the incidence of blister rust have found infection rates to be influenced by site and climatic factors, including elevation, aspect, spring solar radiation, humidity, and late summer snowpack (*e.g.*, Kovalenko *et al*. 2024), and not all *Ribes* species are good alternate hosts for the blister rust fungal pathogen white pine blister rust (Maloy 1997, p. 92); therefore the relationship between the amount of sunlight available for shrub growth and the likelihood of improved conditions for the proliferation of alternate hosts for blister rust is affected by many factors. However, we cannot rule out that thinning or other vegetation management activities could increase blister rust infection rates because few studies have investigated the effect of thinning on blister rust infection. Maher *et al*. (2018) found there was greater infection of whitebark pines by blister rust in thinned stands compared to nearby unthinned stands, but with large margins of error so this result was not definitive. Overall, we expect in some cases thinning could increase blister rust infection rates although we do not expect this to occur in every case.

The FWS recommends that planting of whitebark pine be completed with the goal to offset direct effects that result in mortality for forest and vegetation management projects. Monitoring of project activities with annual reports will aid in the regular evaluation of this consultation to ensure that effects do not exceed those analyzed.

8.1.8. Wild Horse and Burro Management Effects

Wild horse and burro management is estimated to cover roughly 10,511 acres of modeled whitebark pine habitat on BLM-administered lands over the next 10 years. This equates to approximately 0.02 percent of 58,126,376 acres of the whitebark pine range in the U.S. potentially affected by BLM wild horse and burro management activities effects. The BLM has determined there is a remote possibility that wild horse and burro management activities may occur in whitebark pine habitat. If this occurs, seedlings or saplings could be trampled and inadvertently killed due to the use of vehicles and horses during gather operations. Seedlings and saplings could also be destroyed during preparation of construction sites for corrals, bait traps, and helicopter landing pads. Other impacts could occur as described in Livestock Grazing and Range Improvement Effects section 8.1.1. of this document. Impacts to whitebark pine from wild horse and burro management activities, if they were to occur in whitebark pine habitat, are expected to be localized and of small spatial scale.

8.1.9. Recreation Effects

Recreation management is estimated to cover roughly 26,669 acres of whitebark pine modeled habitat on BLM-administered lands over the next 10 years. This equates to approximately 0.05 percent of 58,126,376 acres of the whitebark pine range in the U.S. potentially affected by BLM recreation activities effects (Table 4). Recreation activities in these areas may cause soil disturbance and compaction, destroy microsites for cached whitebark pine seeds, interrupt drainage, limit tree rooting, and damage seedlings. The proliferation of hiking trails, off-trail hiking, littering, and introduction of non-native species may result in disturbance of whitebark pine habitat. Recreational site maintenance and construction activities are not expected to measurably change the suitable growing area, abundance, or productivity of the whitebark pine. Most whitebark pine ecosystems are remote and inaccessible by road, therefore few impacts are expected from recreation activities.

Maintenance of Developed Recreation Areas. Effects to whitebark pine from the maintenance or use of developed recreation sites are expected to be localized and minimal because most activities will occur within established, already disturbed footprints where whitebark pine individuals do not occur. These footprints generally are expected to lack whitebark pine individuals due to past development and maintenance. Adverse effects to individual whitebark pines are expected to mostly be limited to the few seedlings and saplings that may grow at or in these sites between human uses, or seeds buried in the soil seed bank. Mature trees would be removed if they are dead, dying, or leaning towards infrastructure or sites and are determined to be a hazard or danger tree based on established protocols. Additionally, damage to or mortality of whitebark pine trees growing at the edge of sites would occur if pruning, brushing, and clearing occur, or damage to root systems from ground disturbing activities. These effects would be limited in extent and intensity.

Maintenance and Use of Existing Trails. The effects of trail maintenance on the whitebark pine are expected to be minimal due to much of the work occurring in existing trail footprints where trees do not occur. Most trail maintenance work is done using hand tools and crews in situations where individual trees can be easily identified and avoided. Whenever possible, trees will be pruned rather than felled to allow for survival and continued seed production. Trail maintenance and relocation will use existing footprints whenever possible, which is expected to minimize effects to whitebark pines near and alongside trails. Trail relocation activities should be situated to avoid all mature whitebark pines and to minimize damage to seedlings and saplings. During trail decommissioning, whitebark pine seedlings, saplings, and seeds may be directly lost through physical removal and burial. Effects may occur from trail maintenance including summer activities of mowing, cutting, pruning, grading, surfacing, and hazard/danger tree removal and winter activities of plowing and trail grooming.

Construction of New Trails and Recreational Areas. Construction of new trails and recreation areas has the potential to remove as well as damage whitebark pines, similarly to the effects for trail maintenance. Newly constructed trails and recreation areas will likely exhibit small and localized erosion within trail footprints. Erosion within project footprints would occasionally undermine individual whitebark pine trees occurring immediately adjacent to newly constructed trails or recreation areas, causing injury, death, or creating a hazard tree condition that would require removal. Newly constructed trails would also result in damage from trail-associated recreation. Individual whitebark pine individuals may be damaged or killed, resulting from foot traffic trampling root collars, soil compaction damaging root systems, damage to limbs and branches, crushing seedlings, and injury or death of saplings.

Dust. Indirect effects to whitebark pines may also be caused by fugitive dust from the use of heavy equipment alongside developed recreation areas. Once suspended dust particles settle onto leaf surfaces, plants can undergo stress through reduction in critical metabolic processes (photosynthesis, respiration, and transpiration). Intensive exposure to fugitive dust has been demonstrated to reduce terminal bud growth and increase chlorosis in second-year needles in other conifer species. Fugitive dust from recreational site development, operations, and maintenance in whitebark pine habitat is expected to be minor and localized.

Chemical Contaminants. Chemical contamination may occur as a result of leaks from equipment and vehicles or spills associated with developed recreational facilities or road or trail maintenance. Contamination of soils may have negative effects to the health and survival of whitebark pine by causing toxicity to tree tissue and roots, changing the soil functions and microbial communities, and damaging seed banks. Effects from fuel or oil spills will be avoided by adhering to BLM's BMPs and Standards.

Dispersed Recreational Activities. Motorized recreation activities, hiking, use of pack animals, and other dispersed recreational activities may cause soil disturbance and compaction, destroy microsites for cached seeds, interrupt drainage, limit tree rooting, and damage seedlings. Over snow vehicles could break the tops of trees or could damage branches or seedlings and sapling. There may be some damage and mortality of whitebark pine seedlings and saplings from authorized and unauthorized off-road motorized recreation activities which could affect individuals or local areas. These effects are limited mostly to seedling and sapling size classes. Indirect effects of heavy machinery may negatively impact soil function and whitebark pine individual's ability to take up nutrients and water. Effects from trail-related recreation are expected to be localized and occur over very small linear areas resulting in minimal effects to whitebark pine individuals.

Conservation Measures. Conservation measures for recreation site and trail maintenance are expected to minimize effects to whitebark pines by requiring pruning of mature whitebark pine trees whenever possible, which is expected to enable reproductively mature trees growing near buildings, roads, or at the edge of trails to continue to produce cones and seeds for population persistence. The majority of the whitebark pine range on BLM lands will not overlap with developed recreational areas or operations and maintenance. Where whitebark pines occur within the managed and developed footprints of developed recreational areas, conservation measures are expected to largely avoid impacts to existing whitebark pine trees. Where effects cannot be avoided, planting is recommended to offset effects that result in whitebark pine mortality. Conservation measures are expected to minimize ground disturbance and effects to roots by establishing set back distance for ground disturbing activities near mature whitebark pine and limiting activities within whitebark pine stands and habitat. Decommissioned trails will be restored to a more natural state, vegetation regrowth will occur within the decommissioned trail. Conservation measures are expected to minimize adverse effects from soil compaction by limiting the use of heavy equipment in whitebark pine stands. Conservation measures will require surveys to mark and avoid whitebark pines during trail construction.

8.1.10. Recovery Efforts and Research Effects

Recovery efforts and research activities are expected to be small-scale and localized but may occur anywhere within the action area. They are expected to have some adverse effects to whitebark pine individuals but are expected to be largely beneficial to the species, as a whole. Potential impacts of recovery and research efforts to whitebark pine include the small potential of trampling seedlings or saplings; reduction in natural propagation of individual trees from cone or pollen removal; temporary harm to adult trees from collection of tree samples or marking; and accidental injury to adult trees from tree climbers (FWS 2023, pp. 33-34). Overall, the FWS has concluded that restoration and research activities (cone collections, planting seedlings or sowing seeds, mechanical cuttings as a restoration tool in stands experiencing advancing succession, surveying and monitoring of tree health status) do not pose significant threats to whitebark pine at the species level.

Small potential for effects and benefits from recovery efforts and research apply rangewide to whitebark pine (Perkins *et al*. 2016), and any adverse effects are considered minimal. The BLM has committed to continue proactive conservation of whitebark pine (refer to 3.2. Proposed Action; Perkins *et al*. 2016). In addition, conservation measures for all the previously described proposed activities will be implemented as appropriate for site-specific recovery effort and research projects.

Cone caging and collection can result in a minor loss of seed for natural recruitment and loss of food source to Clark's nutcracker, which may reduce seed dispersal and genetic exchange between stands of whitebark pine. Adverse effects may occur to seeds during cone collection from physical damage, affecting viability. However, cones will be placed in burlap sacks while climbers are up in the tree and filled burlap sacks will be lowered to the ground via rope to minimize effects to seeds to insignificant levels. This action may adversely affect mature whitebark pine through mechanical wounding (gouging of bark, breaking of branches, and loss of a small percentage of needles and twigs) from tree climbing, though effects will be minimized as climbers will not use spurs to climb and will avoid cutting limbs or damaging bark and limbs to the maximum extent possible.

Transporting cones and seed could result in spilled seeds, mechanical damage, or exposure to temperatures or humidities that could reduce seed viability or be lethal to seeds. Transportation of seedlings may cause stress and damage from moving along rough and steep terrain to the planting site or from exposure to high temperatures. Direct seeding may result in adverse effects to individuals from mechanical damage to seeds or their failure to germinate or grow due to improper seeding techniques or poor timing for seeding. Seed predators such as Clark's nutcracker or pine squirrels may gather and re-cache seeds in unsuitable locations or eat seeds rendering them non-viable. Adverse effects to whitebark pine may occur when holes are dug by hand or power auger and when stakes are placed for monitoring if these are too close to an established whitebark pine tree. The seedbed may be affected by damaging or killing seeds. While seeding is likely to adversely affect whitebark pine on a localized scale, due to damage to individuals during planting activities, at a landscape scale planting is expected to facilitate increased numbers and distribution of whitebark pine resulting in an overall beneficial effect to the species.

The BLM prepares sites in habitat for whitebark pine, and seedlings are planted with adequate spacing from existing whitebark pine trees or where mature individuals generally do not currently occur. While planting sites are selected to minimize impacts to any whitebark pine, site preparation may kill or damage whitebark pine during mechanical vegetation removal and soil scraping. Mechanical preparation of planting sites may trample or uproot saplings and seedlings or damage cambium and root systems. Propagated seedlings may be damaged (roots, stems and needles) as they are removed from containers and placed in holes. Seedlings may undergo transplant shock resulting in temporarily reduced seedling vigor or even death. While planting is likely to adversely affect some individual whitebark pine seedlings, planting seedlings is expected to benefit whitebark pine by increasing their abundance and reproductive capacity overall. Adverse effects from monitoring efforts may include soil compaction, trampling of seedlings and potential seed beds, and the potential for breaking of small twigs and dislodging needles during measurements of trees such as crown or bole measurements.

Cone collection, seeding, planting, monitoring, and controlling insect depredation activities benefit the recovery of the species through genetic preservation and the advancement of blister rust resistance in whitebark pine populations. These activities align with the Recovery Outline for Whitebark Pine (FWS 2022b), "Conserve genetic diversity through cone/scion collections focusing on known 'plus' and 'elite' trees and fostering the use of these collections for planting." Conservation benefits to the species from this activity are expected to last for multiple generations of whitebark pine.

Surveys and Monitoring. Surveys benefit whitebark pine as they allow staff to mark trees for avoidance of future project activities, thereby circumventing any adverse project activities that may have otherwise occurred to those trees. Surveys also help guide our understanding of the severity and extent of threats to trees and can provide information regarding any trends that may be occurring within stands. This knowledge allows response and management in ways that will address these threats and benefit whitebark pine. Adverse impacts to whitebark pine from survey activities could include trampling of seedlings and potential seed beds, potential for breaking of small twigs and dislodging needles during measurements of trees such as crown or bole measurements. Tagging may involve marking the tree with paint or other methods. Adverse effects resulting from damage or breakage are further described in the *Cone Collection* sub-section below. While the FWS anticipates monitoring is likely to adversely affect seed banks or some individual whitebark pine through trampling or wounding, surveys benefit whitebark pine by providing data on trends occurring in stands and the results of management actions, which allows for adaptive management to address threats to whitebark pine and work toward their recovery.

Beneficial effects include increased understanding of extent and condition of whitebark pine individuals and stands, increased responsiveness to threats, and improved management of whitebark pine in response to survey results. While we recognize that some low level of adverse effects will likely occur due to soil compaction or damage to whitebark pine seeds, seedlings, saplings, or needles of mature trees during survey efforts, we anticipate that surveys will provide critical information needed for conservation efforts and avoidance of project impacts to whitebark pine individuals and will thus result in overall benefits to whitebark pine in the future.

Cone Collection. Cone collection is expected to take place as part of the proposed action on only those potential or known 'plus' or 'elite' whitebark pine trees that would experience unavoidable impacts as part of project activities. This is expected to be a small number of whitebark pine, and this small number will be a very small percentage of the number of trees that are found on the estimated acres (FWS 2021) of the species habitat on BLM-administered lands. The trees from which cones will be collected as part of the proposed action will be only those trees that would be lost as a result of unavoidable project activities.

Reproductively active whitebark pine trees exhibit some level of masting, where years of moderate or high seed production may be synchronized among the individuals in the population (Crone *et al*. 2011, pp. 441-442). To perform cone collection, trees are climbed by staff early in the growing season to cage the cones and then again in the fall to collect cones. The adverse effects to mature whitebark pine that can occur from cone collection activities include mechanical wounding (gouging of bark, breaking of branches, and loss of a small percentage of needles and twigs) from tree climbing. Occasionally a branch may be broken when climbing or attempting to put on or remove a cone cage. The breakage removes some photosynthetic material from the tree. Tissue damage caused by climbing activities is expected to be rare and minor and will not increase the likelihood of white pine blister rust infections, because spores only infect trees by entering stomates on needles, not wounds (Schwandt *et al*. 2013). However, wounds may attract insect pests and provide an entry point for some decay fungi (Vasaitis 2013). *Pinus* species are relatively resistant to decay as compared to non-resinous conifers; however, *Pinus* species are susceptible to several decay fungi, with a few specifically reported on whitebark pine (Forest Products Laboratory 1967; Shaw *et al.* 2009; Zabel and Morrell 1992; Sinclair and Lyon 2005; McCaughey and Schmidt 1990). The amount of decay in a tree increases with wound frequency, size, depth, age, and tree age (Shaw *et al*. 2009). Adverse effects to trees from tree climbing alone are generally expected to be minimal or temporary. Stem decays generally cause minor consequences in whitebark pine (Arno and Hoff 1989). New needles will be grown at branch tips the following spring, providing new photosynthetic material. Spurs and spikes will not be used to climb whitebark pine trees during cone collection to reduce adverse effects from tree climbing.

Cone collection can also result in a minor loss of seed for natural recruitment, and loss of food sources for Clark's nutcracker which, in turn, may reduce seed dispersal, and genetic exchange between stands of whitebark pine. Adverse effects may occur to seeds during cone collection in that they can become damaged, affecting seed viability. However, most targeted seeds are successfully collected and remain viable during the collection process. Only a very small percentage of seeds that are targeted for collection are negatively affected by cone collection activities. Transport of cones and seed may affect the seed by its exposure to temperatures or humidities that reduce seed viability or become lethal. Loss of seed (spillage) and mechanical damage to seeds may occur from stacking or bouncing and rubbing in transport vehicles. Actions are taken while in transport to allow air circulation between bags to prevent heat and moisture build up. When storing cones, adverse effects to cones include potential use of improper storage climate (temperature and humidity) resulting in reduced viability and increased mortality of seed.

Rodents, insects, and diseases (*i.e.*, fungus and molds) may infest seed storage areas resulting in seed predation and mortality. Seed predator prevention/control measures may be used to minimize seed predation by rodents and insects. Measures should be taken to ensure seeds are stored properly to retain seed integrity and viability.

Genetic white pine blister rust resistant trees are targeted for seed collection due to their value in contributing to the persistence of the species in passing genotypes to future generations that can resist white pine blister rust. It is beneficial to the recovery of the species to increase the number of genetically resistant seedlings available for outplanting. Some of the seed from cone collection is stored, thus safeguarding the species in ex-situ conservation. Collection of whitebark pine cones has short- and long-term beneficial effects by safeguarding valuable genetic seeds and by using them for propagation and outplanting to increase the number of genetically resistant whitebark pine trees in the population.

Injury to seeds or seedlings from seed and seedling planting activities (*e.g.*, planting/seeding and site preparation) are expected to be infrequent and localized. This is because tools used for planting rarely disturbs the ground to the extent that seeds would be unable to germinate and because the acres on which activities occur are small relative to the amount of land area over which Clark's nutcrackers cache seeds (many hundreds or thousands of acres).

While we anticipate that some adverse effects will occur due to some damage to whitebark pine trees, cones, and seeds during cone collection, transport, and storage activities, it is reasonably likely that cone collection will facilitate successful seedling production and will be beneficial overall to whitebark pine populations. Furthermore, cone collection associated with this action will only be undertaken for potential or known 'plus' or 'elite' whitebark pine trees that are expected to sustain unavoidable adverse impacts and loss due to timber harvest/sale projects. The BLM will report numbers of trees killed and/or acres impacted by project activities annually.

Scion Collection. The number of trees where scion will be removed is expected to be very small (only those trees that are expected to experience unavoidable impacts or be killed due to project activities), which is a very small percentage of the number of trees that are found on the estimated 138,681 acres of the species habitat on BLM-administered lands. The adverse effects of scion collection are small in that trees can produce seed cones from other shoots that are not collected for use as scion. The small amount of scion collected and its effect of removal on the population of whitebark pine is negligible. Other adverse effects to whitebark pine mature individuals from scion collection is the same as described in the *Cone Collection* sub-section above. In addition to obtaining the scion, effects of transport and grafting the scion onto rootstock has effects as well. Grafting scion may be unsuccessful and thus scion may die and be discarded. Additionally, poor quality, molded, or scion excess to needs is discarded, and old and root-bound rootstock unsuitable for grafting are periodically discarded.

Scion may be adversely affected during transport by, (1) being exposed to temperatures or humidities that stress or kill scion, resulting in loss and misplacement of scion, and (2) physical damage to scion from stacking, bundling, or bouncing and rubbing in transport vehicles. To reduce these negative potential effects, care must be taken during transport of scion. Scion is an important beneficial tool for developing mature whitebark pine stock and can accelerate the production of cones and seed and thus aid in supplying seed more quickly for replanting and recovery efforts, compared to waiting 60 or more years for white pine blister rust resistant seedlings to mature. Collection of scion and its use for grafting and producing seed cones benefits whitebark pine recovery in allowing faster production of seeds for propagation and outplanting back into the natural habitat for whitebark pine. This is expected to have long lasting benefits for whitebark pine recovery. While we anticipate that some adverse effects will occur due to some damage to whitebark pine trees and seeds during scion collection, it is reasonably likely that scion collection will be overall beneficial to whitebark pine.

Pollen Collection. Collection of pollen has temporary adverse effects as trees will produce pollen again in subsequent years after collection. Collection is often from the ground but may also require climbing. Adverse effects to whitebark pine mature individuals from climbing to conduct pollen collection are the same as described in the *Cone Collection* sub-section above. Benefits to the recovery of whitebark pine from pollen collection include genetic preservation of whitebark pine pollen and enhanced white pine blister rust resistance in seed and breeding orchards. Whitebark pine breeding orchards produce seedlings that have relatively high levels of genetic resistance to white pine blister rust. Enhanced genetic resistance in seedlings available for outplanting will help bolster survival of trees in the population. While we anticipate that some adverse effects will occur due to some damage to whitebark pine trees and seeds during pollen collection, it is reasonably likely that pollen collection will be overall beneficial to whitebark pine.

8.2. Summary of Effects

In summary, we expect there to be adverse effects to whitebark pine from *BLM Activities* included in the proposed action. However, for most of the activities that are likely to kill, injure, or otherwise adversely affect whitebark pine, the BLM has committed to implementing conservation measures that will avoid and minimize adverse effects. Such conservation measures are expected to limit the effects of these activities on whitebark pine individuals and largely avoid effects to the species' distribution and reproduction and not preclude survival or recovery of the species.

We expect the most significant effects to the whitebark pine will occur from prescribed burning efforts because this activity can occur across large areas and because fire is difficult to predict and control. Whitebark pine is not adapted to fire and can be killed even by low intensity fire. Broadcast burning reduces fuel loads reducing the intensity of wildfires, which may reduce the overall loss of whitebark pine on a landscape scale.

We also expect adverse effects from vegetation management actions that substantially alter the characteristics of forested stands. These activities are expected to have direct impacts to individual whitebark pines due to the use of heavy machinery that can injure and kill trees, as well as indirect, longer-term impacts to the survival and health of whitebark pines that remain standing. Whitebark pines remaining following heavy thinning are subject to mortality from windthrow, wind snap, and insect attack, as well as mortality associated with sudden changes in climatic conditions. Effects can occur for years after thinning is completed. Conservation measures associated with these activities will ameliorate some of these effects by requiring survey and avoidance measures. While conservation measures will help reduce adverse effects, they will not entirely eliminate them.

In addition to burning, all activities that involve heavy machinery are expected to have adverse effects to whitebark pine. This includes most other activities in the proposed action, including operations and maintenance of developed recreational areas, quarries, special use permits, mineral management, and aspects of grazing, fuels management, and others. Any activity that involves the use of heavy machinery is more likely to crush, injure, or otherwise kill or harm individual whitebark pines of all age classes compared to those that involve hand tools or non-mechanized equipment or activities. Conservation measures are in place that include avoidance and minimization of impacts to whitebark pines. Nevertheless, the *BLM Activities* described in this consultation are expected to have adverse effects on a small or localized scale to individual trees.

Activities involving hand-tools or non-mechanized activities are expected to have adverse effects to a small number of individual trees. This includes grazing management and special use outfitter guides, in which animals may trample or browse on whitebark pine trees or saplings; trail work, which may, at times, require pruning or removal of select individuals; invasive species management in which whitebark pines inadvertently may be subject to herbicide drift; and pile burning in which whitebark pines may, on occasion, be scorched by heat. Despite implementation of conservation measures, which are expected to minimize effects, effects to whitebark pine will not be entirely avoided by these activities.

Activities that involve ground disturbance or soil compaction have the potential to cause adverse effects to whitebark pine seeds in the soil seed bank. It is not possible to determine where seeds occur. Seeds may be scattered throughout the landscape and as far as 20 miles from known whitebark pine populations. They may occur above or below the elevation zone where mature whitebark pines occur. Habitat modeling is informative but not 100 percent accurate and we expect that some whitebark pine trees are present and would be affected outside the modeled habitat areas. Also, Clark's nutcrackers may distribute whitebark pine seeds to areas outside of modeled or occupied habitat. Ground disturbing activities may cause adverse effects by displacing seeds to a depth that is too deep or shallow for germination, or that causes desiccation of the young seedling during germination. Heavy machinery may compact the soil surface to such an extent that germination can no longer occur. Adverse effects to seeds are expected to occur due to the proposed action. However, because seeds are naturally scattered over such a large area, we expect the number of seeds affected will be extremely small relative to the number of seeds unaffected in undisturbed locations. The majority of the action area will not be affected by ground disturbing or soil compacting activities associated with *BLM Activities*.

The BLM's proactive conservation efforts described as part of the proposed action such as, (1) collecting cones, scion, or pollen from trees, (2) implementing the BLM's committed conservation measures (BLM 2025), and (3) continuing to follow the BLM's 2016 Whitebark Pine Strategy (Perkins *et al*. 2016) are expected to aid in the recovery of the species.

9. CUMULATIVE EFFECTS

Cumulative effects are those "effects of future state or private activities, not involving federal activities, that are reasonably certain to occur within the action area" considered in this PBO (50 CFR 402.02). Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA. The action area covers the potential range of whitebark pine on federal BLM-administered lands.

Human population in many of the states where the *BLM Activities* occur could continue to increase and these human population increases are likely to result in increasing effects to whitebark pine in the future. With an increase in human population comes an increasing demand for recreational opportunities which have the potential to occur at higher elevations in whitebark pine habitat. In addition, it is expected that recreational hiking or other forms of trail use will increase as populations in the area increase. Vegetation trampling, soil compaction and disturbance, and increased erosion are among the impacts associated with these activities and may negatively impact whitebark pine as well as seeds in the soil seed back, thereby reducing germination rates. With the predicted continued growth in the human population of some western U.S. states, urban and residential development is also expected to continue to increase. Increased population size has also been linked with increased wildfire ignitions which could lead to the loss of substantial acreage of whitebark pine.

Noxious weed treatment at the state, private, and county levels also have the potential to negatively impact whitebark pine in the action area through chemical drift. Pesticide and herbicide drift, if used in agricultural areas (*e.g.*, hay fields, or in pastures used for grazing) have the potential to affect whitebark pine. Many states have statutes and requirements for the use and application of pesticides and fertilizers that reduce some of the negative impacts of such treatments. Some statutes require landowners to control noxious weed invasions and treat infestations according to application regulations or in accordance with written permission of the control authority. Even with these regulatory mechanisms, the possibility for chemical drift from non-federal activities to whitebark pine individuals in the action area exists.

While these activities have the potential to result in additional adverse effects to the whitebark pine in the action area, most of these activities tend to occur at elevations below the elevation range at which whitebark pines successfully persist and reproduce. Cumulative effects of future state or private activities, not involving federal activities are expected to impact individual whitebark pines and isolated patches of trees, seedings or saplings on a highly localized scale, and are not expected to impact the population or species' range overall.

10. INTEGRATION AND SYNTHESIS OF EFFECTS

The Integration and Synthesis section is the final step in assessing the risk posed to species as a result of implementing the proposed action. In this section, we add the effects of the action and the cumulative effects to the status of the species and the environmental baseline to formulate our biological opinion as to whether the proposed action is likely to appreciably reduce the likelihood of both survival and recovery of the species in the wild by reducing its numbers, reproduction, or distribution.

The action area encompasses 2,402,820 acres (or approximately 4 percent) of the species potential range (58,126,376 acres) (Figure 2, Table 3) in the U.S. (BLM 2025). Within the action area, modeled whitebark pine habitat (Figure 3) is approximately 138,681 acres, or 5.8 percent of the action area. On BLM-administered lands, 76 percent of whitebark pine occurs in designated Wilderness areas and WSAs where *BLM Activities* are limited or restricted or other BLM-designated protected areas [*e.g.*, ACECs and RNAs (Perkins *et al*. 2016)]. Whitebark pine is declining throughout its range. Declines are significant in all analysis units identified in the SSA (Aubry *et al.* 2008; FWS 2021). Rangewide, the SSA reported an average whitebark pine infection rate of 32.5 percent from blister rust (FWS 2021). The SSA also estimated that 13.6 percent of the range was impacted by mountain pine beetle and 16.9 percent by wildfire. Variations in climate may not be directly measured but are partially indirectly accounted for in losses from mountain pine beetle and fire. These impacts were current as of 2016 and additional mortality has occurred since then. On average, mortality from white pine blister rust infections is estimated at 24 percent and as high as 70 percent in some locations (Ward *et al*. 2006; Aubry *et al*. 2008).

Declines from white pine blister rust, wildfire, and mountain pine beetle are expected to continue (FWS 2021). The SSA projected future losses for the next 180 years. Under the most optimistic scenario where current trends continue, the loss of whitebark pine from fire will increase 6-fold after 180 years, while white pine blister rust infection rates will double, and acres affected by mountain pine beetle will triple. Focusing on the next 60 years, which has less uncertainty than 180-year projections, this equates to fire impacting 15 percent of the whitebark pine range, blister rust impacting 61 percent, and mountain pine beetle impacting 31 percent in 60 years (FWS 2021, pp. 106-110). Under scenarios where these three stressors increase through time (rate of severe wildfire and blister rust infection, and acres of mountain pine beetle mortality), the losses become significantly greater (FWS 2021, pp. 106-110).

The SSA (FWS 2021) and Recovery Outline for Whitebark Pine (FWS 2022b) evaluated the status of whitebark pine considering resiliency, redundancy, and representation. The FWS concluded that the resiliency of whitebark pine is greatly diminished due to the four stressors; that is, the ability of whitebark pine to respond to disturbances and perturbations is reduced because of high rates of disease and mortality (FWS 2022a). Both redundancy and representation are naturally high for whitebark pine compared to many other listed species because it is widely distributed throughout western North America and shows high diversity in growth form, ecological setting, and geographic location (FWS 2022a). However, due to the stressors of white pine blister rust, mountain pine beetle, fire, and climatic variations, the redundancy and representation of whitebark pine are in decline. As noted above, these declines are expected to continue.

Based on the information provided, we expect BLM will authorize Livestock Grazing and Range Improvements; Lands, Realty and Cadastral Survey; Mining; Oil and Gas; Geothermal; Forest and Vegetation Management; Wild Horse and Burro Management; Recreation Activities; and Recovery Efforts and Research Activities; and committed conservation measures that are likely to have limited adverse effects to individual whitebark pines on BLM-administered lands in Wyoming, Montana, Idaho, Nevada, California, Oregon and Washington for at least the next 10 years; however, the BLM will implement conservation measures to avoid or minimize adverse effects.

Limited adverse effects are expected due to the use of heavy equipment in many of these activities including but not limited to the following: feller bunchers, road graders, backhoes, excavators, chippers, bulldozers, rock crushers, masticators, and skid steers. Despite the extensive use of the committed conservation measures, limited effects include direct felling, removal, or crushing of whitebark pines of all age classes; injury due to the use of equipment or road construction, road maintenance, road rehabilitation, or hauling activities or from felling nearby trees onto whitebark pines; root damage from compaction and alteration of soil structure and hydrology; and impacts of fugitive dust. Longer term, these activities may result in whitebark pine mortality from the following factors: increases in blowdown (windthrow and wind snap); increased stress from changes in the microclimate of stands; increases in disease linked to a reduction in canopy cover that favors *Ribes* growth (and subsequently blister rust infection); increases in insect-related mortality; and longer-term, increases in growth rates that lead to mountain pine beetle mortality in the future. These effects may kill individual or small groups of whitebark pines; however, they are limited in scale and duration and the implemented conservation measures will minimize or avoid these adverse effects. They are not expected to affect the distribution of whitebark pine or rise to the level of appreciably affecting numbers of individuals for several reasons.

Heavy equipment use during *BLM Activities* could involve large areas and will occur within largely undisturbed and vegetated (forested) areas where the effects to the number of individuals are expected to be greater and more widespread. For these activities, the project committed conservation measures are more protective and are expected to result in the avoidance of most whitebark pines. We expect that injury and mortality will largely be avoided due to survey requirements and avoidance measures. Annual reports will be evaluated to ensure that actual effects do not exceed those analyzed in this PBO. In cases where severe injury or mortality cannot be avoided, planting of seeds and/or saplings with survival monitoring is recommended. In addition, follow-up visits by the FWS may be conducted for a subset of projects after projects are completed to verify that reported effects accurately reflect conditions on the ground and are in accordance with those analyzed in this PBO. Additionally, approximately 76 percent of whitebark pine on BLM-administered lands rangewide occurs in Congressionally designated Wilderness, WSAs, or other protected areas such as ACECs or RNAs (Perkins *et al*. 2016), where mechanical equipment is not permitted or highly restricted. Therefore, the majority of the whitebark pine population on BLM-administered lands rangewide are expected to remain relatively unaffected by any activities associated with the proposed action.

BLM Activities will involve the use of hand tools, including but not limited to chainsaws and pruners. The use of hand tools is expected to result in few effects because committed conservation measures will be in place specifying identification and avoidance of whitebark pines. Additionally, activities conducted manually on the ground with hand tools, have a high level of attention to detail. Individuals utilizing hand tools can easily see and avoid whitebark pines compared to operators of heavy equipment. For these reasons, such activities will result in isolated and rare effects that are not expected to result in an appreciable reduction of survival and recovery of whitebark pine.

Adverse effects are expected to the soil seed bank from many of the activities in the proposed action. Compaction due to heavy equipment may preclude germination or seedling survival and seeds may also be directly crushed by equipment or driven too deep into the soil to allow for germination. Seeds may also be displaced to the soil surface where germination is not possible or where they are consumed by animals. Germinating seedlings may experience higher survival rates near protected microsites and shelter objects and activities such as heavy thinning may create drier and more exposed conditions or lead to a flush of shrub or invasive plant growth, which may impede or alter the climate of forested stands to the detriment of seedling survival. Despite these possible impacts, we expect that hundreds or thousands of seeds will remain undisturbed and unaffected in the seed bank, even within the footprint of the proposed *BLM Activities*. Seeds are widely distributed over the entire landscape within and surrounding project footprints. Clark's nutcrackers are known to distribute seed caches widely and often in areas that are unlikely to be included in project activities, such as cliffs and talus slopes. The probability of any one seed germinating and surviving to reproductive maturity is also infinitesimally small, such that we expect any disturbance to seeds associated with the proposed action would have no measurable impact on the future survival, occurrence, or distribution of the species.

Overall, the proposed action is not expected to reduce the likelihood of survival or recovery of the species in the wild by reducing its numbers, reproduction, or distribution at the scale of the action area or species' range. Project committed conservation measures are expected to result in the avoidance and minimization of most effects by avoiding whitebark pines. The BLM has been proactive in their conservation of the whitebark pine for many years and actively engaged in efforts to find, propagate and plant seeds and seedlings from genetically rust resistant whitebark pine. Planting of seeds and seedlings is recommended if there are project areas where whitebark pine avoidance is not possible. It is expected that many, if not most of future BLM plantings will use rust resistant seed stock, which will improve the resistance of wild populations to white pine blister rust, the foremost stressor for the whitebark pine (FWS 2021). Planting rust-resistant seed stock is expected to improve the survival of these individuals against blister rust infection, increase the prevalence of rust resistance in the populations in which they are planted, and contribute to recovery (FWS 2022b).

The whitebark pine is a widespread species and the FWS has estimated that rangewide, whitebark pine occurs on an estimated 80.6 million acres in western North America, with roughly 70 percent of the species range occurring in the U.S. and the remaining 30 percent occurring in Canada (FWS 2021; 2022a). Activities in the proposed action due to conservation are expected to result at most in the loss of isolated individuals on much smaller acreage due to conservation measures in place.

Cumulative effects in the action area could include future habitat modification or direct mortality and injury to whitebark pine from a variety of actions including but not limited to recreation, and land management actions on state, county, and privately owned lands near the action area. Adverse non-federal effects in the action area are not expected to appreciably affect numbers, reproduction, or distribution of the species.

The proposed *BLM Activities* are expected to cause limited adverse effects to whitebark pine in the action area. The combined effects of the action in the action area on whitebark pine will be, (1) minimized through implementation of the committed conservation measures, (2) highly localized and limited in scope and scale, and (3) will impact a small percentage of acres of modeled habitat across the species' listed range. Therefore, we do not expect the proposed action to appreciably reduce the likelihood of survival or recovery of the species in the wild by reducing its numbers, reproduction, or distribution.

11. CONCLUSION

Regulations direct the FWS to evaluate whether a proposed action is likely to jeopardize the continued existence of threatened or endangered species. The continued existence of a listed species depends upon the fate of the populations that comprise them. That is, the abundance, reproduction, and distribution of a given species depends upon the collective performance of populations within the geographic extent of the species in the wild. Population performance is typically measured by rates of increase or decrease and is derived as a function of an individual's ability to live, die, grow, mature, and reproduce.

In accordance with our policy and regulations (50 CFR 402.02, 402.14(g)), the jeopardy determination is formulated taking together: (1) the status of the species including stressors and conservation needs, (2) the environmental baseline, (3) the effects of the action, and (4) cumulative effects. It is the FWS's opinion that the proposed action will not appreciably reduce the likelihood of both the survival and recovery of the species in the wild by reducing the numbers, reproduction, or distribution of that species and therefore will not jeopardize the continued existence of the whitebark pine. In this PBO, we have described the status of the whitebark pine at the rangewide scale as well as the anticipated effect of the proposed activities being conducted. We have also described the environmental baseline conditions within the action area which is all BLM-administered lands for which potential whitebark pine range has been identified and summarized the effects of the action.

Based on the information presented in the BA, the BA addendum, supplemental information received from BLM and information in the FWS's *Standing Analysis for Effects to Whitebark Pine (Pinus albicaulis) from Low Effect Projects and Whitebark Pine Restoration and Recovery Activities within Montana and Wyoming* (FWS 2023) as described in the Status of the Species, Environmental Baseline, Effects of the Action, and Cumulative Effects sections above, it is the FWS's biological opinion that the effects associated with the proposed action may affect and are likely to adversely affect the whitebark pine, but are **not likely to jeopardize** the continued existence of the whitebark pine. No critical habitat has been designated for this species.

The FWS has reached this conclusion by considering the following:

1. The activities included in this PBO do not exacerbate the primary stressors affecting the species.
2. The BLM will send a report to the FWS annually for the first 5 years and every 5 years thereafter to review results of the previous year's activities, providing a source of oversight, data sharing, and opportunity for consistent understanding of the application of this consultation.
3. The primary stressors to whitebark pine rangewide are the high incidence of the non-native white pine blister rust, large intense fires in whitebark pine habitat (Keane 2001), mountain pine beetle (Raffa and Berryman 1987; Logan *et al*. 2010), and the impacts of climate variability.
4. *BLM Activities* will likely remove and/or damage some individual whitebark pine of all age classes, but the adverse effects to whitebark pine are not expected to reduce the number, distribution, or reproduction of whitebark pine at an ecosystem or landscape scale.
5. The BLM is committed to minimizing impacts to individual whitebark pine through committed conservation measures (applicable by activity type).
6. While the *BLM Activities* are rangewide in scope, effects (to acres/individuals) are small compared to the overall acres/numbers of whitebark pine rangewide. Annual reporting of effects to mature trees and seedlings are expected to ensure that the *BLM Activities* remain within this scope of this opinion.
7. According to the BLM's 2025 BA addendum, BLM-administered lands include roughly 2,402,820 acres of the species' range and 138,681 acres of modeled whitebark pine habitat (BLM 2025). *BLM Activities* to be covered by this PBO are analyzed as follows:

- Livestock Grazing and Range Improvements in modeled whitebark pine habitat are estimated to cover roughly 122,113 acres of BLM-administered lands over the next 10 years. This equates to approximately 0.2 percent of the whitebark pine range in the U.S. potentially having impacts to whitebark pine by BLM livestock grazing and range improvements activities.

- Lands, Realty and Cadastral Survey activities within whitebark pine modeled habitat are estimated to cover roughly 7,817 acres BLM-administered lands over the next 10 years. This equates to approximately 0.013 percent of the whitebark pine range in the U.S. potentially affected by these types of *BLM Activities*.

- Mining (except oil and gas) activities in whitebark pine modeled habitat are estimated to cover roughly 1000 acres BLM-administered lands) over the next 10 years. This equates to approximately 0.002 percent of the whitebark pine range in the U.S. potentially affected by BLM mining activities.

- Oil and gas development activities in whitebark pine modeled habitat are estimated to cover roughly 250 acres BLM-administered lands over the next 10 years. This equates to approximately 0.0004 percent of the whitebark pine range in the U.S. potentially affected by BLM oil and gas development activities.

- Renewable Energy Development-Geothermal is estimated to cover roughly 3,500 acres BLM-administered lands of the whitebark pine range on BLM lands. This equates to approximately 0.006 percent of the whitebark pine range in the U.S. potentially affected by BLM Renewable Energy Development-Geothermal authorizations over the next 10 years.

- Forest and Vegetation Management is estimated to cover 55,350 acres of BLM lands for the next 10 years (Table 4). This equates to approximately 0.1 percent of the whitebark pine range in the U.S. potentially affected by BLM Forest and Vegetation Management.

- Wild Horse and Burro Management is estimated to cover roughly 10,511 acres of modeled whitebark pine habitat on BLM whitebark pine modeled habitat over the next 10 years (Table 4). This equates to approximately 0.2 percent of the whitebark pine range in the U.S. potentially affected by BLM Wild Horse and Burro Management Activities.

- Recreation Management is estimated to cover roughly 26,669 acres of whitebark pine modeled habitat on BLM-administered lands. This equates to approximately 0.05 percent of the whitebark pine range in the U.S. potentially affected by BLM recreation activities.

- Recovery Efforts and Research Activities are expected to be small-scale and localized but may occur anywhere within the action area. They are expected to have some adverse effects to whitebark pine individuals but are expected to be largely beneficial to the species, as a whole.

The conclusions of this PBO are based on full implementation of the action as described in the Description of the Proposed Action section of this document, including any conservation measures that were included in the activities' design.

12. CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. In order for the FWS to be kept informed of actions minimizing or avoiding adverse effects, or benefitting listed species or their habitats, we request notification of the implementation of any conservation recommendations. The recommendations provided here do not necessarily represent complete fulfillment of the agency's section 7(a)(1) responsibility for the species. Furthermore, as some of these recommended measures are expected to result in adverse effects to whitebark pine individuals, section 7(a)2 consultation requirements apply.

The FWS offers the following non-binding conservation recommendations to the BLM to promote the recovery of whitebark pine:

1. Continue to collect cones, and plant seedlings and/or directly sow whitebark pine seeds especially those from 'plus' trees and areas known to have high white pine blister rust resistance. Expand the genetic diversity of the current planting program by collecting cones from parents with a broader array of phenotypic traits and genetic variability. Prioritize areas affected by white pine blister rust, mountain pine beetle, wildfire, climatic variations, and natural disasters (*e.g.*, large, burned areas).
2. Use a conservative approach to seed transport to avoid overriding local adaptations. In cases where planting is required, use great care in sourcing seed, as even populations previously considered to be acceptable for seed transport (15 miles) have been found to be genetically distinct and therefore may not be appropriate for collections. Continually refine and update seed zones with best available science and utilize most current research recommendations when deciding seed transport distances.
3. Protect naturally occurring whitebark pine trees and regeneration and limit project impacts to all life stages. Prioritize protecting natural regeneration whenever possible because natural regeneration involves locally adapted seed sources drawn from the full array of diversity present in a stand. Naturally occurring seedlings have established under a set of local, site-specific filters, and their parents have survived multiple threats over decades and centuries.
4. Establish long-term monitoring plots to document effects of project activities as well as survivorship of restoration plantings. Continue to monitor permanent plots that measure the status and trends of whitebark pine health across BLM-administered land in all states. Publish the results of permanent plot monitoring in reports or publications where the results can be made available for use by other agencies and partners. Expand the current network of permanent plots to include a set of plot locations that are fully randomized.

5. Engage with researchers to improve planting and restoration techniques. Utilize most recent peer-reviewed research from empirical studies when planning activities. Actively and frequently communicate with researchers from diverse backgrounds (universities, government agencies, non-government organizations) to ensure the most up-to-date and best available science is used.
6. Minimize effects associated with windthrow and wind snap by feathering harvest into stand edges, which is expected to provide a protective buffer for residual whitebark pines.
7. Where mortality or severely injuring whitebark pine is unavoidable, planting of seedling whitebark pines (disease resistant stock when available) is recommended to ensure long term survival of an adequate number of seedlings to sustain no-net-loss of whitebark pine individuals.
8. For every seedling found during surveys where prevention of damage resulting in mortality is not possible, it is recommended that two seedlings be planted.
9. For each sapling mortality, it is recommended that eight seedlings be planted.
10. For each mature tree mortality or severely damaged, it is recommended that an acre be planted with a planting density of 100 whitebark pine seedlings.
11. Seedling survival should be monitored post-planting, with a target survival rate of 60 percent 3 to 5 years post-planting.
12. Continue to identify, test, and protect both active and potential 'plus' trees (whitebark pine that are suspected to be phenotypically resistant to white pine blister rust) and 'elite' trees (individual trees that are known to have genetic resistance to white pine blister rust). In some instances, conservation and recovery of whitebark pine could be aided by even single, solitary trees, whether at the stand level or the landscape level depending on how widespread stressors have impeded the health of the whitebark pine in a particular area. Whitebark pine trees that are phenotypically resistant to white pine blister rust provide viable seed sources for natural regeneration or cone collection for site rehabilitation.
13. Support continued genetic research and development of whitebark pine seed and breeding orchards, clone banks, and genetic evaluation plantations. Establish long-term monitoring plots to document whitebark pine cone production, natural disturbances (post-fire response), climate variability, and annual survivorship of restoration plantings. Continue to implement and as needed initiate long-term monitoring to measure the status and trends of whitebark pine health across its range.
14. Develop a monitoring program in whitebark pine habitat to determine regeneration and recruitment success for whitebark pine planting areas and natural regeneration areas. Identify, model, and map future results of whitebark pine inventories and create fine scale maps to identify and develop whitebark pine core areas for high-impact restoration. Microsites, site edaphic variables, and competition from grasses and shrubs play a key role in recruitment of whitebark pine. Consider understanding these knowledge gaps before significant resources are invested into planting.

15. Engage with researchers on the whitebark pine recovery team to improve restoration techniques. Implement recovery actions when recovery plan is finalized. Utilize most recent peer-reviewed research from empirical studies when designing restoration activities. Actively and frequently communicate with researchers from diverse backgrounds (universities, government agencies, NGOs) to ensure the most up-to-date and best available science is used.
16. Seek new public educational opportunities concerning whitebark pine restoration and protection.
17. Encourage and work with public and private land managers, including non-profit organizations and landowners, to protect, restore, enhance, and manage habitat to maintain and expand suitable habitat for the whitebark pine, particularly within and adjacent to occupied areas.
18. Plant white pine blister rust resistant whitebark pine seedlings in severely burned areas where natural regeneration is likely to be low.
19. For the FWS to be informed of actions minimizing or avoiding adverse effects or that benefit listed species or their habitats, the FWS requests notification of the implementation of any conservation recommendations.

13. REINITIATION NOTICE

This concludes formal consultation on the BLM rangewide whitebark pine programmatic consultation for *BLM Activities*. As provided in 50 CFR 402.16, reinitiation of this consultation is required where discretionary federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (2) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this biological opinion or written concurrence; or (3) a new species is listed or critical habitat designated that may be affected by the action. It is the action agency's responsibility to ensure reinitiation requirements are met in accordance with section 7(a)2.

14. INCIDENTAL TAKE

Sections 7(b)(4) and 7(o)(2) of the ESA do not apply to the incidental take of federally listed plant species. Therefore, no incidental take statement is included with this PBO for the whitebark pine. Limited protection of listed plants is provided to the extent that it is unlawful under the ESA to, (a) import any such species into, or export any such species from, the United States, (b) remove and reduce to possession any such species from areas under federal jurisdiction, (c) deliver, receive, carry, transport, or ship in interstate or foreign commerce, by any means whatsoever and in the course of a commercial activity, any such species, (d) sell or offer for sale in interstate or foreign commerce any such species, or (e) violate any regulation pertaining to such species or to any threatened species of plants listed pursuant to section 4 of the ESA and promulgated by the Secretary pursuant to authority provided by the ESA of federally listed threatened plants.

A section 4(d) rule for the whitebark pine prohibits the following activities unless otherwise authorized or permitted: (a) import or export of the species; (b) delivery, receipt, transport, or shipment of the species in interstate or foreign commerce in the course of commercial activity;

(c) sale or offer for sale of the species in interstate or foreign commerce; (d) removal and reduction to possession of the species from areas under federal jurisdiction; (e) malicious damage or destruction of the species on any area under federal jurisdiction; and, (f) removal, cutting, digging up, or damage or destruction of the species on any other area in knowing violation of any law or regulation of any state or in the course of any violation of a state criminal trespass law. Under the species specific 4(d) rule, the exceptions to the prohibitions include: (a) activities authorized by a permit under 50 CFR 17.72; (b) forest-management, restoration, or research-related activities conducted or authorized by the federal agency with jurisdiction over the land where the activities occur; (c) removal, cutting, digging up, or damage or destruction of the species on areas under federal jurisdiction by any qualified employee or agent of the FWS or state conservation agency that is operating a conservation program pursuant to the terms of a cooperative agreement with the FWS in accordance with section 6(c) of the ESA, who is designated by that agency for such purposes, when acting in the course of official duties; and (d) collection of whitebark pine seeds from areas under federal jurisdiction for Tribal ceremonial use or traditional Tribal consumption if the collection is conducted by members of federally recognized Tribes and does not violate any other applicable laws and regulations (87 FR 76882 [December 15, 2022]).

15. REPORTING

As proposed in the BLM's BA (BLM 2024) and briefly described in section 3.3 Program Implementation, reporting will occur on an annual basis for the first 5 years and then every 5 years thereafter. The BLM will track and prepare an activity report, (or use current technology to achieve the same process such as FWS's IPaC tool, of all *BLM Activities* on BLM-administered lands summarized by fiscal year by January 15 of the following year. These activity reports will then be provided to the FWS. Project reporting forms will be reviewed. A meeting between BLM and the FWS is recommend after the reports are submitted to provide opportunity to discuss updates to the whitebark pine baseline as well as effectiveness and updates of the conservation measures.

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APPENDIX A

Summarized Conservation Guidelines from the 2016 Bureau of Land Management Whitebark Pine Conservation Strategy

As part of the Proposed Action, the Bureau of Land Management (BLM) has committed to continuing the implementation of Conservation Guidelines from the BLM 2016 Whitebark Pine Conservation Strategy. The BLM's national whitebark pine (*Pinus albicaulis*) conservation strategy facilitates proactive recovery for whitebark pine and is intended to be used in its entirety by BLM staff in accordance with section 7(a)(1) of the Endangered Species Act of 1973 as amended (16 U.S.C. 1531 *et seq*.). The U.S. Fish and Wildlife Service (FWS) applauds the BLM for these proactive conservation efforts for the whitebark pine. The background information included in the strategy is vital for BLM staff to understand for successful implementation of whitebark pine recovery efforts. For a complete list of BLM 2016 Whitebark Pine Conservation Strategy, refer to Perkins *et al*. (2016). The following is a condensed version of whitebark conservation highlights related to Livestock Grazing and Range Improvements; Lands, Realty, and Cadastral Survey; Mining; Oil and Gas; Geothermal; Forest and Vegetation Management; Wild Horse and Burro Management; Recreation; Recovery Efforts and Research Activities; and committed conservation measures from the BLM's strategy:

- BLM will use White Pine Blister Rust Damage Codes for Ranking Severity of Infection, and Mountain Pine Beetle Activity Rating for Whitebark Pine (BLM 2016 Strategy Appendix 2).
- BLM will continue to assess health status of five-needle pines on BLM-administered lands (BLM 2016 Strategy Appendix 3).
- BLM will follow scion and pine pollen collection and handling guidelines (BLM 2016 Strategy Appendix 4).
- BLM will continue to search for and identify 'plus' trees on BLM-administered lands (BLM 2016 Strategy Appendix 5).
- BLM will continue to follow cone collection guidelines (BLM 2016 Strategy Appendix 6).
- Across the species' range on BLM-administered lands, BLM will continue to follow whitebark and limber pine (five needle pine) management guidelines (BLM 2016 Strategy Appendix 7). This includes following guidelines for silvicultural thinning, identification of white pine blister rust resistant trees and building an on-site prescription around them.
- When undertaking thinning operations in five-needle pines that have white blister rust infection, BLM will take the most heavily infected trees while retaining those showing no sign of infection or minor infections on limbs that are away from the bole of the tree. Protecting trees that have no infection (or minor infections) is important because these wholly (or partially) rust resistant trees should be kept in the genetic pool to increase future stand resistance.

The following Whitebark Pine Silvicultural Treatments/Prescriptions are summarized from Appendix 7 of the BLM 2016 Whitebark Pine Conservation Strategy

In high elevation/upper tree line predominately whitebark and limber pine stands (generally above 8500 feet):

- BLM will maintain and/or restore these stands on the landscape to fill their hydrologic, wildlife and other related ecosystem services.
- In areas infected with white pine blister rust, BLM will preferentially thin trees exhibiting the greatest amount of infection.
- BLM will attempt to leave different ages and sizes of trees within the stand, but, dependent on proximity to mountain pine beetle, preferentially leave five-needle pine trees of less than 6 inches diameter at breast height. The relative densities should range between 10 and 25 percent of the maximum stand density index for newly treated stands and should not exceed 40 percent of maximum stand density index.

In mixed conifer stands with a five-needle pine component (generally above 8,500 feet and directly below the subalpine zone):

- BLM will strive to maintain the five-needle pine component in the mixed conifer systems and will strive to maintain an appropriate mix of species to maximize whitebark pine seed caching by squirrels for grizzly bear food source. Pine species (lodgepole and five needle pine) densities should be managed to be low enough to minimize mountain pine beetle epidemics and keep mountain pine beetle at endemic levels. BLM will maintain white pine blister rust resistant individuals on site and use their seed source for in-planting to maintain five needle pine stands.
- BLM will identify, monitor and collect seeds from potential ‘plus’ trees to provide for a future seed source.
- BLM will use locally collected seed from ‘plus’ trees to interplant these stands when white pine blister rust reaches the break points listed above in Seedling Planting section.

APPENDIX B

Glossary

Area of critical environmental concern (ACEC): An area of critical environmental concern designation is the principal Bureau of Land Management designation for public lands where special management is required to protect and prevent irreparable damage to important historic, cultural, or scenic values; fish or wildlife resources; or natural systems or processes or to protect life and safety from natural hazard.

Adverse effects: Effects that are not insignificant, discountable, or beneficial.

Adze: A versatile cutting tool similar to an axe but having the cutting edge perpendicular to the handle rather than parallel.

Area of Influence (AOI): Under section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq*.), action agencies consult with the U.S. Fish and Wildlife Service if their actions "may affect" listed species or designated critical habitat. The Area of Influence is the area where the U.S. Fish and Wildlife Service has determined that species may occur (range) and also includes areas where the species does not occur but effects to the species from known types of proposed actions (*e.g.*, upstream water depletions that may reduce the species' aquatic habitat downstream) may occur.

Beneficial effects: Contemporaneous positive effects without any adverse effect (even short term) to the species.

Carbaryl: Carbaryl (1-naphthyl methylcarbamate) is a chemical in the carbamate family used chiefly as an insecticide.

Chipper: Chippers are machines capable of reducing trees to wood chips. Chippers differ from rinders in that they produce uniform sized chips depending on the equipment settings.

Chlorosis: Chlorosis is a condition that affects the green pigmentation of plants, primarily manifested through yellowing leaves.

Cribwall: Crib retaining walls are used when a sturdy wall is needed to contain compacted fill or to hold an excavation wall in place.

Discountable effects: Those effects that are extremely unlikely to occur. Based on best judgement, a person would not expect discountable effects to occur.

'Elite' tree: Term used for whitebark pine trees with relatively high levels of genetic resistance to white pine blister rust.

Insignificant effects: Based on best judgement, a person would not be able to meaningfully measure, detect, or evaluate insignificant effects.

Helibase: A base location from which helicopter missions are flown, offering servicing and refueling facilities.

Hoedad: Hoedads are wooden-handled, mattock-like hand tools used to plant bare-root trees quickly. They are designed for steep slopes.

Magnetotelluric: An electromagnetic geophysical method for inferring the earth's subsurface electrical conductivity from measurements of natural geomagnetic and geoelectric field variation at the earth's surface.

Masticator: A masticator is a specialized machine used in forestry management to clear or manage vegetation. It is equipped with rotating heads that utilize sharp blades or teeth to chop down trees, shrubs, and other woody materials into smaller pieces.

Mature tree: Size class of whitebark pine greater than or equal to 4 inches diameter at breast height and/or that may produce cones.

McLeod: A two-sided blade — one a rake with coarse tines, one a flat sharpened hoe — on a long wooden handle. It is a standard tool during wildfire suppression and trail restoration.

Megastrobili: A seed cone found on pine trees.

Outplanting: Outplanting is a term used in horticulture and conservation. It means to transplant from a nursery bed, greenhouse, or other location to an outside area. Outplanting is used to grow threatened and endangered plants in the wild through human intervention.

'Plus' tree: A whitebark pine tree that shows no symptoms of white pine blister rust in the field and that is potentially rust-resistant, but which hasn't been tested for blister rust resistance ranking in nursery trials.

Pulaski: A tool with a head that has an axe blade on one side and an adze on the other.

Puncheon: A short post, especially one used for supporting the roof in a coal mine.

Research Natural Areas (RNAs): are designated areas intended to represent the full array of North American ecosystems with their biological communities, habitats, natural phenomena, and geological and hydrological formations. These areas are managed by various agencies, including the Bureau of Land Management and the Forest Service. RNAs are used for research purposes and are protected to preserve their natural condition.

Sapling: Size class of whitebark pine greater than or equal to 4.5 feet tall and less than 4 inches diameter at breast height. Trees of this size class may be 50 to 150 years of age based on Keane *et al*. 2007, but this varies based on site conditions.

Seedling: For the purposes of this consultation, a size class of whitebark pine less than 4.5 feet tall. Trees of this size class are generally less than 50 years of age based on Keane *et al*. 2007, but this varies based on site conditions.

Univoltine: Univoltine refers to organisms that have one brood per year.

Verbenone: Verbenone is an anti-aggregation pheromone used for the control of pine beetle infestations. It can be used to disrupt the behavior of some forest insect pests in a manner that inhibits infestations.

APPENDIX C

Example of Template of Individual Project Reporting Form

INDIVIDUAL PROJECT REPORTING FORM

WHITEBARK PINE EFFECTS MONITORING

PROJECT INFORMATION:

Project Name/Date:

Project Number:

Location:

BLM Field Office Name/Staff Contact:

Description:

WHITEBARK PINE INFORMATION:

Whitebark Pine Presence (Acres of Habitat/Unsuitable Acres):

Types of Effects (*e.g.*, injury, death, other):

Quantification of Effects (*e.g.*, # adult trees killed, # injured, # saplings injured, # killed, # acres impacted, other):

CONSERVATION MEASURES:

Conservation Measures Employed:

Effectiveness of Conservation Measures: ______________________________

____

____

MONITORING:

Did Monitoring Occur? ______________________________

If Yes, Description: ______________________________

____

NOTES/COMMENTS: ______________________________

____

APPENDIX D

Individual Project Reporting Instructions

To be sent to U.S. Fish and Wildlife Service on January 15 Annually for the first 5 years and then every 5 years, thereafter, as a "5-year report."

As discussed in the Recovery Efforts and Research sub-section of 3.2 *Proposed Action*, and in 3.3 *Bureau of Land Management Program Implementation*, an annual report by January 15 of each year will be sent to the U.S. Fish and Wildlife Service's Wyoming Ecological Services Field Office email address (WyomingES@fws.gov). This annual report will include each project that occurs within the whitebark pine action area. The report, in a spreadsheet format, will include each of the following elements for each project:

- An estimate of the total number of individuals and/or acres of whitebark pine encountered within each project.
- An estimate of the total number of whitebark pine killed by each project for the last fiscal year (or for large-scale multi-year projects, the number killed by the activities completed in the last fiscal year for the project).
- Information on the effectiveness of each conservation measure(s) applied. Projects that occur in the whitebark pine action area will be included in the report.

The following breakdown is recommended to ensure the reporting requirement is met.

1. Basic Information about the Project
    a. Name and email address of project lead of project implementation, and if different project survey/monitoring effort.
    b. Project name.
    c. Dates of project implementation.
    d. Latitude and Longitude (decimal degrees at approximate center of project polygon).
    e. Shapefile for the project boundary, whenever possible (zipped).
    f. Type of activity.
2. Results of Pre-Project Survey
    a. Date of survey completion.
    b. Number of mature whitebark pine individuals counted.
    c. Number of sapling 5-needle pine individuals counted.
    d. Number of seedling 5-needle pine individuals counted.
    e. Acres of whitebark pine in the project area.
3. Effects to Whitebark Pine
    a. Number of mature whitebark pine individuals killed.
    b. Number of sapling 5-needle pine individuals killed.
    c. Number of seedling 5-needle pine individuals killed.
        i. Or proportion of seedlings killed for large projects.
    d. Number and type of other documented whitebark pine effects as a result of the project activity.
    e. Acres of whitebark pine impacted.
4. Comments or Suggestions