United States Department of the Interior

FISH AND WILDLIFE SERVICE
334 Parsley Blvd.
Cheyenne, Wyoming 82007

In Reply Refer to:
2023- 0088508

September 22, 2023

Leanne M. Marten, Regional Forester
USDA Forest Service
Northern Region One
26 Fort Missoula Road
Missoula, Montana 59804

Dear Ms. Marten:

This document transmits the U.S. Fish and Wildlife Service's (Service) programmatic biological opinion (PBO) based on our review of the U.S. Forest Service's (USFS) request for consultation for the proposed Rangewide Conservation Activities Supporting Whitebark Pine Recovery Project (Project) in accordance with section 7 of the Endangered Species Act of 1973, as amended (ESA) (16 U.S.C. 1531 et seq.). The Project includes USFS ongoing and future activities proposed by the USFS to support whitebark pine (*Pinus albicaulis*) conservation across the range of whitebark pine, specifically cone collection, scion collection, pollen collection, operational seedling production, genetic white pine blister rust screening, planting, insect prevention and control, selection and care of mature trees with white pine blister rust resistance, protection of healthy and unsuppressed regenerating stands, clone banks, seed and breeding orchards, genetic evaluation plantations, development of seed production areas (SPAs), surveys, and research, monitoring, and education.

While the Project BA states that these activities are intended to be beneficial to whitebark pine, we anticipate that some adverse effects will occur as a result of the Project. This PBO addresses these effects to whitebark pine. Other federally listed, proposed, and candidate species, and proposed and designated critical habitat may be affected by the individual actions identified in this PBO. ESA consultation will be required for any project implemented pursuant to this PBO that may affect any other listed species or designated critical habitat not otherwise addressed in a separate consulted on action. To address effects on whitebark pine, the attached PBO is based on information provided in the USFS's June 12, 2023, amended programmatic biological assessment (PBA), supporting material, and other information available to the Service. While section 7 policy requires issuance of a final biological opinion by the Service within 135 days of receipt of a final biological assessment and all supporting documentation, we are pleased to issue this final PBO in advance of the required October 25, 2023 deadline.

We appreciate your efforts to ensure the conservation of endangered, threatened, 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) 757-3707.

Sincerely,

TYLER ABBOTT Digitally signed by TYLER ABBOTT
Date: 2023.09.22 12:02:15 -06'00'

Tyler A. Abbott
Field Supervisor
Wyoming Field Office

Enclosure: Programmatic Biological Opinion for USDA Forest Service Rangewide Conservation Activities Supporting Whitebark Pine Recovery Projects

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PROGRAMMATIC BIOLOGICAL OPINION FOR WHITEBARK PINE

For Forest Service Rangewide Conservation Activities

1 Introduction

The U.S. Fish and Wildlife Service (Service) prepared this programmatic biological opinion (PBO) in response to the U.S. Department of Agriculture, Forest Service (USFS) programmatic biological assessment (BA) and request for formal consultation for the effects of the USDA Forest Service Rangewide Conservation Activities Supporting Whitebark Pine Recovery (Project) to the threatened whitebark pine (*Pinus albicaulis*). The request for consultation is in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.; hereafter referred to as the ESA). The USFS determined that this Project "may affect and is likely to adversely affect" the whitebark pine. Regulations direct the Service 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, "effects"); conditions forming the environmental baseline; the species' ecological status; and other information available to the Service. Based on the analysis presented in the programmatic BA and in the Service'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* (USFWS 2023), it is the Service's programmatic biological opinion that the effects associated with the proposed action are likely to adversely affect but are not likely to jeopardize the continued existence of the whitebark pine. No critical habitat has been designated for this species.

This biological opinion addresses only potential effects on whitebark pine from the proposed action undertaken by the USFS or its partners in the action area, including conservation efforts on sites outside the species habitat, range, or USFS administered lands. It does not address potential effects of the proposed action to species or critical habitats other than whitebark pine.

2 Consultation History

This programmatic consultation addresses ongoing and proposed rangewide conservation activities that support the recovery of whitebark pine being conducted by and with the USFS. A complete administrative record of this consultation is on file at the Service's Wyoming Field Office, Cheyenne, Wyoming. It is summarized in the Consultation History below.

August 2022	The USFS initiated conversations with the Service regarding a streamlined consultation approach for beneficial activities that the USFS needed to undertake to assist with the protection, management, and recovery of whitebark pine. Conversations focused on the process for handling these activities programmatically and at the rangewide scale. These conversations occurred with USFS and Service biologists typically on a weekly basis through April 2023.

February 2023	The USFS submitted a draft table describing activities that they planned to include in the consultation and requested feedback from the Service. The Service provided feedback regarding activity descriptions, monitoring, and appropriateness for including in the Service's Restoration and Recovery Programmatic (RRP) framework.
May 2023	The USFS provided a second draft table describing activities that they planned to include in the consultation and requested feedback from the Service. Changes between the first and second table indicated the USFS had removed activities not supported by the Service for inclusion and provided further support for the remaining activities. The Service provided additional feedback on the activities and suggestions on how to proceed with a non-RRP programmatic approach. FS and Service leadership met to discuss approach changes and both parties agreed the RRP was not the appropriate tool.
May 30, 2023	The USFS submitted the draft PBA to the Service and requested initiation of expedited formal consultation. The Service received the request on June 1, 2023.
June 7-9, 2023	The Service provided comments on the draft PBA to the USFS. Coordination meetings occurred among the agencies on updating the PBA.
June 12, 2023	The USFS submitted an update to the PBA in response to Service comments and feedback.
July 18, 2023	The Service responded to the USFS that the PBA was adequate and formal consultation would commence.
August 18, 2023	The Service provided a draft of the PBO for the USFS to review.
September 11, 2023	The USFS provided comments on the draft PBO.

3 Description of the Proposed Action

3.1 Project Description

The Project consists of a variety of conservation actions that fall within 15 broad categories. These actions will be implemented by all regions of the Forest Service or by agency partners. The action area includes the range of whitebark pine as described in the Species Status Assessment (SSA, USFWS 2021) as well as locations such as nurseries, orchards, laboratories, and research settings where activities occur that may be outside of the range of whitebark pine. Activities that are authorized, funded, or carried out by USFS on other lands not administered by the USFS may occur within or outside of the natural range of whitebark pine. A list of current partners and their locations are included in Table 1 of the BA (USFS 2023a). Further, we anticipate that many of the activities involving transport of whitebark pine material will occur between and among locations identified here including transport to and from Canada.

These categories and associated actions are summarized below, and the entire Project description from the programmatic BA (USFS 2023a) is incorporated here by reference.

(1) Cone collection
Seed cones are collected for genetic preservation, propagation, and to advance white pine blister rust resistance, drought tolerance, and cold hardiness in outplantings.

This includes climbing cone-bearing trees in spring and summer using ropes and sometimes ladders, transporting the cones in burlap bags, and storing the cones on drying racks for one to four months. Cone collection is preferred from white pine blister rust resistant trees (Mahalovich 2022) during masting years (years of regional, synchronous, large seed production) (USFS 2023a). Cone transportation will include appropriate documentation regarding removal from federal land and may include interstate and international transport.

Project design features to avoid or minimize the effects of cone collection on whitebark pine include: climbing trees without the use of spikes or spurs to avoid damaging the tree; and collecting, when possible, only from trees that have shown high white pine blister rust resistance in screening or from trees with phenotypic resistance that are in the same stand as highly resistant trees (Mahalovich and Dickerson 2004; Mahalovich 2022; Sniezko et al. 2018). Where white pine blister rust resistance is unknown, collect from trees that are more phenotypically resistant compared to other trees in the stand in coordination with the Regional or other Forest Service Geneticist. It is recommended to 1) collect from a minimum of 20 individual trees from the same seed zone for each bulk seed lot; 2) collect multiple seed lots per seed zone to manage genetic diversity and minimize the potential negative impacts of inbreeding depression in restoration plantings; 3) emphasize new areas during each 10-year seed procurement planning window (Frankham et al. 2014; Jenkins et al. 2022; USFS 2023b); and 4) encourage use of multiple seed lots for plantings. Finally, it is preferential that cones be collected during masting events to increase efficiency (Crone et al. 2011) and genetic diversity from timing of catkin production in the previous year's pollen cloud (USFS 2023a). The relevant general conservation measures described in section *3.4 Conservation Measures* will also be implemented.

(2) Scion collection
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.

This includes climbing or pruning approximately 20 to 30 branch tips approximately 4 to 8 inches (in) 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 transport of scion and grafts with appropriate documentation.

Project design features that avoid or minimize effects of scion collection on whitebark pine are coordinating with the Regional or other Forest Service Geneticist to determine from which trees to collect scion, in appropriate quantities to ensure grafting success, while minimizing the unnecessary reduction of branches available for future cone production and climbing trees without the use of spikes or spurs to avoid damaging the tree. Measures are taken while the scion are in transport to allow air circulation to prevent heat and moisture build up. The relevant general conservation measures described in section *3.4 Conservation Measures* will also be implemented.

(3) Pollen collection
Pollen is collected for genetic preservation and to advance white pine blister rust resistance in seed and breeding orchards.

This includes pollen collection and processing, pollen storage, and transport 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 storage is done in long-term freezers and when dried to appropriate moisture content typically stays viable for a many years. Transport of pollen is done with appropriate documentation regarding removal from federal land and may include interstate and international transport.

Project design features that avoid or minimize effects of pollen collection on whitebark pine are coordinating with the Regional or other Forest Service Geneticist from which trees to collect pollen, collecting pollen from trees with high levels of white pine blister rust resistance (e.g., elite trees, seed orchard, breeding orchard, or clone bank grafts), 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 pollen from getting too warm and causing molding and decomposition, pollen is placed in a cooler if shipped or hand delivered. The relevant general conservation measures described in section *3.4 Conservation Measures* will also be implemented.

(4) Operational seedling production
The benefits of producing white pine blister rust resistant seedlings for outplanting is to increase representation of whitebark pine on the landscape and increase the number of resistant trees in the population.

This includes seed extraction, determination of seed viability, seed storage, seed scarification and stratification, seed sowing, seedling growth, discarding low or no value seed lots, foliar disease treatment, thinning, storage of seedlings, and packing and shipping seeds and seedlings. Transport of seeds and seedlings will be done with appropriate documentation.

Project design features to avoid or minimize effects of operational seedling production on whitebark pine are using seeds with known white pine blister rust resistance following standard procedures outlined in The Woody Plant Seed Manual, Agriculture Handbook 727, June 2008 and regional Forest Service Handbook direction in each region to ensure seedling health through the seedling production process, and storing seeds from individual trees separately when it is being used for resistance screening or gene conservation. Seeds will be protected when needed by using seed predator prevention and control measures (caging) to minimize seed predation by rodents (USFS 2023a), and by applying pesticides only by trained applicators to treat mold following a Pesticide Use Proposal (USDA Form FS-2100-2). To conserve space and discourage disease and weed growth, empty containers will be removed; blocks of containers can be covered with horticultural fabric to protect germinants from predation and keep heat and moisture in the containers. Further, to reduce adverse effects to seedlings during transport, seedlings will be transported during moderate temperatures, in coolers, refrigerated trailers or shipped frozen to thaw on site. Seedlings are packed to reduce damage. Overnight shipping is generally used to lessen potential for seedlings to be in uncontrolled conditions. Additionally, if the seed is donated or sold, the known deficiencies of the seed will be conveyed clearly to the recipient. The relevant general conservation measures described in section *3.4 Conservation Measures* will also be implemented.

(5) Genetic white pine blister rust screening
Genetic white pine blister rust screening determines superior parentage for production of resistant seedlings.

This includes preparing seeds, growing seedlings, processing aeciospores, culturing inoculum, inoculating seedlings, storing seedlings, planting seedlings, white pine blister rust inspections, determinations, packing and shipping seedlings, and disposing of susceptible seedlings. Preparing seeds, growing seedlings, and planting, storing, packing, and shipping of seedlings will generally proceed as described under *(4) Operational Seedling Production*.

In the spring/early summer, aeciospores are collected from sporulating cankers on white pine blister rust infected whitebark pine trees for inoculating *Ribes* spp. for white pine blister rust screening trials or for genetics/genomics research. Typically, blisters are scraped with a small tool (e.g., knife) to separate the spores from the tree and are collected in an envelope. The spores are cleaned by passing them through a very fine sieve (e.g., cheesecloth). Aeciospores are dried to a sufficient low moisture content and placed in cold storage. Indoor growing chambers and seedlings are prepared for white pine blister rust inoculations. Leaves of infected *Ribes* spp. are collected and spread out above seedlings to allow basidiospores to fall onto seedlings below. Temperature and humidity in the growing chambers are controlled to be conducive to spread of white pine blister rust. Seedlings are removed when desired spore loading is achieved, and adequate infection is expected. Inoculated seedlings are then transferred to a greenhouse or an outside setting to facilitate dormancy.

Project design features to avoid or minimize effects of genetic screening on whitebark pine are outplanting of seedlings that show resistance to white pine blister rust during the screening genetic evaluation plantations or in operational outplantings. To conserve space and discourage disease and weed growth, empty containers will be removed. Further, to reduce adverse effects to seedlings during transport, seedlings will be transported during moderate temperatures, in coolers, refrigerated trailers or shipped frozen to thaw on site. Seedlings are packed to reduce damage. Overnight shipping is generally used to lessen potential for seedlings to be in uncontrolled conditions. Additionally, if the seed is donated or sold, the known deficiencies of the seed will be conveyed clearly to the recipient. The relevant general conservation measures described in section *3.4 Conservation Measures* will also be implemented.

(6) Planting
White pine blister rust resistant seedlings or seeds are outplanted to increase representation of whitebark pine on the landscape, increase the number of resistant trees in the population, and to restore depleted populations of whitebark pine. This includes site preparation, transport of seedlings, planting, survival monitoring, and direct seeding. Site preparation includes removing competing vegetation to increase the likelihood of seedling survival, and is typically done with

hand scalping and, although rarely, mechanical treatments or prescribed fire. Planting is done with any existing whitebark pine trees retained in consideration for spacing, with seedlings placed outside the drip line of any live trees that may be present. A sample of the planted seedlings are monitored for survival and growth at the end of the first and third growing seasons. Project design features to avoid or minimize effects of planting on whitebark pine are surveying sites prior to site preparation and avoiding existing whitebark pine, considering existing trees as part of the target spacing of planted seedlings. Prescribed burning for site preparation will only be used where hand or mechanical treatments are not feasible. To reduce adverse effects to seedlings during transport, they are transported during moderate temperatures, in coolers, refrigerated trailers or shipped frozen to thaw on site, and are packed to reduce damage. Seedlings are planted outside the drip line of any live trees that are present. Seedling placement should be near logs or other material, when possible, to ameliorate environmental conditions immediately around the seedling (micrositing). Whitebark planting guidelines in McCaughey et.al. (2009) provide recommendations for successful planting. Seedlings should represent a minimum of 20 mother trees per planting area, preferably more to ensure genetic diversity and minimize the potential negative consequences of inbreeding in subsequent generations (Jenkins et al. 2022; Mahalovich et.al. 2006; USFS 2023b). The relevant general conservation measures described in section *3.4 Conservation Measures* will also be implemented.

(7) Insect control and prevention
Prevention and suppression treatments will occur where needed throughout the range of the species. Insect prevention and suppression applies to all insects known to affect whitebark pine. Insect management tools (including but not limited to sanitation, pheromones, and insecticides) can be used in whitebark pine habitat and adjacent stands that have clearly defined conservation objectives related to protecting biologically important whitebark pine trees. Prevention can decrease or mitigate insect-caused effects on conservation efforts. Mountain pine beetle (*Dendroctonus ponderosae Hopkins)* prevention and suppression can reduce whitebark pine tree mortality (Progar et al., 2021; Kegley & Gibson, 2011).

Monitoring insect populations is a critical component of integrated pest management and the tools associated with monitoring insect populations include aerial detection and ground-truthed surveys, traps, pheromones, and insecticide strips. These tools are included to assist managers in applying prevention and suppression treatments in a targeted and productive manner. Prevention treatments have been effective in reducing insect impacts on management objectives. Insect suppression treatments suppress the effects of insects on whitebark pine conservation objectives. Project design features to avoid or minimize effects of insect control and prevention on whitebark pine are implementing recommendations that are developed in consultation with the Forest Health Protection specialist(s), writing a Pesticide Use Proposal (USDA Form FS-2100-2) when using chemicals, and following agency and state standard operating procedures for reporting chemical applications. The relevant general conservation measures described in section *3.4 Conservation Measures* will also be implemented.

(8) Selection and care of mature trees with white pine blister rust resistance
Selection and care of mature trees with white pine blister rust resistance aims to increase their persistence on the landscape. This includes identification of resistant trees and measures to preserve or increase resilience of stands (containing resistant trees) to fire as well as insects and disease. Measures may include pruning infected branches and/or branches in the lower portion

of the crown, removing surface and ladder fuels from around mature trees and potentially piling fuel, chemical application for mountain pine beetle, and monitoring the health of mature, resistant whitebark pine trees.

Tree selection is based on resistance to white pine blister rust. Across the range of the species, trees whose progeny have relatively high levels of resistance in nursery trials are often called elite trees. Healthy trees within infected stands (e.g., phenotypically resistant trees) that have not been tested at nurseries are sometimes called plus trees, mother trees, superior trees, and candidate trees. Insect control and prevention is like that described above. Pruning of infected and/or lower branches close to the branch collar using hand tools may be done to prevent white pine blister rust cankers from spreading into the bole. Though there is limited work on effectiveness of pruning whitebark pine for white pine blister rust, pruning is used in limber pine (Jacobi et al. 2017). White pine blister rust infection risk from pruning wounds is not increased because spores must enter through the tree needles.

Reduction of surface and ladder fuels in and adjacent to whitebark pine stands is expected to increase stand resilience and resistance to fire and reduce the risk from high intensity fires near whitebark pine stands. Although this activity will be conducted on an unlimited number of trees, especially for prevention and control of insects, the removal of surface and ladder fuels as well as mechanical treatments are estimated to occur on 5,000 acres annually across the range of whitebark pine on National Forest System lands. This amount may vary from year to year where some years it may be greater than 5,000 acres and some years it may be less. This is approximately 0.01 percent of the species range.

Removal of surface and ladder fuels with hand or mechanical methods typically occurs in a 15 to 33-foot radius of mature trees or more (e.g. one tree height) depending on the varied fuel loadings, topography, and other site conditions. If enough material exists that it needs to be piled in hand piles, the location and size of piles will be determined by appropriate USFS personnel to minimize the likelihood of nearby whitebark pine of any age class being scorched when the piles are burned. Mechanical treatments using heavy equipment will follow standard avoidance and minimization measures (e.g., using the least impactful machinery, following Regional direction on maximum allowable slope for operations and maximum allowable detrimental soil disturbance, cleaning equipment prior to arriving on site, identifying and minimizing damage to whitebark pine, specifically avoiding concentrations of seedlings and saplings). Other tools in care and maintenance of mature trees include bark-beetle baiting and monitoring. Monitoring includes removing a small sample of vegetative material for genomic screening for white pine blister rust resistance.

Project design features to avoid or minimize effects of selection and care of resistant mature trees on whitebark pine include implementing these activities only in those areas that are adjacent to high value trees, designing mechanical treatments to avoid damage to existing mature whitebark pine, avoiding effects of these actions to concentrations of seedlings and saplings of whitebark pine, placing slash piles of appropriate size to avoid damage to whitebark pine, and training equipment operators and sawyers to identify and avoid damaging whitebark pine. Further, these activities will follow Regional direction on maximum allowable slope for operations and maximum allowable detrimental soil disturbance, and will adhere to Forest Service Manual 2900 for invasive species prevention protocols. A Pesticide Use Proposal is necessary for use of insecticide products (USDA Form FS-2100-2), and pheromones will be used as deemed appropriate. The relevant general conservation measures described in section *3.4 Conservation Measures* will also be implemented.

(9) Protect healthy, unsuppressed regenerating stands:
Methods may include gopher control, removal of surface and ladder fuels, insect control and prevention, and pruning. Gopher control measures include placing strychnine-treated baits into the underground gopher tunnels or by trapping.

Removal of surface and ladder fuels is described above in *(8) Selection and care of mature trees with white pine blister rust resistance*. Insect and white pine blister rust control measures via pruning saplings are also like those described in *(8)*, with no more than 50 percent of sapling crown removal to maintain adequate photosynthetic area.

Project design features to avoid and minimize effects to whitebark pine include designing mechanical treatments and selecting placement and size of slash piles to avoid damage to existing whitebark pine as well as training sawyers to identify and not to cut or damage whitebark pine. Trapping gophers is used where practical, and a Pesticide Use Proposal is necessary for use of strychnine (USDA Form FS-2100-2) where trapping is not practical. In addition, to maintain adequate photosynthetic area of treated saplings, no more than 50 percent of the tree crown will be removed (Jacobi et al. 2017). The relevant general conservation measures described in section *3.4 Conservation Measures* will also be implemented.

(10) Clone bank
A clone bank is an archive of plants stored in living form. Clone banks benefit whitebark pine by preserving genetics of high value trees and by maintaining genetic diversity.

This activity includes preserving genetics of high value trees by maintaining a clone bank to serve as replacements for unforeseen losses or to augment existing seed orchards with newer genetic material. Clone banks will be established in whitebark pine habitat administrative sites, such as tree improvement areas, and includes the same activities as *(11) Seed and breeding orchards*, below. The relevant general conservation measures described in section *3.4 Conservation Measures* will be implemented.

(11) Seed and breeding orchards
Establishment of seed and breeding orchards benefit whitebark pine by producing white pine blister rust resistant seed that can be used for seedling production and outplanting. This focuses on production of seedlings from trees whose progeny show relatively high levels of resistance when tested in controlled settings (sometimes called elite trees). Once orchards are reproductively mature (i.e., all entries are producing cones and pollen, and background pollen contamination is minimal), orchard management will transition to wind or open pollination.

This includes site preparation, grafting, planting, pollen application, cone collection, foliar disease and insect control and prevention treatment, and orchard maintenance. Site preparation for seed and breeding orchards includes clearing with hand tools, mechanical treatment, or prescribed fire. Seed and breeding orchards also include fuel reduction, fencing, watering and weather system installation, and other planting preparation activities. Sites with existing healthy and mature whitebark pine are to be avoided when selecting an orchard site. Naturally regenerated trees and poor performing grafts may be cut and removed to ensure production of high-quality seeds by the orchard.

Grafting and planting are as described above under *(2) Scion collection* and *(6) Planting*, respectively. Pollen application includes applying pollen from proven high white pine blister rust resistance trees using hand applicators to breeding orchard trees covered with pollination bags, or to seed orchards using a pollen and water solution applied periodically, when first year conelets are receptive. Cone collection occurs once cones are ripe in September of their second year. Foliar disease and insect control and prevention treatment uses fungicide to treat foliar diseases following the Pesticide Use Proposal, and insect control and prevention is as described in the *(7) Insect control and prevention section*, above. Orchard maintenance can include irrigation, fertilization, floral stimulation, pruning, graft maintenance, application of pesticide and fungicide, rodent control, mowing, fence maintenance, fire break maintenance, label maintenance, and records maintenance.

Project design features to avoid and minimize effects to whitebark pine as a result of seed and breeding orchards include avoiding areas with existing whitebark pine, using hand or mechanical preparation of sites first and prescribed fire only where those methods are not feasible, and creating a Pesticide Use Proposal for use of insecticide products (USDA Form FS-2100-2). Only seeds with relatively high levels of resistance (i.e., elite trees) will be used in seed and breeding orchards, and once orchards are reproductively mature (all entries are producing cones and pollen and background pollen contamination is minimal), orchard management will transition to wind or open pollination. The relevant general conservation measures described in section *3.4 Conservation Measures* will also be implemented.

(12) Genetic evaluation plantations

Establishment of genetic evaluation plantations allows for the evaluation of performance of white pine blister rust resistant survivors of families and operational seed lots following completion of screening, under more operational planting methods and site conditions. These sites also facilitate evaluation of other key adaptive traits (abiotic and biotic) not available in greenhouse and nursery environments. While planted in a field setting, evaluation plantations are still planted in a replicated, experimental design to discern genetic, environmental and genotype-by-environment interactions in the traits of interest. Plantation locations may include weather stations in order to evaluate responses of white pine blister rust resistant genetic families to environmental and climatic conditions.

This includes site preparation, maintenance, and monitoring. Site preparation is as described in *(6) Planting*, above, and maintenance includes watering, fertilizing, weed control, label maintenance and record keeping, control of competing vegetation, maintaining fences, pruning, and also may include thinning of planted and natural trees. Monitoring includes collection of field data and evaluation of performance of genetically resistant stock.

Project design features that avoid or minimize effects to whitebark pine as a result of genetic evaluation plantations includes conducting surveys for whitebark pine during site selection for weather stations; any trees located will be avoided during installation. Seedlings with both high and moderate white pine blister rust resistance parentage, as well as susceptible control lots, will be used in genetic evaluation plantations. The relevant general conservation measures described in section *3.4 Conservation Measures* will also be implemented.

(13) Develop seed production areas (SPAs)
Seed Production Areas (SPAs) will produce white pine blister rust resistant seed in natural habitat settings.

This includes establishing SPAs, removing competing vegetation, removing unhealthy, undesirable whitebark pine phenotypes (trees exhibiting poor growth, presence of insect and disease problems), pruning, and cone collection. The establishment of SPAs includes identifying areas with high levels of white pine blister rust resistance (defined in the BA Appendix A, USFS 2023a) in breeding zones not represented with seed orchards, potentially on partner lands. Once the SPA is identified, competing, non-whitebark pine vegetation is removed with hand and mechanical means following the process outlined in *(8) Selection and care of mature trees with white pine blister rust resistance*. Additionally, unhealthy whitebark pine are removed by hand or mechanical methods. Pruning and cone collection will be performed following the process outlined in the sections *(8) Selection and care of mature trees with white pine blister rust resistance* and *(1) Cone collection*, above.

(14) Surveys
Inventory and map forest stands in whitebark pine habitat.

This includes field surveys using standardized field exam and survey methods to evaluate and collect data to inform baseline conditions and restoration actions. Marking trees with nails, stakes in the ground, paint, and other marking techniques may be used. Surveying through inventorying and mapping forest stands of whitebark pine as well as restoration work and inclusion of those data into the USFS's Natural Resource Management database provides a valuable resource for tracking projects and future project scoping. There are no specific project design features associated with conducting surveys, though the relevant general conservation measures described in section *3.4 Conservation Measures* will also be implemented.

(15) Research, monitoring, and education
Benefits of research, monitoring, and education include understanding the response of whitebark pine to various environmental and treatment factors as well as educating the public to support the conservation of the species.

Research may include: testing the efficacy of restoration treatments; gene conservation, genetic and genomic basis of response, and modeling of future performance; fire behavior modeling; collecting baseline information; growing seedlings, collection of plant seeds and seedlings, assessing seedling responses to environmental conditions, pests, or pathogens to improve restoration strategies; assessing response to silvicultural treatments, including implementation and evaluation, as well as recovery and restoration treatment implementation and evaluation; collection of tree cores, fire scars, vegetation, insects, pathogens, foliage, branch, root, bark, and soil samples; long-term plot establishment and measurement; installation of meteorological equipment; and research of bird, mammal, and insect populations.

Monitoring may include insect and disease evaluation and diagnosis; determining ages of trees; monitoring ongoing activities; long-term health monitoring and forest inventory treatment effectiveness monitoring; and monitoring bird, mammal, and insect populations. Monitoring may also include collection of tree cores, fire scars, vegetation, insects, pathogens, foliage, branch, root, bark, and soil samples.

Education and outreach include educating managers and the public; training those working and recreating in and around whitebark pine; validating species identification; collection of whitebark pine plant materials and insect and disease samples; and storing for vouchers, training, display, research, and education.

Project design features to avoid and minimize effects of research, monitoring, and education activities consists of ensuring that high value trees are not removed. The relevant general conservation measures described in section *3.4 Conservation Measures* will also be implemented.

3.3 Project Implementation

The Project is anticipated to continue with proposed activities being conducted by multiple agencies and partners, led by the USFS, in perpetuity. Current partners are summarized in Table 1 of the USFS BA (USFS 2023a) and additional partners may become involved through a federal nexus. For example, the genetic white pine blister rust screening program led by the USFS includes multiple partners who send suitable material to the USFS for participation in *(5) Genetic white pine blister rust screening*, *(10) Clone banks*, *(11) Seed and breeding orchards*, and *(12) Genetic evaluation plantations*. In addition, multiple partners participate in *(4) Operational seedling production*, with USFS nurseries receiving and growing out seed of whitebark pine that originates on partner lands. Nearly all partners may participate *in (14) Surveys* and *(15) Research, monitoring and education* activities. Working together across the range of the species leads to greater recovery benefits.

The Project includes a variety of proposed activities that fall within 15 broad categories as described in section *3.2 Project Description*. Implementation of individual activities that fall within the parameters as described in *3.2 Project Description* and *6. Effects of the Action* will be checked for consistency by appropriate USFS personnel for all activities, including those implemented by the partners identified in Table 1 of the USFS BA. Consistency checks with this PBO and the effects considered will be completed by filling out the consistency form included in Appendix C of the USFS BA (USFS 2023a). A summary of all activities that fall within the scope of the Project will be reported to the Service, by fiscal year, by January 30. The USFS and Service will review a subset of project consistency forms and discuss relevant updates to the baseline during a joint annual meeting. Any proposed activity that falls outside the scope and intent of this PBO will need to be evaluated in a separate consultation under section 7 of the ESA (e.g., standalone consultation for that activity or inclusion in a different programmatic approach).

3.4 Conservation Measures Included in the Proposed Action

As described in the USFS BA, Project design features, including agency manual direction and standards of operation, will help avoid or minimize adverse effects of the Project on whitebark pine. For all activities covered under this consultation, every reasonable effort will be made to avoid removing or damaging healthy, unsuppressed whitebark pine when collecting vegetative materials (e.g., cones, scion, pollen, and aeciospores). Additionally, action-specific Project design features are included under each activity description above and in section *III Effects of the Action and Cumulative Effects* in the USFS BA (USFS 2023a). The individual activity form used to ensure consistency with this PBO will identify all measures to be implemented for each individual activity. These include, but are not limited to, the following manual direction and standards of operations as well as conservation measures consistent with the *Standing Analysis for Effects to Whitebark Pine (*Pinus albicaulis*) from Low Effect Projects and Whitebark Pine Restoration and Recovery Activities within Montana and Wyoming* (USFWS 2023).

3.4.1 Conservation Measures in Forest Service Handbook and Manual Direction and Policy:

- Forest Service Manual 2900: This guidance ensures that forest management activities are designed to minimize or eliminate the possibility of establishment or spread of invasive species on National Forest System lands or to adjacent areas (USFS 2011). The Forest Service Manual 2900 can be obtained following this link: https://www.fs.usda.gov/im/directives/fsm/2900/wo_2900_zero_code_clear.doc.
- A Pesticide Use Proposal (USDA Form FS-2100-2) and applicator training will be completed prior to application of pesticides.
- Follow standard procedures outlined in The Woody Plant Seed Manual, Agriculture Handbook 727, June 2008 and regional Forest Service Handbook direction pertinent to each region.
- Forest Service Handbook 4090.13 Good Laboratory Practices Handbook.

3.4.2 Conservation Measures consistent with the Standing Analysis for Effects to Whitebark Pine (*Pinus albicaulis*) from Low Effect Projects and Whitebark Pine Restoration and Recovery Activities *within Montana and Wyoming* (USFWS 2023):

General

- 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.
- When working in whitebark pine stands, ensure work does not introduce or spread *Ribes* species that are an alternate host for white pine blister rust.

Training and Education

- Train project personnel to identify five needle pine species regardless of their age class (seedling, sapling, and mature trees) to ensure project activities do not result in more adverse effects than described in the project description.

Soil Conservation

- 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 regional direction (e.g., the USFS Region 1 direction generally limits ground-based equipment to slopes less than 40 percent).
- Minimize creation of dust when using mechanical equipment (heavy equipment and vehicles).

Genetic Collection & Restoration Activities

- Restoration projects will maintain mature whitebark pine trees during project activities. Restoration projects will avoid crushing and damaging live whitebark pine seedlings and saplings to the extent possible. Maintaining some dead trees in the project area can provide habitat for wildlife.

4 Status of the Species

The Status of the Species evaluates the species' current range-wide 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 range-wide population retains sufficient abundance, distribution, and diversity to persist and retains the potential for recovery (see USFWS and NMFS 1998).

The Service provided a thorough status of the species in the 2021 SSA (USFWS 2021), and a summary of the status for Wyoming and Montana in the *Standing analysis for effects to whitebark pine (*Pinus albicaulis*) from low effect projects and whitebark pine restoration and recovery activities within Montana and Wyoming* (USFWS 2023). These detailed assessments are incorporated by reference, with a summary provided here.

4.1 Species Description and Taxonomy

The whitebark pine is a five-needle conifer species placed in the subgenus *Strobus,* which also includes other five-needle white pines. Recent phylogenetic studies (Liston *et al.* 1999; Syring *et al.* 2005, 2007; as cited in Committee on the Status of Endangered Wildlife in Canada (COSEWIC) 2010) showed no difference in monophyly (ancestry) between subsection *Cembrae* and subsection *Strobi* and merged them to form subsection *Strobus.* No taxonomic subspecies or varieties of whitebark pine are recognized (COSEWIC 2010). Based on this taxonomic classification information, we recognize whitebark pine as a valid species (USFWS 2021).

4.2 Distribution and Status

The range of whitebark pine spans an estimated 80,596,935 acres in western North America (USFWS 2021), though density and occupancy vary greatly throughout its windy, cold, high elevation or high latitude environments. It has a broad range 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. It also occurs in scattered areas of the warm and dry Great Basin. As a result, many whitebark pine stands are geographically isolated (Arno and Hoff 1989).

Roughly 70 percent of the species' range occurs in the United States, with the remaining 30 percent of its range occurring in British Columbia and Alberta, Canada (USFWS 2021). In Canada, most of the species' distribution occurs on federal or provincial crown lands (COSEWIC 2010). In the United States, approximately 88 percent of land where the species occurs is federally owned or managed (USFWS 2021, Figure 2). The majority is located on

USFS lands (approximately 74 percent, or 42,975,220 acres). The bulk of the remaining acreage is located on National Park Service (NPS) lands (approximately 10 percent, or 5,623,490 acres). Small amounts of whitebark pine also can be found on Bureau of Land Management (BLM) lands (approximately 4 percent, or 2,476,371 acres). The remaining 12 percent of the range is under non-federal ownership, on State, private, and tribal lands. In the United States, 29 percent of the range is designated as wilderness under the Wilderness Act of 1964 (16 U.S.C. 1131-1136). This designation limits management options and conservation efforts in those areas to some degree.

4.3 Life History and Population Dynamics

There are four stages in the life cycle of the whitebark pine: seed, seedling, sapling, and mature trees, also referred to as reproductive adults. Seeds are produced in female cones and once on the ground may take 2 years or more, up to 11 years in some cases, to germinate. Germinated seeds become seedlings that are between 3 to 4 inches (in) tall with a taproot that can measure between 5 to 7 in, with 7 to 9 cotyledons, also known as the embryonic first leaves (Arno and Hoff 1989). Whitebark pine seedlings may persist for multiple years, depending on growing conditions, until reaching the sapling stage of the life cycle. Whitebark pine saplings are non-reproductive (non-cone bearing) trees greater than 4.5 feet (ft) in height. Whitebark pine saplings persist for an unknown length of time, potentially decades depending on growing conditions, until they produce male and female cones. Mature reproductive whitebark pines contain both female and male cones, which is known as monoecious reproduction, and can survive on the landscape for hundreds of years. This slow-growing, long-lived tree can live between 500 years and 1,000 years (Arno and Hoff 1989; Perkins and Swetnam 1996), or even longer in areas with low litter depth and high rock cover (Maloney et al. 2012). Therefore, in addition to the four general needs for all life stages, mature whitebark pine trees require a more open canopy, dispersal of seeds by Clark’s nutcracker (*Nucifraga columbiana*) or other means, two summers of suitable temperatures and precipitation for pollinated cones to mature, as well as levels of nitrogen and phosphorus that are adequate to restore values after being depleted in masting years (USFWS 2021).

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 Clark’s nutcracker (Hutchins and Lanner 1982; Keane *et al.* 2017). Both pollen dispersal and Clark’s nutcracker seed dispersal can occur at a scale of a few meters to many miles (*e.g.*, 20.3 miles in the case of Clark’s nutcracker seed dispersal; Lorenz et al. 2011 p. 242). To promote a greater than 75 percent probability of occurrence of Clark’s nutcracker at a site, Schaming and Sutherland recommend management plans that achieve a landscape composition of a minimum 30,888-61,776 acres of cone bearing whitebark pine habitat within a 20.26-mile radius based on findings in the southern Greater Yellowstone region where extensive whitebark stands occur (Schaming and Sutherland 2020, p. 16). Whitebark pine is a long-lived species that exhibits some level of masting, where years of moderate or high seed production may be synchronized in a population (Crone et al. 2011, p. 441-442). Whitebark pine populations need a certain density of reproductive individuals to produce sufficient pollen clouds that facilitate the synchronization of masting, and thus increased probability of regeneration (Rapp *et al.* 2013).

4.4 Habitat

The whitebark pine typically occurs on cold and windy high-elevation or high-latitude sites in western North America, although it also occurs in scattered areas of the warm and dry Great Basin. As a result, many stands are geographically isolated (Arno and Hoff 1989; Keane *et al.* 2012). The distribution of whitebark pine includes coastal and Rocky Mountain ranges that are connected by scattered populations in northeastern Washington and southeastern British Columbia (Arno and Hoff 1989; Keane *et al.* 2012). The coastal distribution of whitebark pine extends from the Bulkley Mountains in northwestern British Columbia to the northeastern Olympic Mountains and Cascade Range of Washington and Oregon, to the Kern River of the Sierra Nevada Range of east-central California (Arno and Hoff 1989). Isolated stands of whitebark pine are known from the Blue and Wallowa Mountains in northeastern Oregon and the subalpine zone of mountains in northeastern California, south-central Oregon, and northern Nevada (Arno and Hoff 1989; Keane *et al.* 2012). The Rocky Mountain distribution of whitebark pine ranges from northern British Columbia and Alberta to Idaho, Montana, Wyoming, and Nevada (Arno and Hoff 1989; Keane *et al.* 2012), with extensive stands occurring in the Yellowstone ecosystem (McCaughey and Schmidt 2001).

In general, the upper elevational limits of whitebark pine decrease with increasing latitude throughout its range (McCaughey and Schmidt 2001). The elevational limit of the species ranges from approximately 2,950 ft at its northern limit in British Columbia to 12,000 ft in the Sierra Nevada (McCaughey and Schmidt 2001). Whitebark pine often grows on inceptisols (Mahalovich et al. 2016; Arno and Hoff 1989). Whitebark pine is typically found growing at the subalpine treeline or with other high-mountain conifers just below the treeline and subalpine zone (Arno and Hoff 1989; McCaughey and Schmidt 2001). In the Rocky Mountains, common associated tree species include lodgepole pine (*P. contorta* var. *latifolia)*, Engelmann spruce (*Picea engelmannii)*, subalpine fir (*Abies lasiocarpa)*, and mountain hemlock (*Tsuga mertensiana)*. Common associated tree species are similar in the Sierra Nevada and Blue and Cascade Mountains, except lodgepole pine is present as Sierra-Cascade lodgepole pine (*P. contorta var. murrayana)* and mountain hemlock is absent from the Blue Mountains (Arno and Hoff 1989; McCaughey and Schmidt 2001).

4.5 Threats to the Species

Major threats to whitebark pine include mortality from disease that is caused by the non-native white pine blister rust, predation by the native mountain pine beetle, altered fire regimes, and the effects of climate change.

White pine blister rust

White pine blister rust is recognized as the primary threat to whitebark pine (USFWS 2022, Tomback et al., 2022). It is a disease of five-needle pines (*Pinus spp*.) caused by a nonnative fungus, *Cronartium ribicola* (Geils *et al.* 2010). The disease causes branch- and stem-girdling cankers, resulting in branch death and top-kill, which reduces cone and pollen production in mature trees, and tree mortality in all age classes (Geils et al., 2010, Tomback and Achuff, 2010). White pine blister rust occurs throughout the entire whitebark pine range with a few isolated exceptions. Infection rates vary and are increasing throughout the range. Infection rates are also affected by white pine blister rust resistance levels in different areas: a gradient of lower to higher resistance occurs from the southern Greater Yellowstone Ecosystem northwest to Idaho (Mahalovich 2015); and, some of the highest levels of resistance occur in northwestern Montana and in the Pacific coastal portion of the species' range (Mahalovich 2013, Sniezko and Kegley 2015), despite cool and moist conditions in the latter area normally conducive to infection. While some areas have little or no white pine blister rust related mortality, others have mortality rates exceeding 90% (Jenkins et al., 2022). 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; McDonald *et al.* 2006).

Mountain pine beetle

The mountain pine beetle is recognized as one of the principal sources of whitebark pine mortality (Raffa and Berryman 1987; Arno and Hoff 1989). Mountain pine beetles feed on whitebark pine and other western pines and to successfully reproduce the beetles must kill host trees (Logan and Powell 2001; Logan *et al.* 2010). Upon locating a suitable host (*i.e.*, large diameter tree with sufficient resources for brood production success), adult female mountain pine 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 defenses to mountain pine beetle predation. 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, even a live tree's defensive mechanisms (*e.g.*, oleoresin and volatile organic compounds emission, mobilization of resin flow, additional formation of resin directed towards the sites of beetle activity (Bohlmann 2012) can be exhausted (Raffa and Berryman 1987).

Climate change and altered fire regime

Whitebark pine also faces major threats from climate change, habitat loss from past and ongoing fire suppression activities, mortality from recent severe fire, and the combined negative effects of these individual threats. Fire is one of the most important landscape-level disturbance processes within high-elevation whitebark pine forests (Agee 1993; Morgan and Murray 2001; Spurr and Barnes 1980), and is relevant to whitebark pine both as a stressor that can cause mortality of all life stages of whitebark pine and as a mechanism that can reduce competition and hazardous fuels, and provide improved conditions for establishment of regeneration (Arno 2001, Shoal et al. 2008, Keane and Parsons 2010a, Keane et al. 2020). Fire regimes in whitebark pine systems are often characterized as being of mixed severity (Arno 2001, Campbell and Antos 2003; Larson 2009).

Habitat loss is anticipated to occur across the whitebark pine range, with current habitats becoming unsuitable for the species as a result of both direct and indirect impacts from climate change (Bartlein *et al.* 1997; Hamann and Wang 2006; Schrag *et al.* 2007; Warwell *et al.* 2007; Aitken *et al.* 2008; Loehman *et al.* 2011; Rice *et al.* 2012; Chang *et al.* 2014). Researchers have hypothesized that there will be significant habitat loss as (1) temperatures become so warm that they 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 cold high-elevation habitats, and (3) climate change alters the frequency and intensity of disturbances (*e.g.*, fire, disease) to such an extent that whitebark pine cannot persist. In summary, the pace of predicted climate change will outpace many plant species' abilities to respond to the concomitant habitat changes. Whitebark pine is potentially particularly vulnerable to warming temperatures because it is adapted to cool, high-elevation habitats (USFWS 2021).

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

5 Environmental Baseline

Regulations for implementing the ESA (50 CFR 402.02) define the environmental baseline as the condition of the listed species or its designated critical habitat in the action area relative to its numbers, reproduction, and distribution, without the consequences to the listed species or designated critical habitat caused by the proposed action including the anticipated condition of the species contemporaneous to the term of the proposed action; the factors responsible for that condition; and the relationship of the action area to the survival and recovery of the species. 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 area 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 consequences to listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency's discretion to modify are part of the environmental baseline.

5.1 Status of and Factors Affecting the Whitebark Pine Within the Action Area

Because the action area includes the range of whitebark pine on USFS lands plus additional research, nursery, and orchard locations outside of the range, the status of and threats to the species are the same as those affecting whitebark pine throughout its range described above. Other Forest Service management activities on lands across the range of the species (including but not limited to vegetation, fire, and wilderness management, recreation, grazing, etc.) are currently being implemented by the USFS. While these activities do not pose substantial threats to the species and in some cases may produce benefits to the species, 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 threats mentioned in the Status of the Species section.

5.2 Recent Section 7 Consultations

Due to the recent listing status of whitebark pine under the ESA, few consultations under section 7 have occurred (refer to https://reports.ecosphere.fws.gov/FWSPublicReports/Reports/Index?reportname=BiologicalOpinionReport for the updated list of completed section consultations for whitebark pine). Individual forests within the USFS have requested reinitiation of consultation in batches for ongoing and active timber sale and fuel management projects that previously consulted for other listed species (these project records are on file in TAILS and ECOSphere for the respective offices) and that now need consultation under section 7 for effects to whitebark pine. Additionally, other federal agencies have requested consultation for effects of their management activities on whitebark pine, ranging from 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 removing over a thousand tress to improve visitor driving and parking experiences within a national park. Each of these separate consultations reached a “no jeopardy” conclusion due to the limited 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 stand in the way of 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, and also lead 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, consultations for whitebark pine to date have resulted in the removal of a total of less than one percent of the total known acreage of the species.

6 Effects of the Action

Effects of the action are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed 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. (50 CFR 402.02). Descriptions of the effects of each proposed activity covered under this programmatic BO are provided below. Effects to whitebark pine from these 15 broad categories of activities are expected to last multiple generations and be overall beneficial to whitebark pine.

6.1 Activities included in this consultation

(1) Cone collection

Cone collection takes place on a small number of whitebark pine (cones were collected from 2,054 trees from 2008 to 2022), which is a very small percentage of the number of trees that are found on the estimated 42,975,221 acres (USFWS 2021) of the species range on USFS system lands. At the current rate, cones are collected from approximately 140 trees per year, and we expect this to increase now that the species is listed under the ESA. Whitebark pine exhibits some level of masting, where years of moderate or high seed production may be synchronized in a population (Crone et al. 2011, p. 441-442).

Trees are climbed early in the growing season to cage cones and then in the fall to collect cones. The adverse effect to mature whitebark pine that can occur from cone collection is mechanical wounding (gouging of bark, breaking of branches, and loss of a small percentage of needles and twigs) from tree climbing. Occasionally a branch is broken when climbing or attempting to put on or remove a 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 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; Arno 1989). 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 to reduce adverse effects from tree climbing for cone collection. Cone 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 in that they can become damaged affecting viability. However most targeted seeds are successfully collected and remain viable during the collection process. Therefore, a very small percentage of seeds that are targeted for collection are negatively affected by cone collection activities. Collected seeds have a higher potential to become seedlings when propagated in the greenhouse than when seeds are gathered, cached, or eaten by birds or small mammals, or are subjected to diseases.

Transport of cones and seed may affect the seed by being exposed to temperatures or humidities that reduce viability or become lethal. Loss of seed (spillage) and mechanical damage to seeds may occur from stacking or bouncing and rubbing in transport vehicles. Measures 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 for improper storage climate (temperature and humidity) resulting in reduced viability and increased mortality of seed. Rodents, insects, diseases (fungal 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 are taken to ensure seed are stored properly to retain seed integrity and viability and following standard procedures outlined in The Woody Plant Seed Manual, Agriculture Handbook 727, June 2008.

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 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.

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 seeding production and will be overall beneficial to whitebark pine.

(2) Scion collection

The number of trees where scion is removed is very small (scions were removed from 223 trees over the 10 years from 2011 to 2022), which is a very small percentage of the number of trees that are found on the estimated 42,975,220 acres (USFWS 2021) of the species range on USFS system lands. At the current rate, scion is collected from approximately 25 trees per year, and we expect this value to increase now that the species is listed under the ESA. The adverse effects 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 *(1) Cone Collection*.

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 being exposed to temperatures or humidities that stress or kill scion, loss and misplacement of scion, and physical damage to scion from stacking, bundling, or bouncing and rubbing in transport vehicles. To reduce these negative effects care will 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 thus 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.

(3) Pollen collection

Pollen is collected from a small number of whitebark pine trees when pollen ripens between June and July (Arno and Hoff 1989). From 2015 to 2021, pollen was collected from 825 trees. At the current rate, pollen is collected from approximately 120 trees per year, and we expect this value to increase now that the species is listed under the ESA. Whitebark pine exhibits some level of masting, where years of moderate or high seed production may be synchronized in a population (Crone et al. 2011, p. 441-442). During non-masting years pollen may be limited (Rapp et al. 2013). 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 *(1) Cone Collection*.

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. The seed and breeding orchards will 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.

(4) Operational seedling production
Most of the activities associated with seedling production are temporary and seedlings can rebound unless there has been mortality. Following standard nursery protocols minimizes adverse impacts to seedlings and ensures the maximum survival of seedlings for recovery purposes such as out-planting and research. The actions associated with operational seedling production include extracting seeds, determining seed viability, storing seeding, stratifying seeds, sowing seeds, growing seedlings, treating foliar disease, storing seedling, and packing and shipping seedlings.

Operational seedling production has documented success for use in seed and breeding orchards to produce genetic resistant seedlings for planting and for genetic preservation. Regions 1 and 4 of the USFS have been planting whitebark pine since 1988 and 1991, respectively, and have well established protocols in place that generally result in high levels of survival (McCaughey et al., 2009). To date, 9,724 acres have been planted in Regions 1 and 4 (WO Silvicultural Accomplishment Report Table 7). Over the past 3 years, most of the 500,000 seedlings produced by R1 and R4 nurseries have been planted on USFS System Lands.

During seed extraction seeds may become physically damaged or lost, resulting in reduced or loss of viability and mortality. Seed extraction processes are designed and implemented to reduce these adverse impacts to seeds to maximize the number of seeds available for use.

Seeds selected for seed viability testing may be discarded after testing if planting is not feasible (e.g., testing done at an off-site location instead of at a nursery), resulting in a loss of these seeds. Only a small percentage of seeds from each collection are selected for viability testing.

Affects to seeds during storage include potential for improper storage climate (temperature and humidity) resulting in reduced viability and increased mortality of seed. Rodents, insects, diseases (fungal 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. Operational seed lots that are found to have little or no white pine blister rust resistance or poor/no germination (not likely to produce seedlings that survive to cone bearing age) may be discarded if another use for them (e.g., research) cannot be found. Once seed is confirmed to have sufficiently low moisture content, it is stored in freezers until needed. Seed from individual trees is stored separately when it is being used for white pine blister rust resistance screening or gene conservation. These efforts are taken to ensure seed are stored properly to retain seed integrity and viability. Storing of seedlings may result in damage to seedlings from cold storage conditions. Seedlings may become stressed or die although precautions and protocols are followed to ensure healthy seedlings through the storage process.

During seed scarification, stratification, and germination seeds may become moldy or damaged. Some moldy or damaged seeds may need to be discarded. Seeds that do not germinate may be discarded. During sowing, seeds may become dropped and lost. Some seeds may not germinate or fail to thrive and die once sown. Seed predators may dig up seeds from containers. Empty or non-viable containers are removed to conserve space and discourage disease and weed growth. Blocks of containers may be covered with horticultural fabric to protect germinants from predation and keep heat and moisture in the containers.

During growing of seedlings adverse effects may occur from climate fluctuations in the greenhouse or outdoor beds, non-native species competition, and herbivores. Fertilizer, fungicides, heat, and supplemental light are applied and have beneficial effects to the survival and vigor of whitebark pine. Native mycorrhizae are also shown to benefit whitebark pine in the greenhouse (Jenkins et al 2018). Results of greenhouse mycorrhizal inoculations have shown increased growth and elevated nutrient status (Jenkins et al 2018), however the benefits of inoculation from field studies are known to be highly variable and site specific. While some have found that inoculated seedlings had increased survival (Lonergan et al. 2014), others have found no strong correlation between inoculation and increased germination or seedling survival (Cripps et al 2018; Schwandt and Cleaver 2015.

Fungicide may be used to treat foliar diseases to increase the health of whitebark pine trees where they are affected by fungal pathogens. Adverse effects from treatment may occur while applying the fungicide from trampling or non-target drift or migration of fungicide spray or drench.

Seedlings may be mechanically damaged (shoots, roots, etc.) or die during packing and shipping activities. They can be stressed or die during shipping from uncontrolled temperature extremes, lack of light, and jostling.

The production of seedlings benefits whitebark pine recovery in supplying many genetically resistant whitebark pine seedlings to be outplanted. The supply from the production of seedlings is greater than would occur though the natural process in whitebark pine habitat. The production of these seedlings increases the number of whitebark pine in the population and provide increased resistance against mortality from white pine blister rust.

While we anticipate that some adverse effects will occur due to some damage or destruction to whitebark pine seeds and seedlings during production of seedlings, it is reasonably likely that seedling production will be overall beneficial to whitebark pine.

(5) Genetic white pine blister rust screening

Genetic white pine blister rust screenings has documented success for producing genetic resistant seedlings for planting and for genetic preservation. Lucky Peak Nursery (LPN), Coeur d'Alene Nursery (CDAN), and Dorena Genetic Resource Center (DGRC) nurseries have been producing whitebark pine seedlings for more than 20 years and have been successful in producing seedlings with evidence of resistance to white pine blister rust (e.g., LPN and DGRC producing approximately 15,000 and CDAN producing approximately 150,000 seedlings per year, J. Herbert Stone Nursery producing ~5,000 but planning to increase in 2024 to approximately 40,000.). By 2024 we expect approximately 200,000 seedlings will be produced per year, and we expect that this number may increase now that the species is listed under the ESA.

White pine blister rust resistance breeding processes are based on processes used with white pine blister rust resistance breeding (Mahalovich et al. 2006, Mahalovich 2010; Sniezko and Liu 2022; Sniezko et al. 2007) and have resulted in the establishment of four seed orchards in USFS

Region 1, with four more seed orchards currently being established in Region 6. Seedling families from approximately 1,400 and 1,500 parent trees in R1 and R6, respectively, have been evaluated for resistance.

As cones are dried, seeds are extracted, cleaned, and stored, and packing and shipping of seedlings are carried out in the same manner as described above in *(4) Operational seedling production*. Therefore, effects are expected to be similar (i.e., all these activities may result in damage of and mortality to individual seeds and seedlings.). A genomic application to screen trees for white pine blister rust resistance is currently being developed (Tomback et al. 2022). This screening would require a small sample of a vegetative material to be collected.

Collecting aeciospores will result in effects to the host whitebark pine tree when blisters are scraped with a small tool to separate the spores from the tree. Seedlings purposely exposed to spores will be stressed leading to reduced vigor, or they may die. Once infected the disease is endophytic and so is a permanent infection. Seed from parents (or bulk seed) with low white pine blister rust resistance may be discarded. Genetic screening is beneficial to whitebark pine recovery by identifying white pine blister rust resistant individuals, developing seed producing trees from screened individuals and propagating them to increase the population of resistant trees in natural habitat.

While we anticipate that some adverse effects will occur due to some damage or destruction of whitebark pine seeds or seedlings during genetic white pine blister rust screening, it is reasonably likely that genetic screening will facilitate successful resistant seed production and will be overall beneficial to whitebark pine.

(6) Planting

Planting is done to increase numbers of white pine blister rust resistant seedlings. Regions 1 and 4 of the USFS have been planting whitebark pine since 1988 and 1991, respectively. Regions 2 and 6 have planted whitebark pine since 1999 and 1997, respectively. To date, 9,724 acres (approximately 300 acres per year) have been planted in Regions 1 and 4 (USFS 2023a), and approximately 5,000 acres of whitebark pine have been planted in Regions 2 and 6 (approximately 200 acres per year) (USFS 2023a). Over the past three years, most of the 500,000 seedlings produced by Regions 1 and 4 nurseries have been planted on USFS administered lands. Current USFS whitebark pine plantings follow the most recent planting guidance and have high whitebark pine seedling survival. Average current seedling survival three years post-planting in Forest Service regions 1 and 4 is 87 percent (USFS 2023a). Results from several published studies and student theses researching whitebark pine seedling survival are below:

- Planting years 1987-1998 (Gallatin National Forest). Surveyed at 11 years post-planting. Survival was between 2 percent and 47 percent (Scott & McCaughey 2006).
- Planting years 1989-2005 (USNF, BLM, and NPS lands). Surveyed in 2006. Survival first year was 74 percent. Survival years 4-15 was 41.4 percent (Izlar 2007).
- Planting years 2000-2002, 2006, 2007 (Glacier National Park). Monitored 2000-2007. Survival was 41 percent (Asebrook et al. 2011).
- Planting years 2010 (Waterton Lakes National Park, Canada). Surveyed annually for 7 years. Survival year 7 was 53 percent (Cripps et al. 2018).

- Planting years 2015 (Beaverhead-Deerlodge National Forest). Surveyed 3 months and 14 months post-planting. Survival was 97 percent and 94 percent, respectively (Jenkins 2017).

Data for USFS Region 5 are not available, but we anticipate that the effects of this action will be the same as in other USFS Regions. Current production of approximately 200,000 whitebark pine seedlings per year equates to planting about 800 acres per year at a spacing of 250 trees per acre. This number may increase as recovery efforts ramp up.

Site preparation is conducted in suitable habitat for whitebark pine but where mature individuals generally do not currently occur. While planting sites are selected to avoid impacts to any whitebark pine, small numbers of whitebark pine saplings, seedlings, and seeds may be present. Site preparation may kill or damage whitebark pine during mechanical vegetation removal and soil scraping or prescribed burning. Mechanical preparation may trample, uproot saplings and seedlings or damage cambium and root systems. Prescribed burning may kill whitebark pine trees and seeds if they are present in the action area but may also prepare the soil for seeds in the seed bank to germinate and reduce competition around existing trees, though more research is needed in this area. Surveys may be conducted on selected sites prior to site preparation. Existing whitebark pine found during surveys or implementation will be avoided and considered as part of the target spacing of planted seedlings. Adverse effects to whitebark pine saplings from mechanical and soil scraping damage are the same as described in *(1) Cone Collection*.

Planting usually occurs on areas that have been previously burned by wildfires and only require minor site preparation with hand tools to remove burned material or small amounts of vegetation immediately around the seedling planting site. On average across the range, it is estimated that planting occurs on 500 acres per year. Considering range-wide anticipated increased planting efforts, site preparation is anticipated on approximately 5,000 acres per year, which is a very small amount (less than 0.01 percent) of whitebark pine habitat.

Transportation and planting of seeds and seedlings result in similar effects to those described above in *(4) Operational seedling production*, though additional stress and damage may occur as a result of movement along rough and steep terrain to the planting site. Direct seeding may result in adverse effects to the species from mechanical damage to seeds, or failure to germinate or grow due to improper seeding techniques or poor timing for seeding. Seed predators 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. 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. Survival rate for whitebark pine plantings after three years has been documented at 87 percent in USFS Region 1.

During monitoring, trees may be trampled by monitors or soil may be compacted. Since seedlings are monitored at the end of the first and third growing seasons, the impacts are infrequent. Planting seedlings and direct seeding is a benefit to whitebark pine recovery, because it increases population size of the species and adds white pine blister rust resistant trees to populations.

While we expect some adverse effects to whitebark pine on a localized scale due to damage to individuals during planting activities, at a landscape scale we anticipate that planting will facilitate increased numbers and distribution resulting in an overall beneficial effect to whitebark pine.

(7) Insect control and prevention
Insect prevention and suppression applies to all insects known to affect whitebark pine. Insect management tools can be used in whitebark pine habitat and adjacent stands that have clearly defined conservation objectives related to protecting biologically important whitebark pine trees.

Prevention and suppression treatments (such as sanitation, pheromones, and insecticides) can decrease or mitigate insect-caused effects on conservation efforts. Monitoring insect populations is a critical component of Integrated Pest Management and the tools associated with monitoring insect populations include aerial detection and ground-truthed surveys, traps, pheromones, and insecticide strips. These tools are included to assist managers in applying prevention and suppression treatments in a targeted and productive manner.

We do not anticipate adverse effects to whitebark pine trees during insect prevention and control activities, and it is likely they will facilitate increased survival and therefore will be beneficial to whitebark pine.

(8) Selection and care of mature trees with white pine blister rust resistance
White pine blister rust resistant trees will be identified and marked with marking paint and/or tree tags. Tree marking paint is applied only over a small area of the bark and the effects are thought to be minor. Aluminum nails are driven into the tree through the bark, cambium, and sapwood. The wound from the nail is very small and it does not increase likelihood of infections because spores only infect trees by entering stomates on needles, not wounds (Schwandt et al. 2013). Being able to mark trees is important for identifying trees for cone collection and for protecting these individuals. Use of aluminum nails, pruning, as well as damage caused by hand or mechanical treatments may cause adverse effects due to removal of photosynthetic material and wounding of trees. Adverse effects to whitebark pine mature individuals from these three activities are the same as described in *(1) Cone Collection*. Benefits from pruning include: 1) prevention of white pine blister rust cankers from spreading to the bole of the tree, 2) reducing the potential of alternate hosts being infected, 3) reducing the likelihood that fire will burn the bole or be carried up into the crown, 4) improving air flow around the bole to reduce risk of bark beetle mortality, and 5) removal of dwarf mistletoe infections.

Hand and mechanical treatments that remove fuel from around mature resistant trees or adjacent stands may moderate wildfire intensity, increasing the probability that patches of unburned trees remain resulting in a mosaic landscape (Keane 2018). Whitebark pine has low fire resistance (Stevens et al. 2020, Table 1; lower than subalpine fir, Engelmann spruce, and lodgepole pine) and may be killed even by low intensity surface fire (Keane and Parsons 2010a, 2010b). Therefore, benefits from removing nearby trees are expected to be limited. However, reduction of non-whitebark pine trees increases light, water, and nutrient availability to whitebark pine trees, likely providing some localized benefits. Subsequent treatments are often necessary to maintain those benefits because the increase in available growing space may increase regeneration of competitors (Maher et al. 2018, p.541, Figure 4). Adverse effects of vegetation removal may include breaking of branches and trampling of seeds and seedlings around the root zone of mature trees. Use of heavy equipment disturbs and compacts soil and can lead to crushing and burying of seeds and seedlings. In addition, mature whitebark pines may be killed by windthrow and windsnap in recently thinned stands (Murry et al. 2021, Berg 2022). Concentrations of whitebark pine seedlings and saplings would be avoided although seedlings may be crushed leading to stress or death. Branches on nearby trees may become broken. Wounding or breakage from mechanical treatments result in effects as those described above regarding tree identification and pruning.

The number of acres thinned, or where tree release was conducted or is planned around whitebark pine in USFS Region 1, totaled 3,017 acres from 2008 to 2037; for USFS Region 4 the number of acres totaled 5,753 from 2004 to 2020; and for USFS Region 6 the number of acres totaled 6,035 from 1997 to 2025. USFS Region 2 did not report thinning or tree release around whitebark pine, and the data for USFS Region 5 was not available. The total amount of 14,805 acres where treatments occurred over two decades (a historical rate of approximately 750 acres per year across the range) is 0.034 percent of the estimated whitebark pine habitat of 42,975,220 acres on USFS System lands. We estimate that the total amount of removal of surface and ladder fuels and mechanical treatments will occur on approximately 5,000 acres annually, which is 0.01 percent of the species habitat on USFS System lands. In some years, these activities could exceed 5,000 acres, whereas in other years less than 5,000 acres will be treated. These activities still will remain a small percentage of whitebark pine habitat.

Other effects of these activities could include ground disturbance and weed spread by equipment. Invasive species may compete with whitebark pine or change ecological processes. USFS Regional direction on maximum allowable slope for operations and maximum allowable detrimental soil disturbance will be followed.

Regular monitoring will be beneficial to trees because, when detected, early signs of beetles may be treated or deterred to increase the chances of survival of trees. Monitoring can also detect increases in white pine blister rust infections or presence of other insects and diseases.

While we recognize that some adverse effects will occur due to damage or destruction to whitebark pine trees and seeds on a localized scale due to activities associated with selection and care of mature trees, we anticipate that these activities will maintain cone producing trees on the landscape longer resulting in an overall beneficial to the whitebark pine.

(9) Protect healthy, unsuppressed regenerating stands
This activity will be implemented where healthy, unsuppressed, and regenerating stands exist within the range of whitebark pine. We estimate that the total amount of fuel reduction treatments will be approximately 5,000 acres annually which is 0.01 percent of the species habitat on USFS System lands. In some years, these activities could exceed 5,000 acres, whereas in other years less than 5,000 acres will be treated.

Key activities implemented to protect existing stands includes controlling gophers, removing surface and ladder fuels, and insect control and prevention. Controlling gophers can reduce herbivory to whitebark pine seedlings and roots which may lead to tree mortality. Strychnine and trapping will be used to control gophers. Strychnine is a plant derived toxin that is not known to affect the vascular pathways of plants. Use of strychnine is one of several chemical means used by the USFS for pocket gopher control.

Removing surface and ladder vegetation in the immediate vicinity of, and adjacent to, healthy, unsuppressed, and regenerating stands of whitebark pine may moderate wildfire intensity, resulting in an increased probability that patches of unburned trees remain on the landscape (Keane 2018). In addition, reduction of non-whitebark pine trees provides more light, water, and nutrients to trees which may have benefits, but also may increase regeneration of competitors (Maher et al. 2018, p.541, Figure 4), creating a need for subsequent treatments in order to maintain those benefits. Adverse effects may include breaking of branches and trampling of seedlings around the root zone of mature trees. Adverse effects from wounding or breakage from mechanical treatments is the same as those described above in *(1) Cone Collection*. If reduction of competitors increases the growth rate of trees, in some stands adverse effects of ladder fuel removal may include increased susceptibility of whitebark pine trees to mountain pine beetle mortality and may increase drought-related stress or mortality (Waring and Six 2005, p. 114, Six et al. 2021, p. 3, Kichas et al. 2023), while in other stands it may decrease susceptibility to mountain pine beetle (Sturdevant, 2015). Removing surface fuels is likely to result in a long term (although not permanent) decrease in soil organic matter, which is a source of nutrients important for ectomycorrhizal symbionts and which increases retention of soil moisture. Research has not yet confirmed that removing surface and ladder fuels consistently has positive effects on whitebark pine, but Forest Service experience suggests that effects are frequently beneficial to target species.

We recognize that some adverse effects will occur due to damage and destruction to whitebark pine trees, cones, and seeds associated with activities protecting regenerating stands. However, we anticipate that these activities will reduce some mortality over time and result in overall beneficial effects to whitebark pine.

(10) Clone bank

Clone banks occur in managed administrative areas such as tree improvement areas in whitebark pine habitat. Clone banks are typically around 2 acres, and we expect an average of one new clone bank established annually. We anticipate that the effects of clone banks are the same as those in *(11) Seed and breeding orchards* except there are minimal effects in USFS Region 1 (12 acres) and no effects in USFS Region 6 to existing whitebark pine mature trees, seedlings, and seeds in suitable habitat. Beneficial effects include ensuring long-term persistence of clones of genetic resistant trees in case of stochastic or catastrophic events.

(11) Seed and breeding orchards

Development of seed and breeding orchards is based on well-established processes used with white pine blister rust resistance breeding (Mahalovich et.al. 2006; Sniezko and Liu 2022; Sniezko et al. 2007) and have already resulted in the establishment of four seed orchards and six breeding orchards in USFS Region 1 from 1.2 to 4 acres in size, with four more seed orchards currently being established in Region 6. Seedling families from more than 1,400 and more than 1,500 parent trees in USFS Regions 1 and 6, respectively, have already been evaluated for white pine blister rust resistance. Some areas of Region 6 have among the highest level of resistance documented (NASEM 2019) and, coupled with the low to moderate level of white pine blister rust in most areas of Region 6, suggests high rates of survival for this area. A number of trials (established since 2009 in Region 6) have been planted to confirm resistance (all include a susceptible control), but the trials have not reached a high level of infection. The size of a seeding and breeding orchards is typically less than 10 acres, and we expect an average annual development of new seed and breeding orchards at a rate of approximately one every 2 years, though this value may increase as formal recovery planning and implementation efforts get under way in accordance with section 4 of the ESA.

Site preparation, grafting, planting, and pollen application are anticipated to have the same effects as those described above in *(4) Operational seedling production* and *(6) Planting*. Orchard maintenance includes pruning with the same effects (wounds) as those in *(1) Cone Collection,* foliar and insect disease treatment with effects as those of *(4) Operational seedling production* and *(7) Insect control and prevention*, above, and gopher control with as those in *(9) Protect healthy, unsuppressed regenerating stands*. Orchard maintenance also includes fencing that may unintentionally adversely affect whitebark pine when fencing is installed where there are seeds in the seed bank or seedlings that are not detected. To minimize this effect, surveys will be conducted on selected sites prior to fence installation to detect and mark whitebark pine seedlings and mature trees for avoidance. Other activities to maintain seed and breeding orchards include irrigation and fertilization, staking and supporting trees with cones, collecting cones (similar effects as described in *(1) Cone collection*), and other orchard care practices.

Beneficial effects from seed and breeding orchards include production of additional resistant seed that will support the increase of seedling production and outplanting into suitable habitat.

While we recognize that some adverse effects will occur to whitebark pine trees during orchard operations, we anticipate that these activities will facilitate increased survival and result in an overall beneficial effect to the whitebark pine.

(12) Genetic evaluation plantations

Developing genetic evaluation plantations has documented success in evaluating white pine blister rust resistance in selected whitebark pine. Resistance breeding processes are based on well-established processes used with white pine blister rust resistance breeding (Mahalovich et al. 2006, Mahalovich 2010; Sniezko and Liu 2022; Sniezko et al. 2007). The typical size of a genetic evaluation plantation is approximately 20 acres, and we expect an average annual development of new genetic evaluation plantations at a rate of approximately two every 5 years in USFS Region 1 and one every 2 years in Region 6, though this value may increase now that the species is listed under the ESA. Two genetic evaluation plantations (replicates), each 20 acres in size, are established after the completion of each screening.

Effects from site preparation (hand, mechanical, or prescribed fire); planting; grafting; pruning; pesticide application; mowing; rodent control; and fencing are described above under *(6) Planting* and *(11) Seed and breeding orchards*. During installation of genetic evaluation plantations, maintenance and operation of associated weather stations may result in soil disturbance, which may result in adverse effects to seeds. Seedlings may be trampled inadvertently. Since the weather stations encompass very small areas (~ 12 square yards) the scale of adverse impacts is expected to be minimal.

Maintenance and monitoring activities are expected to have similar effects to those described in *(11) Seed and breeding orchards*, above, with the following exceptions. USFS Region 1 monitoring and data acquisition schedules include completion of one annual monitoring survey (quick check), and data acquisition in the first, third, fifth and seventh years, then beginning in the tenth year, at five-year intervals, following western white pine selective breeding guidelines (Mahalovich 2010). *Ad hoc* contingency measurements may occur when an abiotic or biotic agent reaches ≥ 50% incidence. Future scion and pollen collection may occur if genetic analyses indicate augmentation of existing seed and breeding orchards. Benefits from weather stations include better understanding of response of whitebark pine to climatic conditions, and benefits of monitoring are improved documentation of which individuals continue to exhibit resistance to white pine blister rust over time to inform management decisions and allow for better selection during screening processes.

While it is likely that some adverse effects will occur due to damage or destruction of some whitebark pine trees during genetic plantation activities, we anticipate that these activities will facilitate improved production in the future and will result in an overall beneficial effect to whitebark pine.

(13) Develop seed production areas (SPAs)
Development of SPAs aims for a 30 by 30 foot spacing of cone-bearing trees, leading to approximately 50 cone-bearing trees per acre. At the time of collection, a minimum stand size of 11 acres is required to satisfy cone collections from 20 selected trees spaced a minimum of 200 feet apart. Minimum size per SPA is 11 acres and maximum size is 100 acres. These are generally needed in breeding zones not represented by seed orchards (e.g., the Nevada zone), and several SPAs are anticipated to be needed for some SSA analysis units. The amount of acreage needed for SPAs is a very small percent of the total occupied range of whitebark pine. We expect the development of one new SPA between 11 and 100 acres per year, though this number may be higher initially after the species' listing and may halt in expansion once every breeding zone or SSA analysis unit maintains sufficient SPAs.

To develop these SPAs, the sites must be prepared; the reduction of vegetation in the immediate vicinity via hand or mechanical means reduces the risk of being consumed or carrying wildfire. In addition, reduced competition provides more light, water, and nutrients to the tree, reduces fire hazard, and can increase cone production. Other SPA development activities include pruning and cone collection. Adverse effects may include breaking of branches and trampling of seedlings around the root zone of mature trees, leading to adverse effects as described in *(1) Cone Collection*.

Further, SPAs require removal of competing vegetation, and effects are as those described above under *(8) Selection and care of mature trees with white pine blister rust resistance*. Site preparation also includes removal of large numbers of unhealthy, undesirable whitebark pine phenotypes (trees exhibiting poor growth, presence of insect and disease problems) from the SPA with hand or mechanical methods, an adverse effect to the species. Benefits from removing these inferior trees include ensuring genetic diversity within the pollen cloud in the immediate vicinity in order to produce superior seed and subsequent seed collected for a bulked lot (USFS 2022, Chapter 300). Adverse effects include potential for trampling seedlings and seed bed and direct mortality of target whitebark pine trees.

Effects from pruning are discussed under *(8) Selection and care of mature trees with white pine blister rust resistance* and effects of cone collection are the same as those discussed under *(1) Cone collection*. Beneficial effects from establishing SPAs are increased resistant seed availability for growing seedlings and outplanting into suitable habitat.

While we recognize that some adverse effects will occur due to damage and destruction of some whitebark pine trees during SPA activities, we anticipate that these activities will result in overall beneficial effects to whitebark pine over time.

(14) Surveys

Surveys benefit whitebark pine as they 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 from surveys 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 trees involves nailing a tag to a tree or marking with paint. Effects from these activities are described under *(1) Cone Collection*, and *(8) Selection and care of mature trees with white pine blister rust resistance*. Beneficial effects include increased understanding of extent and condition of whitebark pine individuals and stands, increase 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 during survey efforts, we anticipate that surveys will provide critical information needed for conservation efforts and will result in overall benefits to whitebark pine in the future.

(15) Research, monitoring, and education

Research is described broadly as encompassing any research that takes place to further the understanding of whitebark pine, its habitat, and associated taxa. Effects from research could include any of the effects from descriptions provided above on all activities and could include additional effects to soil and whitebark pine habitat from increased human presence. Research currently focuses on growing and testing seedlings (effects as described in *(4) Operational seedling production*); collecting samples (e.g., seeds, seedlings, tree cores, fire scars, vegetation, insects, pathogens, bark, soil, and other components of whitebark pine and its habitat), with effects anticipated to be to the same as those under *(1) Cone collection*; manipulating vegetation and silvicultural treatments to determine treatment effectiveness (e.g., thinning, fire), with effects anticipated to be to the same as many of those described above. The evaluation of past, present, and future silviculture treatments may result in increased visits to field sites leading to potential damage to, and crushing of, whitebark pine individuals and soil compaction in those areas.

Research may also include monitoring of bird, mammal, and insect populations. Effects of these activities on whitebark pine may include possible interference and disruption of behavior resulting in loss of seed dispersal and caching, changes in herbivory and mutualisms, damage to mature trees, and trampling of seedlings, soils, and seeds. Researching the main threats to whitebark pine (i.e., altered fire regimes, white pine blister rust, climate change, and mountain pine beetle) will improve our understanding of these threats, enabling biologists and managers to better address them.

Monitoring whitebark pine long-term plots involves establishment and measurement within these plots. Effects may occur during monitoring when seeds, seedlings, and soil may be trampled in the same area on a regular interval. In addition, small twigs may be broken, or a small number of needles may be dislodged from trees during measurements. Nails may be used in the cambium and sapwood to tag trees which may cause wounding. Effects from tagging (wounds) are discussed under *(1) Cone Collection, (8) Selection and care of mature trees with white pine blister rust resistance*. Meteorological equipment installation within these monitoring areas has similar effects to those described above *in (5) Genetic evaluation plantations*.

Education can take the form of collection and storage of whitebark pine plant material for vouchers, training, display, and research. Collection of whitebark pine plant materials may affect whitebark pine by removing needles, roots, stems, twigs, cores, boles, insects and pathogens, mycorrhizae, litter and any other parts of the tree, and has similar effects to those described above in the previous sections.

Although it is challenging to describe all the effects from possible research on whitebark pine, research that is conducted to better understand, manage, and restore the species and its habitat is considered beneficial. Beneficial effects include gaining information and knowledge on the processes, components, and ecology of whitebark pine to support recovery efforts across the range of the species.

While we recognize that some adverse effects will occur due to damage to whitebark pine trees, cones, and seeds during research activities, we anticipate that research activities will facilitate conservation and recovery and thus result in overall beneficial effects to the whitebark pine.

6.2 Summary of the effects of the action

In summary, the USFS is proposing a variety of conservation actions that fall within 15 broad categories covered programmatically through this consultation. Although the activities in the USFS's PBA are described as beneficial to whitebark pine across the broader landscape, they are also likely to result in adverse effects to individuals on a localized scale. Types of adverse effects to the species from these activities include trampling, removal of needles, twigs, branches, bark, wounding, and mortality of all size and age classes. For habitat-level effects in establishing production areas, plantations, orchards, and protecting existing whitebark pine regeneration and mature trees, we expect effects to a total of approximately 15,000 acres per year across the range. These adverse effects are limited in scope and scale, affecting less than 0.05 percent of whitebark pine habitat annually (USFS 2023a p. 35). See Table 1 below for an estimated annual average effect resulting from each of the activity types included in this PBO.

Table 1. Anticipated annual average effects of this Project by activity number. Some years may have greater or fewer values than the estimate of effects provided here. It is anticipated that some of these numbers may increase with focused efforts on restoration and recovery of whitebark pine.

Activity #	**Project activity**	**Anticipated Annual Average by Activity Type**	**Unit**
1	Cone collection	400	mature trees
2	Scion collection	140	mature trees
3	Pollen collection	25	mature trees
4	Operational seedling production	370,000	trees
5	Genetic white pine blister rust screening	32,000	trees
	Total trees	**402,565**	**trees**
6	Mechanical and Rx fire site prep for planting Planting	5,000 200,000	Acres trees
8	Selection and care of mature trees with white pine blister rust resistance	5,000	acres
9	Protect healthy, unsuppressed regeneration	5,000	acres
10	Clone bank	2	acres
11 & 12	Genetic evaluation plantations and Seed and breeding orchards	1,000	acres
13	Develop seed production areas	11-100	acres
	Total acres	**16,102**	**acres**
7	Insect control and prevention	as needed	
14	Surveys	as needed	
15	Research, monitoring, and education	as needed	

Beneficial effects are anticipated as a result of the implementation of these activities, including increasing the number of genetically resistant trees in the population and ex-situ genetic conservation of whitebark pine. Monitoring and research activities will result in new information that likely will aid in the recovery planning and implementation of whitebark pine.

7 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.

Activities currently occurring on State, Tribal, local, and private land as described in the SSA are reasonably certain to continue. The SSA finds that “12 percent of the range is under non-Federal ownership, on State, private, and Tribal lands” (USFWS 2021). Many non-federal partners and entities listed are also engaged in recovery and restoration activities in whitebark pine habitat as described in Table 1 of the BA (USFS 2023a). Such activities occur on State, private and Tribal lands throughout the range of whitebark pine and include the following: recreation (including ski areas, snowmobiling, camping, hiking, horseback riding); livestock grazing and management; industrial areas (towers, energy transmission and service ROWs, etc.), residential and commercial development (cabins, resorts, etc.); silviculture (logging, firewood, tree planting, etc.); energy development and mining; transportation such as roads for hunting, plant and food collection, ecological restoration, wildfires and fire suppression; and invasive species control.

These activities occurring in whitebark pine habitat under non-federal ownership are described and analyzed in the SSA (USFWS 2021). Effects from these activities include mortality of trees, collection and loss of seed and loss of suitable habitat that can support whitebark pine. Whitebark pine can recover from some of these activities such as silviculture and plant and food collection, whereas other activities such as residential and commercial development and installation of industrial areas may alter whitebark pine habitat to the point where it cannot recover or support trees. Since 12 percent of whitebark pine range is on non-federal lands, and not all this area has resulted in loss of suitable habitat likely many of these areas still support whitebark pine stands.

8 Conclusion

The continued existence of a listed species depends upon the fate of the populations that comprise them, and the continued existence of a population is determined by the fate of individuals that comprise the population. 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 Service's opinion that the proposed action will not reduce appreciably 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. No critical habitat has been proposed for whitebark pine; therefore, none will be affected.

In this PBO, we have described the status of the whitebark pine at the range-wide scale as well as the anticipated annual effect of the proposed activities being conducted. We have also described the environmental baseline conditions at the scale of the range of the species, which is the action area, and summarized the effects of the action. The Service has reached this conclusion by considering the following:

1. The activities included in this PBO do not exacerbate the primary stressors affecting the species, and tier to the restoration and recovery actions outlined by the Service.
2. The USFS and Service will meet at least annually to review proposed activities that will fall within this programmatic consultation and to review results of the previous year's

activities, providing a source of oversight and opportunity for consistent understanding of the application of this consultation.

3. The primary stressors to whitebark pine range-wide 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 change. The Project includes actions intended to increase whitebark pine resistance and resiliency to the primary stressors.
4. The Project will 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 USFS is committed to minimizing impacts to individual whitebark pine through Project design features.
6. While the Project is range-wide in scope, individual actions consistent with this consultation will be small in nature relative to the distribution of the species. Approximately 565 mature trees will have material collected from them per year, and 10,000 seedlings will be screened for white pine blister rust resistance per year. Operational seedling production, clone banks, genetic evaluation plantations, and SPAs will total about 300 acres per year, while planting and protecting both regeneration and mature whitebark pine trees will result in about 5,000 acres of effects each per year. In some years, these activities could exceed 5,000 acres each, whereas in other years less than 5,000 acres for each of those activities will be treated.
7. Whitebark pine are found on approximately 56,000,000 acres within the western United States (USFWS 2021), over half of which has been impacted by major stressors. The USFS manages approximately 42,975,221 acres. Based on the estimated annual implementation of the Project activities, the annual effects of these conservation activities are expected on less than 0.01 percent of whitebark pine habitat across the entire species' range.

9 Incidental Take Statement

Section 9 of the ESA and federal regulation pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct. Harm in the definition of "take" in the ESA means an act which actually kills or injures wildlife. Such act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass in the definition of "take" in the ESA means an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity (50 CFR 17.3). Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

Sections 7(b)(4) and 7(o)(2) of the ESA generally do not apply to listed plant species. However, the section 4(d) rule for 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 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 Service or state conservation agency that is operating a conservation program pursuant to the terms of a cooperative agreement with the Service 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). Therefore, no incidental take is included as part of this PBO.

10 Reporting

As proposed in the Forest Service's BA (USFS 2023a) and briefly described in section *3.3 Project Implementation* above, reporting will occur on an annual basis. The USFS will provide a report of all completed activities (following Table 2 in USFS 2023a) summarized by fiscal year by January 30 of the following year. This activity report will then be presented at an interagency meeting with the Service. A subset of the project consistency forms will be reviewed. This meeting will also provide opportunity to discuss updates to the baseline as well as effectiveness and updates of the conservation measures.

In addition to responding to the programmatic nature of this consultation, the USFS will use current tracking and reporting corporate databases for compiling accomplishments on USFS lands. The two main corporate reporting systems are: (1) the Forest Service Activity Tracking System (FACTS) which manages information about activities related to fire/fuels, silviculture, Trust Funds, range vegetation improvement, and invasive species used by all levels of the USFS; and (2) the Grow Hub (beta) replaced NMIS, which tracks seed collection and storage, sowing of seed, culturing of seedlings to specific size criteria, seedling inventory, seedling lifting, grading and culling, packing of seedlings for storage, and shipment and distribution of seedlings to Forests and Districts for planting. The USFS will use these databases to report the amount of each activity conducted annually (Table 2 of the BA, USFS 2023a) except where noted (e.g., genetics reports are hand compiled from internal record keeping).

11 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 on listed species or critical habitat, to help implement recovery plans, or to develop information. The recommendations provided here do not necessarily represent complete fulfillment of the agency's section 7(a)(1) responsibility for the species:

1. Continue to identify, test, and protect both active and potential plus trees (whitebark pine that are or believed to be phenotypically resistant 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. Some whitebark pine trees are phenotypically resistant to white pine blister rust, providing viable seeds sources for natural regeneration or cone collection for site rehabilitation.
2. 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. Prioritize areas affected by white pine blister rust, mountain pine beetle, wildfire, climate change, and natural disasters (*e.g.*, large, burned areas).
3. 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 change effects, 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.
4. 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.
5. When designing and implementing this Project, avoid impacts that reduce reproduction or recruitment of whitebark pine into populations.
6. When designing and implementing this Project, consider, evaluate, and carry out opportunities to mitigate and offset the effects of global and climate change.
7. Prior to Project implementation, inventory whitebark pine stands and monitor populations of Clark's nutcracker, providing the Service with signs of caching or other indications of Clark's nutcracker presence in the Project area.
8. 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 science is used.
9. Seek new public educational opportunities concerning whitebark pine restoration and protection.

10. 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.
11. Plant white pine blister rust resistant whitebark pine seedlings to increase numbers of resistant trees on the landscape, and in severely burned areas where natural regeneration is likely to be low.

For the Service to be informed of actions minimizing or avoiding adverse effects or that benefit listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

12 Reinitiation Notice

This concludes consultation on the effects of the USDA Forest Service Rangewide Conservation Activities Supporting Whitebark Pine Recovery on whitebark pine. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been maintained (or is authorized by law) and: (1) the amount or extent of incidental take is exceeded; (2) if new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (3) if the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion; or (4) if a new species is listed or critical habitat designated that may be affected by the action.

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