Olympic National Park
Washington

US Department of the Interior
National Park Service

Final Mountain Goat Management Plan / Environmental Impact Statement

April 2018

UNITED STATES DEPARTMENT OF THE INTERIOR – NATIONAL PARK SERVICE

MOUNTAIN GOAT MANAGEMENT PLAN / ENVIRONMENTAL IMPACT STATEMENT

Lead Agency: National Park Service, US Department of the Interior
Cooperating Agencies: USDA Forest Service, Washington Department of Fish & Wildlife

This *Mountain Goat Management Plan / Environmental Impact Statement* (plan/EIS) for Olympic National Park (the park) evaluates the impacts of a range of alternatives for managing exotic mountain goats on the Olympic Peninsula in a manner that reduces impacts on park resources while reducing potential public safety issues associated with the presence of mountain goats. Upon conclusion of the plan/EIS and decision-making process, the alternative selected for implementation will become the mountain goat management plan, which will specifically address the issue of mountain goats within the park and in areas of the adjacent Olympic National Forest. The National Park Service (NPS) (at Olympic National Park) worked in cooperation with the Washington Department of Fish & Wildlife (WDFW), and the United States Department of Agriculture (USDA) Forest Service (Olympic, Mt. Baker-Snoqualmie, and Okanogan-Wenatchee National Forests) to prepare this plan/EIS.

This plan/EIS evaluates the impacts of the no-action alternative (alternative A) and three action alternatives (alternatives B, C, and D). Alternative A would involve full implementation of the 2011 *Mountain Goat Action Plan* including management of individual mountain goats in visitor use areas according to a continuum of mountain goat-human interactions. Specific management could range from hazing to lethal removal of hazardous mountain goats. Alternative B would focus exclusively on the capture of mountain goats within the park and on adjacent Olympic National Forest lands followed by transfer to the WDFW and release on National Forest System (NFS) lands at Mt. Baker-Snoqualmie and Okanogan-Wenatchee National Forests (North Cascades national forests). Translocation would be conducted at the discretion of WDFW to NFS lands in the North Cascades where mountain goats are native and supplementation of the existing population would further mountain goat conservation efforts (e.g., improve genetic diversity and enhance demographic vigor to depleted populations). Alternative C would use lethal removal to significantly reduce or eliminate mountain goats from the park and adjacent Olympic National Forest lands. Alternative D (preferred alternative) would use a combination of capture and translocation and lethal removal to reduce or eliminate mountain goats from the park and adjacent Olympic National Forest lands. Capture and translocation would take place wherever safe and feasible. Once a point of diminishing returns for capture operations is reached, management would continue using lethal removal activities. This plan/EIS analyzes impacts of these alternatives in detail for both the Olympic Peninsula area and NFS lands within the two national forest units located in the North Cascades Mountains that could receive mountain goats.

The notice of availability for the draft plan/EIS was published in the *Federal Register* and online at the NPS Planning, Environment, and Public Comment (PEPC) website at http://parkplanning.nps.gov/olymgoat on July 24, 2017. The public comment period for the draft plan/EIS was open from July 24, 2017, to October 10, 2017. A summary of and responses to public and agency comments received on the draft plan/EIS are provided in appendix J of this final plan/EIS. Where needed, text was changed in this plan/EIS to address comments. The publication of the US Environmental Protection Agency notice of availability of this final plan/EIS in the *Federal Register* will initiate a 30-day wait period before the Regional Director of the Pacific West Region will sign the Record of Decision (ROD), documenting the selection of an alternative to be implemented. After the NPS publishes a notice in the *Federal Register* announcing the availability of the signed ROD, implementation of the alternative selected in the ROD can begin. The USDA Forest Service, as a cooperating agency, will adopt the final EIS and sign their own ROD which will cover actions in the National Forests that must be authorized by the USDA Forest Service prior to implementation.

For further information, visit http://parkplanning.nps.gov/olymgoat or contact:

Olympic National Park
Mountain Goat Management Plan/EIS
600 East Park Avenue
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Decision-Making Process

In the event that an alternative is selected that involves removing goats (either via live capture or lethal means) from Olympic National Forest and/or translocating mountain goats to North Cascades national forests, the USDA Forest

Service would have to authorize these actions on NFS lands, which could include issuing temporary closures around staging areas, capture sites, and lethal removal areas as needed, per 36 CFR 261 Subpart B, "Prohibitions in Areas Designated by Order." Therefore, the responsible officials for the USDA Forest Service will decide through their own records of decision whether to authorize the following actions on their respective forests:

- The responsible official for the Olympic National Forest will decide whether to authorize the NPS to use helicopters to remove mountain goats from wilderness areas in the Olympic National Forest and transport them to staging areas; and whether to authorize temporary closures associated with the NPS capture operations, and at staging areas used by the WDFW.
- The responsible officials for the Mt. Baker-Snoqualmie and Okanogan-Wenatchee National Forests will decide whether to authorize the WDFW to establish temporary closures for staging and release sites and to release mountain goats with helicopters in the wilderness areas on their respective forests.

USDA Forest Service Objection Process

Actions proposed on NFS lands under this plan/EIS constitute activities that implement land management plans for the USDA Forest Service and are subject to the agency's pre-decisional objection process at 36 CFR 218 Subparts A and B. The objection process occurs prior to the USDA Forest Service making a final decision (signing a ROD) and will include circulation of the final EIS and the USDA Forest Service's draft decision document (ROD). Legal notices to initiate the objection period will be published in the newspapers of record for the three national forests following publication of the Notice of Availability of the final EIS. Detailed instructions for how to file an objection will be provided in the USDA Forest Service's draft ROD and legal notice.

The opportunity to provide comments to establish eligibility to object under 36 CFR 218 ended when the public comment period on the draft plan/EIS ended on October 10, 2017. Only those individuals who submitted timely and specific written comments (36 CFR 218.2) regarding the *Mountain Goat Management Plan / Environmental Impact Statement* during the public comment periods are eligible to file an objection (36 CFR 218.24(b)(6)). For issues to be raised in objections, they must be based on previously submitted, specific, written comments regarding the proposed project or activity and must be attributed to the objector. For objection eligibility, each individual or representative from each entity submitting timely and specific written comments regarding the proposed project or activity must either sign the comments or verify identity upon request (36 CFR 218.24(b)(8)).

National Park Service
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MOUNTAIN GOAT MANAGEMENT PLAN / ENVIRONMENTAL IMPACT STATEMENT

APRIL 2018

EXECUTIVE SUMMARY

This *Mountain Goat Management Plan / Environmental Impact Statement* (plan/EIS) analyzes the impacts that could result from a continuation of current management of an exotic mountain goat population on the Olympic Peninsula (the no-action alternative) by the National Park Service (NPS) and United States Department of Agriculture (USDA) Forest Service, as well as the impacts that could result from three action alternatives. The plan/EIS describes the reasons the NPS is taking action at this time and evaluates a range of alternatives for the management of exotic mountain goats on the Olympic Peninsula, as well as the associated actions proposed by the Washington Department of Fish & Wildlife (WDFW) to translocate mountain goats to National Forest System (NFS) lands in the North Cascade Mountains should an alternative involving translocation be implemented. Two separate project areas are being evaluated in this plan/EIS: (1) areas of Olympic National Park and Olympic National Forest, where exotic mountain goats could be reduced, which comprise the area referred to as the Olympic Peninsula; and (2) areas in the Mt. Baker-Snoqualmie National Forest and Okanogan-Wenatchee National Forest where mountain goats could be translocated, which comprise the area referred to as the North Cascades national forests.

PURPOSE OF TAKING ACTION

The purpose in taking action is to allow the NPS to reduce or eliminate impacts on park resources from exotic mountain goats, while reducing potential public safety issues associated with the presence of mountain goats in the park.

NEED FOR ACTION

Mountain goats are not native to the Olympic Peninsula. They were introduced to the Olympic Mountains prior to the establishment of the national park, and have since colonized the entire range, with the majority of the population residing within the park (Noss et al. 2000). The original need to manage this exotic species was an ecological concern related to the impacts that mountain goats impose on natural resources at the park, particularly sensitive vegetation communities (NPS 1995; Houston, Schreiner, and Moorhead 1994). Safety concerns were increased in 2010 when a visitor was fatally gored by a mountain goat while hiking on a park trail. Mountain goats have a high affinity for salts and natural sources of salt occur within their native range. There are no natural sources of salt in the Olympic Mountains, and mountain goats have learned to seek salts from humans. In areas with high levels of visitor use within the park and national forest, mountain goats have become conditioned to the extent that they are a nuisance and may be hazardous to visitors. The Olympic National Park *Mountain Goat Action Plan*, included as appendix A, addresses mountain goat behavior and seeks to minimize the potential for hazardous mountain goat-human encounters. This action plan focuses on the management of individual mountain goats that have been identified as potentially hazardous (appendix A). Additional planning and compliance is needed to address overall management of the mountain goat population on the Olympic Peninsula.

There is also a need to remove mountain goats from adjacent lands in the Olympic National Forest because mountain goats in these areas are part of a population that moves between the Olympic National Forest and Olympic National Park. As in the national park, mountain goats cause soil erosion, impact native plant communities, and occupy habitat for native species in the national forest. As a result of these concerns, a plan/EIS is needed to address the impacts of exotic mountain goats in the park and in the adjacent Olympic National Forest, which would include the interference with natural processes, native species, natural habitats, and impacts on visitor use and safety.

OBJECTIVES IN TAKING ACTION

Objectives are "more specific statements of purpose that provide additional bases for comparing the effectiveness of alternatives in achieving the desired outcomes of the action" and represent a refinement of the purpose of this plan/EIS. All alternatives selected for detailed analysis must meet all objectives to a large degree and resolve the purpose of and need for action. The following objectives relate to the management of mountain goats on the Olympic Peninsula:

- Develop a scientifically based method for the management of exotic mountain goat populations in an extensive mountainous wilderness area.
- Reduce or eliminate impacts on sensitive environments and unique natural resources from mountain goats in the park and in Olympic National Forest.
- Reduce or eliminate the potential for visitor safety issues associated with mountain goats in the park.
- Further public understanding of the Olympic high elevation ecosystems and native species and the ecology and conservation of mountain goats in their native range.
- Protect the International Biosphere Reserve and World Heritage Site designations of Olympic National Park and preserve the integrity of these designations.
- Protect the wilderness character of designated park wilderness and wilderness in Olympic National Forest.
- Work cooperatively with co-managers of mountain goats or habitats in Washington State (USDA Forest Service, WDFW, and tribes).
- Support the wildlife management objectives of cooperating agencies and tribes, to the extent practicable, with respect to mountain goats.
- Provide opportunities to reestablish or augment sustainable native mountain goat populations in suitable mountain goat habitat on NFS lands in the North Cascades national forests.

ISSUES RELATING TO THE PROJECT

Issues associated with mountain goats on the Olympic Peninsula are primarily related to visitor safety and the unique vegetation of the Olympic Mountains. Because many of the areas inhabited by mountain goats are popular destinations for park and national forest visitors, both in the frontcountry (e.g., Hurricane Ridge) and backcountry (e.g., Glacier Meadows), there is high potential for mountain goat-human interactions. Most notable are areas where mountain goats are habituated to human presence and have become conditioned to seeking salts and other minerals from humans. Mountain goats can be a nuisance along trails and around wilderness campsites where they persistently seek salt and minerals from human urine, packs, and sweat on clothing. They often paw and dig areas on the ground where hikers have urinated or disposed of cooking wastewater. The nature of mountain goat-human interactions can vary widely, such as humans observing mountain goats from several hundred meters away across a ridge, mountain goats approaching visitors, hazing events and hazardous interactions such as the October 2010 fatality.

Through herbivory and wallowing behaviors, mountain goats have directly and indirectly affected the vegetation in the Olympic Mountains. Changes in the relative abundance of plant species have been observed as a result of mountain goat herbivory; this has altered competitive interactions among plant species. Wallowing by mountain goats has impacted plant species as a result of soil disturbance and

subsequent creation of mineral substrates for colonization by disturbance-oriented plant species. As the mountain goat population on the Olympic Peninsula increased prior to live capture operations in the 1980s, changes in vegetation were substantial, and the status of rare plant populations became a concern.

ISSUES AND IMPACT TOPICS

The issues described above form the basis for identifying impact topics that can be used to organize the analysis of effects of mountain goats and the management actions being considered. Table ES-1 details the impact topics that are discussed and analyzed in the plan/EIS.

TABLE ES-1. SUMMARY OF IMPACT TOPICS

Impact Topic	Reason for Analysis
Mountain Goats	On the Olympic Peninsula, any proposed management of mountain goats in this plan/EIS would have direct impacts on mountain goats. For the North Cascades national forests, impacts on mountain goats are analyzed as part of the wildlife topic. Any proposed management activities would have only beneficial impacts on mountain goats.
Wilderness Character	The congressionally designated Daniel J. Evans Wilderness was established in 1988 and comprises about 95% of the park. Adjacent to the park on Olympic National Forest are five wilderness areas. The NPS and USDA Forest Service are responsible for preserving wilderness character. Wilderness character is “a holistic concept based on the interaction of (1) biophysical environments primarily free from modern human manipulation and impact, (2) personal experiences in natural environments relatively free from the encumbrances and signs of modern society, and (3) symbolic meanings of humility, restraint, and interdependence that inspire human connection with nature” (Landres et al. 2015). On the Olympic Peninsula, the presence of exotic mountain goats in wilderness, and their impacts on native species from grazing and wallowing results in adverse impacts on the natural quality of designated wilderness in Olympic National Park and Olympic National Forest. Additionally, any proposed management activities, such as the use of aircraft and firearms to remove mountain goats, could result in impacts on the untrammeled, undeveloped, and opportunities for solitude or primitive and unconfined recreational qualities of wilderness character. For the North Cascades national forests, impacts on wilderness character are also analyzed because proposed management activities, in particular the use of aircraft to translocate mountain goats, could impact the untrammeled and undeveloped qualities of wilderness character.
Wildlife and Wildlife Habitat, Including Special-Status Species	The Olympic Peninsula is home to a variety of native fish, birds, and other wildlife throughout its diverse habitats, including several endemic species due to its isolated biogeographic history. Similarly, the North Cascades national forests are home to an abundant and diverse assemblage of native fauna. On the Olympic Peninsula, mountain goats represent a source of competition that impacts certain native wildlife species and their habitat. Wildlife could be impacted by mountain goat management activities including hazing, aversive conditioning, capture, and lethal removal actions, the use of staging areas and associated site preparation, and aircraft or vehicular traffic. For the North Cascades national forests, impacts on wildlife are also analyzed because proposed management activities to translocate mountain goats would have the potential to impact wildlife, including sensitive and management indicator species.

Impact Topic	Reason for Analysis
Vegetation, Including Special-Status Plant Species	Mountain goats occupy high-elevation alpine and subalpine vegetation communities at or above treeline. The summer range of mountain goats is composed primarily of subalpine meadows, fragile alpine herbaceous communities, and sparsely vegetated scree and rock slopes. Mountain goats damage vegetation and destabilize soils through herbivory, trampling, and wallowing behaviors. On the Olympic Peninsula, the removal of mountain goats would reduce adverse impacts on native vegetation. For the North Cascades national forests, impacts on vegetation are also analyzed because translocation activities could result in the removal of vegetation at staging areas and the disturbance of vegetation at mountain goat release sites.
Threatened or Endangered Species	Several species that are federally listed under the *Endangered Species Act* (ESA), or their designated critical habitat, could be impacted by proposed mountain goat management activities, such as the use of aircraft or firearms. On the Olympic Peninsula, two species that could be impacted are the northern spotted owl and marbled murrelet, both listed as threatened. For the North Cascades national forests, impacts on threatened or endangered species are also analyzed because proposed management activities associated with staging areas and release sites, such as the use of aircraft, could impact six threatened or endangered species. These species includes the northern spotted owl (threatened), marbled murrelet (threatened), grizzly bear (threatened), Canada lynx (threatened), gray wolf (endangered), and wolverine (candidate).
Acoustic Environment	The natural soundscape in the Olympic Mountains is a special resource to park and national forest visitors. The park is one of the best examples of a natural soundscape found anywhere in the national park system and includes natural sounds that are part of the biological or physical resources of the park. On the Olympic Peninsula, any proposed mountain goat management activities, specifically the use of aircraft and firearms, would result in noise that could in turn impact visitors, wildlife, and wilderness character within the park and national forest. For the North Cascades national forests, although the proposed translocation of mountain goats would have similar impacts on the acoustic environment, those impacts are addressed within the context of the analysis of impacts on wildlife, wilderness character, and visitor use and experience.
Soils	Mountain goats cause soil disturbance and erosion by wallowing, trailing, and trampling. On the Olympic Peninsula, alpine and subalpine soils tend to be shallow, poorly developed, and fragile, making them sensitive to disturbance. Any proposed management that would reduce or eliminate mountain goats from areas with sensitive soils would result in beneficial impacts on soils. For the North Cascades national forests, impacts on soils are not analyzed because the translocation of mountain goats to their native range will not contribute adverse impacts on soils.
Archeological Resources	Mountain goat wallowing behavior has the potential to degrade or destroy archeological resources in the park and in national forests. On the Olympic Peninsula, only about one percent of the park has been systematically inventoried for archeological resources, although results from this work indicate that there are thousands of archeological sites within the project area. Mountain goat wallowing has had an adverse effect on both documented and undocumented archeological resources in the Olympic Mountains. For the North Cascades national forests, impacts on archeological resources are not analyzed because there are no known cultural, historic, or archeological resources within the project area that would be disturbed as a result of actions related to mountain goat restoration.

Impact Topic	Reason for Analysis
Visitor Use and Experience	Potential activities associated with the management of mountain goats, specifically the use of aircraft and firearms, would generate intermittent loud noises that could disrupt visitor activities and enjoyment of natural soundscapes. Proposed management activities could result in the temporary closure of areas. On the Olympic Peninsula, visitors to the park and adjacent national forest have indicated that the presence of habituated mountain goats deters them from hiking on trails, while other visitors have indicated that the presence of mountain goats in the Olympic Mountains enhances the visitor experience. The reduction or elimination of mountain goats could reduce recreational mountain goat hunting opportunities in the national forest. For the North Cascades national forests, impacts on visitor use and experience are also analyzed because future visitors would observe mountain goats more frequently and hunting opportunity would be increased due to increased mountain goat populations.
Visitor and Employee Safety	The presence of mountain goats in the park and in the national forest can present threats to visitor and employee safety. On the Olympic Peninsula, many of the areas that mountain goats inhabit are hiking and camping destinations for visitors and thus, there is potential for mountain goat-human interactions. There have been attacks by mountain goats, although attacks are rare. Interactions between mountain goats and humans can range from neutral, to nuisance, to hazardous. For the North Cascades national forests, impacts on visitor and employee safety are also analyzed because translocated mountain goats would inhabit areas that are also popular destinations for national forest visitors, thus increasing the potential for interactions between mountain goats and humans.

ALTERNATIVES CONSIDERED

The alternatives considered include a required "no-action" alternative and three action alternatives that were developed by the interagency planning team, which included federal and state agencies, and through feedback received during the public scoping and draft plan/EIS public review processes. The three action alternatives analyzed in this plan/EIS meet, to a large degree, the management objectives and address the purpose of and need for action. The alternatives are briefly described below.

Alternative A: No Action

Under the no-action alternative, options for the management of mountain goats on the Olympic Peninsula would be limited to those actions outlined in the park's *Mountain Goat Action Plan* (appendix A), which are focused on preventing unacceptable mountain goat behavior. Management would be set up according to a continuum of mountain goat-human interactions and the appropriate park response to each. Common management activities under alternative A would include foot patrols, evaluation of mountain goat-human interactions, possible area closures, and use of nuisance animal control tools, including hazing and up to lethal removal. The frequency of management activities under alternative A would vary depending on the level of mountain goat-human interaction observed at a given time. The long-term duration of management activities would continue indefinitely, and may increase in frequency and intensity, because the mountain goat population within the park and national forest would continue to increase.

Elements Common to All Action Alternatives (Alternatives B, C, and D)

The action alternatives described below (alternatives B, C, and D) include several management elements that would be used to reach the goal of substantially reducing or eliminating mountain goats on the

Olympic Peninsula. Some elements are common to all three action alternatives and include the use of helicopters for access and transporting mountain goats, area closures for safety, and various interpretive tools to provide information and education to the public under an enhanced public outreach program. These are described in more detail below.

Interpretive Tools. Under all action alternatives, park and national forest staff would provide information and educational opportunities to the public through interpretive programs and visitor interactions regarding the management of mountain goats on the Olympic Peninsula. Public outreach would be enhanced to increase the public's awareness of the current mountain goat situation, and detailed information would be provided regarding impending mountain goat management activities or areas of potential closures in the park and national forest.

Helicopters. Under all action alternatives, helicopter operations would take place during two separate 2-week management periods in a given year: once in mid- to late July, and the second in late August to mid-September. Helicopters would be used for both capture and translocation, and lethal removal, operating up to a maximum of 12 days during each period, and a maximum of 8 hours per day. Flight paths would be determined by weather (clouds and winds), but in general, helicopters would take the most efficient routes between staging areas and mountain goat habitat.

Area Closures. Under all action alternatives, there would potentially be temporary area closures within both the park and national forest during management activities, which include capture and translocation and lethal removal operations. In general, trails and campgrounds would remain open to the public in both backcountry and frontcountry areas as long as management personnel determine it is safe to do so. As applicable for each alternative, closures would include areas near ongoing management activities and immediately surrounding staging areas. There would be no parkwide or forest-wide closures, and no area closures would be permanent. The NPS would coordinate a schedule of area closures six months in advance, or as soon as is feasible, to minimize any impacts on visitor use by management activities.

Staging Areas. Under all action alternatives, staging areas would be required for mobilization of staff and equipment during management activities. The use of helicopters to access remote areas of the park and national forest would require a safe and accessible space for taking off, landing, and refueling. Five staging areas have been identified, with three sites in the northern part of the park and two sites on Olympic National Forest lands, beyond the southeastern boundary of the park.

Baiting. It is likely that salt blocks could be placed in remote areas of the park and national forest to attract mountain goats to suitable areas for carrying out management activities. Baiting areas would either be located away from public use areas or closed to public access to minimize mountain goat-human conflicts.

Lethal Removal. Under all action alternatives, there would be the potential for lethal removal of mountain goats. The number of mountain goats, methods, and timing for lethal removal would vary for each action alternative. Shotguns and high-powered rifles would be used for lethal removal actions. Ammunition would be non-toxic. Personnel involved, which could include NPS or other federal personnel, state personnel, or skilled public volunteers, would have the appropriate skills and proficiencies in the use of firearms to maximize public safety, including experience in the use of firearms for the removal of wildlife. Any lethal action would be completed as humanely as possible. Under all alternatives, mountain goats that sustain life-threatening injury during management activities would be dispatched as quickly as possible to minimize suffering.

Animal Welfare Tools and Considerations. The NPS would strive to use the most humane techniques possible for animal capture, transport, and handling to maximize individual animal welfare and health.

Translocation activities would be conducted in accordance with established WDFW translocation protocols; and when conducting lethal removal using firearms, consideration would be given to the choice of firearm and shot placement to ensure the humaneness of the action.

Research and Monitoring. Under all alternatives, research and monitoring activities would take place opportunistically based on available funding. Possible research and monitoring efforts could involve management efficacy analysis and mountain goat population studies. Mountain goat population surveys would be conducted in a manner similar to the no-action alternative.

Carcass Handling and Disposal. Under all action alternatives, mountain goat carcasses resulting from management activities could be left in the field, but relocated away from trails, campsites, or where visible from areas with high visitor use. If feasible, mountain goats that have been killed could be donated for processing and human consumption. Carcasses could be provided to interested tribes or other willing recipients who may wish to obtain hides and horns.

Alternative B: Capture and Translocation

Under alternative B, mountain goats would be captured within the park and in the adjacent Olympic National Forest and translocated to the Mt. Baker-Snoqualmie and Okanogan-Wenatchee National Forests (North Cascades national forests), where mountain goats are native and augmentation of the existing populations would further mountain goat conservation. Mountain goats could be captured over the course of up to 3 to 5 years, with most activity in years 1 and 2. Capture operations would occur during two 2-week management periods per year: once in mid- to late July, and once in late August to mid-September. Captured mountain goats would be transported by helicopter to one of five staging areas for transfer to WDFW. WDFW would then translocate mountain goats in crates to the North Cascades national forests.

Capture and translocation under alternative B would most likely involve approximately 50% of the 725 mountain goats projected to occupy the Olympic Mountains by 2018. However, the number of mountain goats captured and translocated could be more or less, depending on capture success and the ability of WDFW to receive and translocate mountain goats. Following the 5-year initial management period, maintenance activities would consist of periodic capture and translocation efforts focused in areas of high visitor use, or areas experiencing high levels of resource damage, in order to reduce impacts by the remnant mountain goat population and to keep the mountain goat population at a reduced level.

Alternative C: Lethal Removal

Under alternative C, lethal removal using shotguns or high-powered rifles would be used to eliminate or significantly reduce mountain goats from the park and adjacent Olympic National Forest. Mountain goats would not be translocated under this alternative. Specific management activities for the lethal removal of mountain goats would include helicopter- and ground-based use of firearms. Park staff and other approved personnel, including skilled public volunteers, would access areas on foot that are accessible, but in more remote areas, a helicopter would be used for lethal removal activities. Following lethal removal, mountain goat carcasses would remain on the landscape but would be moved from areas of high visitor use and occupied marmot habitat.

Initial lethal removal actions would involve removing as many mountain goats as possible from the Olympic Peninsula. It is expected that at least 90% of the projected 2018 mountain goat population, or approximately 625 to 675 mountain goats, could be removed during the initial management phase. Carcasses that result from aerial operations would remain in place if the carcasses are in steep and remote terrain and crews conducting ground-based lethal removal would remove as much carcass material as they are safely able to carry. Carcasses that are near areas of high human use would be relocated at least 325

feet away when it is safe to do so. Maintenance activities under alternative C would involve opportunistic ground- and helicopter-based lethal removal throughout the summer and fall seasons as personnel, funding, weather, and accessibility of targeted mountain goats allow. Maintenance activities would be prioritized in proximity to areas of high visitor use and areas experiencing high levels of resource damage.

The timing and duration of the initial management phase under alternative C would be 3 to 5 years, with most activity occurring in years 1 to 3. Lethal removals would be conducted only if necessary in years 4 and 5. In an effort to reduce the use of helicopters for lethal removal, management would start with ground-based activities, using skilled public volunteers and park staff in year 1. Helicopter-based operations would occur within the same 2-week management periods as described for alternative B. Ground-based lethal removal with skilled public volunteers would start in September, after the peak visitor use season, and would focus on goats that are in accessible areas throughout the initial management period.

Alternative D: Combination of Capture and Translocation and Lethal Removal (Preferred Alternative)

Under alternative D, initial management would involve the capture and translocation of as many mountain goats as possible, similar to alternative B, followed by a switch to lethal removal, similar to alternative C. Initial management activities under alternative D could last 3 to 5 years, with most of the activity in years 1 to 4. It is anticipated that nearly all management activities in year 1 would consist of live capture and translocation, which would continue to be the primary reduction tool during year 2. In year 1, capture operations would focus on locations where mountain goats can be safely captured and where they are interacting with visitors and resources. Some capture operations would continue into year 3 in the event of weather-related or other logistical constraints in years 1 and 2. Some lethal removal could be scheduled as early as the second capture operation in year 1, but only for those mountain goats that are determined to be uncatchable. The timing and duration of capture and translocation operations within a year would be the same 2-week management periods as described for alternative B. Translocation operations under alternative D would be identical to those described for alternative B.

Similar to alternative C, it is anticipated that initial management under alternative D would remove at least 90% of the mountain goat population, or approximately 625 to 675 mountain goats. Approximately 50% of the mountain goats would be captured and relocated and the remaining mountain goats would be lethally removed. Ground-based lethal removal would most likely start in the fall of year 2, directly after the second capture operation is completed. It is anticipated that the success rate for capturing mountain goats would diminish over time and management would likely switch to almost exclusively lethal removal during year 3 or year 4 of the initial management, but could begin as early as year 2. By year 5, most mountain goats encountered would be lethally removed.

ENVIRONMENTAL CONSEQUENCES

This document evaluates the impacts that would result from the proposed mountain goat management alternatives. The analysis used methods and assumptions that follow Council on Environmental Quality (CEQ) and US Department of the Interior regulations and guidance found in the 2015 NPS National Environmental Policy Act (NEPA) Handbook. A summary of the environmental consequences is provided below for each alternative, and a full analysis for each impact topic is evaluated in chapter 4.

Alternative A: No Action

Olympic Peninsula

Impacts under the no-action alternative would occur from potential management activities and from the continued presence of exotic mountain goats on the Olympic Peninsula. The management activities under this alternative would seek to address undesirable mountain goat-human interactions and thus, would occur infrequently and be of short duration, over an indefinite period. Direct, short-term, adverse impacts to wilderness character; wildlife and wildlife habitat, including special-status species; threatened or endangered species; acoustic environment; and visitor use and experience could result from hazing activities and associated human presence, although greater impacts would occur on the rare occasion that required mountain goat capture or lethal removal. However, impacts would be minimal for most affected resources because any disturbance or changes would be of limited duration and intensity. Under the no-action alternative, impacts would occur over an indefinite period from the continued presence and growth of the mountain goat population, including from mountain goat-human interactions and due to mountain goat behaviors such as browsing, grazing, wallowing, trailing, and trampling. Although there would be some beneficial impacts on visitor use and experience from continued wildlife viewing opportunity, the increasing presence of mountain goats would continue to threaten visitor safety. In comparison to the action alternatives, the continued habitat degradation, alteration of forage resources, and soil disturbance due to the no-action alternative would have greater long-term, adverse impacts on the natural quality of wilderness character; wildlife and wildlife habitat, including special-status species; threatened or endangered species; soils; and archeological resources. The continued abundance of mountain goats would also likely have substantial adverse impacts on vegetation, including special-status plant species, through herbivory, trampling, and soil disturbance, which affects the relative abundance of plant species, alters interspecific competition, and degrades habitat for sensitive subalpine and alpine plant communities. As the mountain goat population continues to grow under the no-action alternative, these adverse impacts would expand geographically and in intensity.

North Cascades National Forests

Alternative A would have no impacts in the North Cascades national forests.

Alternative B: Capture and Translocation

Olympic Peninsula

During the first 3 to 5 years of initial management under alternative B, temporary adverse impacts would affect most resources analyzed due to capture and translocation activities, and associated preparation and use of staging areas. These impacts would occur intermittently each year during the two 2-week management periods. Management activities, including the use of aircraft, vehicles, and other equipment would produce direct, adverse impacts on the acoustic environment. In turn, the noise associated with these activities would have direct, periodic adverse impacts on the following resources: mountain goats; wilderness character; wildlife and wildlife habitat, including special-status species; threatened or endangered species; visitor use and experience; and visitor and employee safety. Increased human presence under alternative B, as well as handling of mountain goats, would further disturb mountain goats; wilderness character; wildlife and wildlife habitat, including special-status species; vegetation, including special-status plant species; and threatened or endangered species. Restrictions on public access or area closures during mountain goat capture and translocation activities, although temporary and localized, would adversely impact wilderness character and visitor use and experience. Most of these direct impacts would be temporary and intermittent, therefore the overall impact would be minimal;

however, there would be substantial impacts on wilderness character from the noise associated with helicopter use at staging areas. These adverse impacts would progressively diminish in duration and intensity, as the need for management activities declines as the mountain goat population is decreased.

Maintenance activities under alternative B would have the same adverse, direct impacts as described for the initial management phase, although they would only occur periodically every few years. The capture and removal of mountain goats would have an adverse effect on the local mountain goat population because it would result in a large decrease in numbers, although mountain goats would remain in certain areas and be likely to rebound after initial management activities cease. However, assuming that maintenance activities are able to keep the mountain goat population at a lower level, alternative B would result in beneficial impacts on most resources, including substantial benefits to wildlife and wildlife habitat, including special-status species; vegetation, including special-status plant species; and soils due to reduced pressure on these resources by mountain goats. These beneficial impacts would continue for an extended duration. Adverse effects of the remaining mountain goat population from browsing, grazing, wallowing, trailing, and trampling would continue indefinitely in certain areas of the Olympic Mountains, impacting the natural quality of wilderness character; wildlife and wildlife habitat, including special-status species; threatened or endangered species; soils; and archeological resources. Thus, the implementation of alternative B would produce fewer beneficial impacts on natural resources than alternatives C or D because those alternatives would eliminate a much larger number of mountain goats. The removal of mountain goats would have no long-term impact on the acoustic environment. Likewise, adverse impacts on visitor use and experience, and visitor and employee safety would continue under alternative B due to potential human interactions with any remaining mountain goats. For the visitor whose experience is enhanced by the ability to view mountain goats, minimal adverse impacts would result because although the mountain goat population would be reduced, there would still be a population present to view.

North Cascades National Forests

The translocation of mountain goats to the North Cascades national forests would have short-term, direct adverse impacts on all resources analyzed, although long-term, beneficial impacts are believed to outweigh those more immediate impacts. As on the Olympic Peninsula, the primary source of direct impacts would be from helicopter use, human presence, and other activities associated with preparing and using staging areas and release sites. There would be short-term, adverse impacts on the untrammeled and undeveloped qualities of wilderness character, as well as opportunities for solitude within wilderness areas. Impacts on wildlife, including special-status species, would include their displacement or disturbance, which could adversely affect the survival of some individuals; however, these effects would be limited in area and duration during management actions. Likewise, for several federally threatened or endangered species, including grizzly bear, Canada lynx, gray wolf, and wolverine an effects determination was made that proposed actions *may affect, but would not likely adversely affect* their survival and recovery. However, an effects determination was made that proposed translocation activities are *likely to adversely affect* the northern spotted owl and marbled murrelet because unknown nesting individuals near staging sites could be disturbed by helicopters and other human activity. Furthermore, adverse impacts on vegetation would occur during preparation of staging areas and release sites, but these effects would be limited to small areas and vegetation would recover following management activities. There would also be some short-term, adverse effects on visitor use and experience in the North Cascades national forests due to noise and sight of helicopters, as well as temporary closures of a few roads and trails. Lastly, adverse impacts on visitor and employee safety would occur due to risks associated with staging and release activities and increased future potential for human-mountain goat interactions.

Augmenting the mountain goat populations in the North Cascades national forests would have lasting beneficial effects on the viability of this Regional Forester Sensitive wildlife species through increased

genetic diversity and enhanced demographic vigor to depleted populations. The natural quality of wilderness would be improved over the long term as a result of the mountain goat relocation as this would move these ecosystems toward their historical ecological condition, but the undeveloped quality of wilderness would also be adversely impacted from the presence of radio collars on translocated mountain goats. For other wildlife species and vegetation resources, management activities are unlikely to have any indirect or long-term, adverse impacts. The increased abundance of mountain goats would produce beneficial, lasting impacts on visitor use and experience due to increased opportunity to view native wildlife and possibly increased mountain goat hunting opportunity in the future from the translocation of mountain goats.

Alternative C: Lethal Removal

Olympic Peninsula

During the first 3 to 5 years of initial management under alternative C, temporary adverse impacts would affect most resources analyzed due to lethal removal actions, and associated preparation and use of staging areas. These direct impacts would occur intermittently each year during the two 2-week management periods in years 2 and 3. The preparation and use of staging areas would result in adverse impacts on the same resources as described above under alternative B. Unlike alternative B, the duration of these impacts would be less frequent, and less intense because fewer helicopter flights to and from staging areas would be required because mountain goats would not be captured and translocated. Also, the impacts under alternative C would occur over a relatively shorter time frame because lethal removal would be a more efficient method to remove mountain goats. Adverse impacts on mountain goats on the Olympic Peninsula would be more substantial than under alternative B because of the number that would be lethally removed. Also, the use of firearms for lethal removal activities would produce additional noise and disturbance, which would further impact mountain goats; wilderness character; wildlife and wildlife habitat, including special-status species; vegetation, including special-status plant species; threatened or endangered species; visitor use and experience; and visitor and employee safety. The impacts from potential public access restrictions or area closures would be similar as under alternative B. Lastly, the presence of a large number of mountain goat carcasses on the landscape would have short-term benefits on scavenging wildlife, but would adversely impact the untrammeled quality of wilderness character. Overall, similar to alternative B, most direct adverse impacts of management activities under alternative C would be temporary and intermittent, and would diminish as increasing numbers of mountain goats are lethally removed. Maintenance activities under alternative C would have the same adverse, direct impacts as describe above for the initial management phase. However, such impacts would be more intermittent and less intense than those under alternative B because a much smaller number of mountain goats are expected to remain on the Olympic Peninsula after initial management.

After completion of management activities under alternative C, there would be long-term, beneficial impacts on most resources due to reduced impacts from exotic mountain goats. This alternative would also produce those benefits more quickly and to a larger degree than under alternative B. Some of the beneficial impacts would be substantial, including those to soils; wildlife and wildlife habitat, including special-status species; archeological resources; and visitor use and experience. One exception is that the lethal removal of mountain goats from the park would have a significant and permanent adverse impact on mountain goats on the Olympic Peninsula. These impacts would likely continue indefinitely because any mountain goats remaining on the landscape would be too few for the population to rebound. Beneficial impacts on visitor use and experience would result from the reduced potential for visitors to encounter mountain goats or to be inconvenienced by area closures related to the presence of conditioned or aggressive mountain goats. There would also be long-term, adverse impacts on visitor use and experience for those visitors that value seeing mountain goats in the Olympic Mountains.

North Cascades National Forests

Alternative C would have no impacts in the North Cascades national forests.

Alternative D: Combination of Capture and Translocation and Lethal Removal (Preferred Alternative)

Olympic Peninsula

Impacts associated with management of mountain goats under alternative D would include a combination of the impacts described under alternatives B and C. As described above for those alternatives, the initial management phase of mountain goat management activities would result in temporary adverse impacts on most resources from both capture and translocation operations and lethal removal actions. The preparation and use of staging areas would result in adverse impacts from aircraft, vehicle, and other equipment noise; direct disturbance from human activity; safety issues; and temporary limitations on public access in some areas. The impacts associated with lethal removal activities would include disturbance from aircraft and firearm noise and the presence and disturbance of ground crews and would be concentrated during the final 2 years of initial management, but would begin at the end of year 2 for ground-based lethal removal activities. The potential for adverse impacts would decrease substantially after management changes from capture and translocation to lethal removal activities, because lethal removal activities would require less helicopter flight time and fewer human resources. The resources affected include mountain goats; wilderness character, including opportunities for solitude and unconfined recreation; wildlife and wildlife habitat, including special-status species; vegetation, including special status plant species; threatened or endangered species; acoustic environment; visitor use and experience; and visitor and employee safety. Most of the adverse impacts would be temporary, intermittent, and minimal.

As described for alternative C, alternative D would result in long-term, beneficial impacts on most resources, including substantial beneficial impacts on the natural quality of wilderness, wildlife and wildlife habitat, including special-status species; vegetation, including special-status plant species; archeological resources; and soils, as a result of the removal of the majority of adverse impacts on these resources by mountain goats. The beneficial impacts would likely continue indefinitely because any mountain goats remaining on the landscape would be too few for the population to rebound. Long-term, beneficial impacts on visitor use and experience would result from the reduced potential for visitors to encounter mountain goats or to be inconvenienced by area closures related to the presence of conditioned or aggressive mountain goats. There would also be long-term, adverse impacts on visitor use and experience for those visitors that value seeing mountain goats in the Olympic Mountains.

North Cascades National Forests

Alternative D would have the same impacts in the North Cascades national forests as alternative B.

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Acronyms

ACETA	Aerial Capture, Eradication and Tagging of Animals
AGL	above ground level
APHIS	Animal & Plant Health Inspection Service
CEQ	Council on Environmental Quality
dBA	A-weighted decibel
ESA	*Endangered Species Act*
NEPA	*National Environmental Policy Act*
NFS	National Forest System
NPS	National Park Service
PEPC	NPS Planning, Environment, and Public Comment Website
plan/EIS	Mountain Goat Management Plan / Environmental Impact Statement
ROD	record of decision
SHPO	State Historic Preservation Office
USDA	US Department of Agriculture
USFWS	US Fish and Wildlife Service
WDFW	Washington Department of Fish & Wildlife

Chapter 1:

Purpose of and Need for Action

CHAPTER 1: PURPOSE OF AND NEED FOR ACTION

INTRODUCTION

This *Mountain Goat Management Plan / Environmental Impact Statement* (plan/EIS) for Olympic National Park (the park) analyzes the impacts that could result from a continuation of current management of an exotic mountain goat population on the Olympic Peninsula (the no-action alternative), as well as the impacts that could result from three action alternatives.

This plan/EIS analyzes the impacts that could result from the no-action alternative and three action alternatives that involve lethal removal and/or translocation of nonnative mountain goats from the Olympic Peninsula.

This chapter describes the reasons the National Park Service (NPS) is taking action at this time to evaluate a range of alternatives for the management of exotic mountain goats in the park, and the subsequent actions by the Washington Department of Fish & Wildlife (WDFW) on National Forest System (NFS) lands in the North Cascades national forests. Two separate project areas are being evaluated in this plan/EIS: (1) areas of Olympic National Park and Olympic National Forest where exotic mountain goats could be reduced, which comprise the area referred to as the Olympic Peninsula; and (2) areas in the Mt. Baker-Snoqualmie National Forest and Okanogan-Wenatchee National Forest where mountain goats could be translocated, which comprise the area referred to as the North Cascades national forests.

PURPOSE OF TAKING ACTION

The purpose in taking action is to allow the NPS to reduce or eliminate impacts on park resources from exotic mountain goats (*Oreamnos americanus*), while reducing potential public safety issues associated with the presence of mountain goats in the park.

NEED FOR ACTION

Mountain goats are not native to the Olympic Peninsula. They were introduced to the Olympic Mountains prior to the establishment of the national park, and have since colonized the entire range, with the majority of the population residing within the park (Noss et al. 2000). The original need to manage this exotic species was an ecological concern related to the impacts that mountain goats impose on natural resources at the park, particularly sensitive vegetation communities (NPS 1995; Houston, Schreiner, and Moorhead 1994). Safety concerns were increased in 2010 when a visitor was fatally gored by a mountain goat while hiking on a park trail. Mountain goats have a high affinity for salts and natural sources of salt occur within their native range. There are no natural sources of salt in the Olympic Mountains, and mountain goats have learned to seek salts from humans. In areas with high levels of visitor use within the park and national forest, mountain goats have become conditioned to the extent that they are a nuisance and may be hazardous to visitors. The Olympic National Park *Mountain Goat Action Plan,* included as appendix A, addresses mountain goat behavior and seeks to minimize the potential for hazardous mountain goat-human encounters. This action plan focuses on the management of individual mountain goats that have been identified as potentially hazardous (appendix A). Additional planning and compliance is needed to address overall management of the mountain goat population on the Olympic Peninsula.

There is also a need to remove mountain goats from adjacent lands in the Olympic National Forest because mountain goats in these areas are part of a population that moves between the Olympic National

Forest and Olympic National Park. As in the national park, mountain goats cause soil erosion, impact native plant communities, and occupy habitat for native species in the national forest. As a result of these concerns, a plan/EIS is needed to address the impacts of exotic mountain goats in the park and in the adjacent Olympic National Forest, which would include the interference with natural processes, native species, natural habitats, and impacts on visitor use and safety.

OBJECTIVES IN TAKING ACTION

Objectives are "more specific statements of purpose that provide additional bases for comparing the effectiveness of alternatives in achieving the desired outcomes of the action" (NPS 2015e). Objectives presented below represent a refinement of the purpose of this plan/EIS and are focused primarily on objectives for Olympic National Park, although these would help meet the purpose and need for the Olympic National Forest areas that are adversely affected by mountain goats. All alternatives selected for detailed analysis must meet all objectives to a large degree and resolve the purpose of and need for action. Objectives for managing exotic mountain goats must be grounded in the enabling legislation, purpose, significance, and mission goals of the park, and must be compatible with the direction and guidance provided in the strategic plan, natural resources management plan, master plan, or other management guidance for the park. Any plan the park and cooperating agencies develop must be consistent with the laws, policies, and regulations that guide the NPS. The following objectives relate to the management of exotic mountain goats on the Olympic Peninsula:

- Develop a scientifically based method for the management of exotic mountain goat populations in an extensive mountainous wilderness area.
- Reduce or eliminate impacts on sensitive environments and unique natural resources from mountain goats in the park and in Olympic National Forest.
- Reduce or eliminate the potential for visitor safety issues associated with mountain goats in the park.
- Further public understanding of the Olympic high-elevation ecosystems and native species, and the ecology and conservation of mountain goats in their native range.
- Protect the International Biosphere Reserve and World Heritage Site designations of Olympic National Park and preserve the integrity of these designations.
- Protect the wilderness character of designated park wilderness and wilderness in Olympic National Forest.
- Work cooperatively with co-managers of mountain goats or habitats in Washington State (US Department of Agriculture (USDA) Forest Service, WDFW, and tribes).
- Support the wildlife management objectives of cooperating agencies and tribes, to the extent practicable, with respect to mountain goats.
- Provide opportunities to reestablish or augment sustainable native mountain goat populations in suitable mountain goat habitat on NFS lands in the North Cascades national forests.

MOUNTAIN GOATS ON THE OLYMPIC PENINSULA

Mountain goats are a native species in the State of Washington but are not native on the Olympic Peninsula. Approximately 12 mountain goats were introduced to the Olympic Peninsula near Lake Crescent from 1925 to 1929, prior to establishment of the national park. By the early 1980s, the mountain goat population in the park had grown to more than 1,000 individuals, with mountain goats distributed in

high-elevation habitats throughout the Olympic Peninsula (Houston, Moorhead, and Olson 1986). The highest density population was on Klahhane Ridge and included more than 200 mountain goats. The park implemented a series of live capture operations from 1981 to 1989, translocating 407 mountain goats to other mountain ranges throughout several western states (Houston et al. 1991). An additional 119 mountain goats were legally harvested during sport hunting seasons outside the park and 3 known mountain goats were illegally harvested in the park between 1983 and 1997. A second survey, conducted in July 1990 following the cessation of the NPS capture and translocation program, produced an estimate of 389 goats (Jenkins et al. 2012). Live capture operations were halted in 1990 for several reasons, including employee safety, animal safety, and changing Department of the Interior rules concerning helicopter landing techniques (NPS 1995). Subsequent surveys were conducted in 1994, 1997, and 2004, during a period in which no mountain goats were removed from the Olympic Mountains (Jenkins et al. 2012). A survey conducted in 2011 revealed that the population started increasing sometime between 2004 and 2011. Most recently, a 2016 survey revealed that the population has continued to increase to an estimated 625 mountain goats, with an 8% average annual rate of increase from 2004 to 2016. At this growth rate, there could be approximately 725 mountain goats on the Olympic Peninsula by 2018 (Jenkins et al. 2016).

Following the 2010 visitor fatality, the NPS developed the 2011 *Mountain Goat Action Plan* (appendix A) to provide guidance for addressing mountain goat behavior issues and minimizing the potential for hazardous encounters between mountain goats and humans. In 2015, a continuum for classifying and responding to mountain goat-human interactions was developed during a "Managing Animal Behavior" workshop attended by the Olympic National Park biologists (appendix B). Potential management actions identified in the continuum that range from tracking mountain goat behavior to lethal removal of conditioned and aggressive mountain goats are described in detail in appendices A and B.

COOPERATING AGENCIES AND THE DECISION-MAKING PROCESS

The NPS is the lead agency for this planning process, whereas the USDA Forest Service and WDFW are participating as cooperating agencies. Management of mountain goats in Washington State is the primary responsibility of WDFW, but the USDA Forest Service is responsible for managing the vast majority of their habitat outside of Olympic National Park on both the Olympic Peninsula and in the North Cascades national forests (see FS 1991, FSM 2600). The NPS has jurisdiction over actions on NPS lands; however, NPS must also consider the impacts of its actions on other agencies' lands. The USDA Forest Service has jurisdiction over the Olympic National Forest lands and must provide NPS and WDFW with permission to engage in certain proposed mountain goat management activities on its lands. The USDA Forest Service also manages lands in the North Cascades national forests, where WDFW proposes to translocate mountain goats depending on the alternative ultimately selected in this plan/EIS.

After reviewing and analyzing comments on the draft plan/EIS, the NPS prepared this final plan/EIS and will issue a record of decision (ROD) that selects an alternative for implementation. In the event that an alternative is selected that involves removing goats (either via live capture or lethal means) from Olympic National Forest and/or translocating mountain goats to North Cascades national forests, the USDA Forest Service would have to authorize these actions on NFS lands, which could include issuing temporary closures around staging areas, capture sites, and lethal removal areas as needed, per 36 CFR 261 Subpart B. Therefore, the responsible officials for the USDA Forest Service will decide through their own records of decision whether to authorize the following actions in their respective forests:

- The responsible official for the Olympic National Forest will decide whether to authorize the NPS to use helicopters to remove mountain goats from wilderness areas in the Olympic National Forest and transport them to staging areas; and whether to authorize temporary closures associated with the NPS capture operations, and at staging areas used by the WDFW.

- The responsible officials for the Mt. Baker-Snoqualmie and Okanogan-Wenatchee National Forests will decide whether to authorize the WDFW to establish temporary closures for staging and release sites and to release mountain goats with helicopters in the wilderness areas in their respective forests.

IMPACTS ASSOCIATED WITH MOUNTAIN GOATS AT OLYMPIC NATIONAL PARK

Issues associated with mountain goats at the park are primarily related to visitor safety and the unique vegetation at the park.

Issues associated with mountain goats at the park are primarily related to visitor safety and the unique vegetation at the park. Because many of the areas inhabited by mountain goats are popular destinations for park visitors, both in the frontcountry (e.g., Hurricane Ridge) and backcountry (e.g., Royal Basin), there is a high potential for mountain goat-human interactions within the park. Most notable are areas where mountain goats are habituated to human presence and have become conditioned to seeking salts and other minerals from humans. Mountain goats can be a nuisance along trails and around wilderness campsites where they persistently seek salt and minerals from human urine, packs, and sweat on clothing. They often paw and dig areas on the ground where hikers have urinated or disposed of cooking wastewater. The nature of mountain goat-human interactions in the park can vary widely, such as humans observing mountain goats from several hundred meters away across a ridge, mountain goats approaching visitors, and hazardous interactions such as the October 2010 fatality (appendix A).

Through their herbivory and wallowing behaviors, exotic mountain goats have directly and indirectly affected the vegetation within the park. Changes in the relative abundance of plant species have been observed as a result of mountain goat herbivory; this has altered competitive interactions among plant species. Wallowing by mountain goats has impacted plant species within the park as a result of soil disturbance and subsequent creation of mineral substrates for colonization by disturbance-oriented plant species. As the mountain goat population in the park increased prior to live capture operations in the 1980s, changes in vegetation were substantial, and the status of rare plant populations became a concern (Houston, Schreiner, and Moorhead 1994).

Mountain goat wallow site

NPS MANAGEMENT POLICIES REGARDING REMOVAL OF EXOTIC SPECIES

Section 4.4.4.2 of NPS *Management Policies 2006* states that "all exotic plant and animal species that are not maintained to meet an identified park purpose will be managed—up to and including eradication—if (1) control is prudent and feasible, and (2) the exotic species: interferes with natural processes and the perpetuation of natural features, native species or natural habitats; or disrupts the genetic integrity of native species; or disrupts the accurate presentation of a cultural landscape; or damages cultural resources; or significantly hampers the management of park or adjacent lands; or poses a public health hazard as

advised by the U.S. Public Health Service (which includes the Centers for Disease Control and the NPS public health program); or creates a hazard to public safety. High priority will be given to managing exotic species that have, or potentially could have, a substantial impact on park resources, and that can reasonably be expected to be successfully controlled. Lower priority will be given to exotic species that have almost no impact on park resources or that probably cannot be successfully controlled. Where an exotic species cannot be successfully eliminated, managers will seek to contain the exotic species to prevent further spread or resource damage."

PARK BACKGROUND

Olympic National Park protects 922,651 acres of three distinct ecosystems, including rugged glacier-capped mountains, wild Pacific coast, and vast stands of old-growth and temperate rain forest. The park encompasses one of the largest wilderness areas in the contiguous United States; 95% (876,447 acres) of the park is designated as wilderness, offering visitors a chance to experience the diversity of the park in its natural and pristine state. The 3,500 miles of rivers and streams in the park are home to 29 species of native freshwater fish and support 70 unique stocks of Pacific salmon and steelhead. The park includes habitat for more than 1,100 species of native plants, 300 species of birds, and 65 species of mammals. The isolated peninsula has at least 24 endemic taxa that are not found anywhere else on earth (NPS 2008a, 2010). The maintenance or restoration of these native plants and animals is given priority over exotic species in the park, according to NPS *Management Policies 2006* (NPS 2006).

Throughout the diverse landscape of the park is an array of cultural and historic sites. Historic sites within the park document 10,000 years of human occupation, with 650 archeological sites. Local communities are closely and directly linked to the park in culture, heritage, and tradition, and provide important historical information and meaning to the landscape (NPS 2008a, 2010b).

Occupying the central core of the Olympic Peninsula, with a narrow strip along the Pacific coast, the park is the primary travel destination of the peninsula. More than five million people live within a 3- to 5-hour drive of the park in the region stretching from Vancouver, British Columbia, south to Seattle, Washington, and Portland, Oregon. The park is surrounded by a network of land and marine areas managed by state and federal agencies, tribes, and private interests. Among these entities are eight federally recognized tribes that have traditional association with the Olympic Peninsula. These tribes include the Lower Elwha Klallam Tribe, Jamestown S'Klallam Tribe, Port Gamble S'Klallam Tribe, Skokomish Indian Tribe, Quinault Indian Nation, Hoh Tribe, Quileute Nation, and Makah Tribe. Federally owned lands surrounding the park make up the Olympic National Forest, which consists of portions of land on all sides of the park and includes several designated wilderness areas (NPS 2008a, 2010).

Olympic National Park Enabling Legislation

The enabling legislation of Olympic National Park (Act of June 29, 1938, 52 Stat. 1241) states that the park is "set apart as a public park for the benefit and enjoyment of the people" (NPS 2008a).

Purpose and Significance of Olympic National Park

As stated in the 2017 *Olympic National Park Foundation Document* (NPS 2017c), "According to House Report 2247, April 28, 1938, the purpose of Olympic National Park is to preserve for the benefit, use, and enjoyment of the people, a large wilderness park containing the finest sample of primeval forest of Sitka spruce, western hemlock, Douglas fir, and western red cedar in the entire United States; to provide suitable winter range and permanent protection for the herds of native Roosevelt elk and other wildlife

indigenous to the area; to conserve and render available to the people, for recreational use, this outstanding mountainous country, containing numerous glaciers and perpetual snow fields, and a portion of the surrounding verdant forests together with a narrow strip along the beautiful Washington coast."

Within the national park system, statements of significance describe distinctive natural, cultural, and recreational resources and values that are the factual rationale for national recognition of the site. According to the 2017 *Olympic National Park Foundation Document* (NPS 2017c), the significance of the park includes the following:

- Olympic National Park protects several distinctly different and relatively pristine ecosystems that provide both ecological and scenic diversity to the Olympic Peninsula, ranging from wild Pacific coast and islands to densely forested lowlands to the glacier-crowned Olympic Mountains. Views of the mountain range define the landscape for great distances in all directions, and the rugged beauty of the coastline and verdant grandeur of the rainforest have inspired people for generations.
- The ecosystems protected within Olympic National Park contain a unique array of habitats and life forms, resulting from thousands of years of geographic isolation, along with extreme gradients of elevation, temperature, and precipitation. There are many animals and plants on the Olympic Peninsula that exist nowhere else in the world. The park is key to maintaining the populations of these taxa.
- Olympic National Park contains some of the last remaining undisturbed, contiguous aquatic habitat throughout the range of several west coast fish species. The park protects 12 major river basins, more than 3,500 miles of rivers and streams, more than 300 high mountain lakes, and 2 large lowland lakes. As a consequence, the park is entrusted with the stewardship of numerous unique stocks of Pacific salmonids and other native freshwater fish species. Salmon are a keystone species of the park's forest and aquatic ecosystems and are deeply woven into the cultural fabric of the Pacific Northwest.
- One of the largest wilderness areas in the contiguous United States is designated within Olympic National Park. By today's wilderness quality scale, the Daniel J. Evans Wilderness is superb. Few, if any NPS areas in the contiguous United States can approach or surpass the Daniel J. Evans Wilderness in terms of its near-pristine nature, grandeur, immensity, or variety of resources, which include glacier-covered mountains, subalpine lakes and meadows, extensive river valleys, old-growth coniferous forests, and the tremendously diverse wild Pacific coastline. The wilderness character of these lands is of inestimable value and among the most precious of the region's resources.
- Olympic National Park contains the finest remaining stands of old-growth temperate coniferous forest in the contiguous United States, including one of the finest remaining examples of temperate rainforest in the United States. These extensive forests of ancient and immense trees provide important habitat for complex communities of plants and animals, including a number of imperiled species.
- The Olympic rocky intertidal community is considered to be one of the most complex and diverse shoreline communities in the United States. Olympic National Park includes about 1,400 square miles of the intertidal, island, and shoreline habitat, and contributes to a large protected landscape of coastal and ocean habitats, including approximately 64 miles of shoreline, 52 of which borders designated wilderness.
- Olympic National Park is home to the largest population of Roosevelt elk in its natural environment in the world. Decades of protection from human harvest and habitat manipulation

have sustained not only high densities of elk, but also preserved the natural composition, social structure, and dynamics of this unique western forestland sub-species of elk.

- Olympic National Park manages a variety of cultural resources, from ancient village sites to historic structures, which retain local, regional, or national significance. Eight federally recognized tribes (the Lower Elwha Klallam Tribe, Jamestown S'Klallam Tribe, Port Gamble S'Klallam Tribe, Skokomish Indian Tribe, Quinault Indian Nation, Hoh Tribe, Quileute Nation, and Makah Tribe) have, since time immemorial, sustained strong ties to the Olympic Peninsula and what is now the park. Hundreds of archeological and ethnographic sites attest to approximately 12,000 years of continuous use and connection to the park landscape. Park resources continue to provide material, spiritual, and cultural sustenance to contemporary descendants as they have for millennia.
- Olympic National Park serves as a recreational "backyard" for millions of people in the Puget Sound region and Olympic Peninsula region, in addition to attracting recreation visitors from across the nation and world.

The attributes of the park have led to multiple international designations. In 1976, the park was designated an International Biosphere Reserve in the Man and the Biosphere Program by the United Nations Educational, Scientific, and Cultural Organization. This identifies the park as an internationally significant ecosystem within one of the world's major biogeographical provinces. The park is valued for the study of biological evolution and natural processes that are largely free of human disturbance. The park serves as a global benchmark of ecological health against which effects of human activities in similar environments can be compared. The park was recognized for its scientific values because it contains superb examples of temperate rain forests and is a large protected ecosystem. International recognition came to the park again in 1981 when it was declared a World Heritage Site by the World Heritage Convention, joining a system of natural and cultural properties that are considered irreplaceable treasures of outstanding universal value. Few areas in the United States are designated as both an International Biosphere Reserve and World Heritage Site (NPS 2008a).

- The park protects the primeval character of one of the largest wilderness areas in the contiguous United States.
- The park protects some of the finest remaining stands of old-growth temperate rain forest in the United States. These forests of ancient and immense trees provide habitat for dozens of smaller plants and animals, including important habitat for a number of threatened species.
- The park protects the largest population of Roosevelt elk in its natural environment in the world. Decades of protection from human harvest and habitat manipulation have sustained not only high densities of elk, but also preserved the natural composition, social structure, and dynamics of this unique coastal form of elk as found nowhere else.
- The park protects important cultural resources, with regional and national significance, including more than 650 archeological sites, hundreds of ethnographic sites, 31 cultural landscapes, and 16 historic districts. Within the park boundary, there are 121 historic structures on the List of Classified Structures.

PROJECT AREAS EVALUATED FOR IMPACTS

Olympic Peninsula

Management actions proposed in this plan/EIS would be focused primarily in areas of the park and forest that are above 4,675 feet in elevation.

The project area includes Olympic National Park and Olympic National Forest on the Olympic Peninsula, focused in high-elevation mountain goat habitat (figure 1). Mountain goat habitat on the Olympic Peninsula comprises approximately 149,000 acres of high-elevation alpine and subalpine lands that are free of glacial ice and above 4,675 feet in elevation (Jenkins et al. 2011a, 2016). Mountain goat habitat outside of the park occurs primarily in adjoining wilderness areas in Olympic National Forest, as well as some non-wilderness areas on NFS lands. Management activities proposed in this plan/EIS would also occur in some areas at lower elevations that are used by mountain goats as winter range, where opportunistic management activities could occur any time during the year. Additionally, there are several proposed staging areas for actions associated with mountain goat management in both Olympic National Park and Olympic National Forest (described in detail in chapter 2). As a result, the discussion of the affected environment and potential effects is limited to those resources that may be affected by proposed activities in mountain goat habitat and surrounding staging area locations.

North Cascades National Forests

Two action alternatives in this plan/EIS propose translocating mountain goats to the North Cascades national forests, which include the Mt. Baker-Snoqualmie National Forest and Okanogan-Wenatchee National Forest (figure 2). Nine sites are proposed where mountain goats could be released in the Mt. Baker-Snoqualmie National Forest; two release sites are proposed in the Okanogan-Wenatchee National Forest (one site in the Methow Valley Ranger District and one in the Cle Elum Ranger District); and one release site is proposed on land owned by Seattle Public Utilities. These sites are characterized by high elevations and are within areas currently or historically occupied by mountain goats. As on the Olympic Peninsula, the North Cascades national forests also include potential staging areas where mountain goats could be received and prepared for transport via helicopter to identified release sites. Thus, the affected environment and analysis of potential effects of proposed actions includes the resources that could be affected within and surrounding mountain goat staging areas and release sites. The areas where mountain goats would be released also include several wilderness areas.

ISSUES AND IMPACT TOPICS

Issues describe the relationship between actions and environmental, social, or economic resources. Issues are usually concerns or problems that may occur if current management continues or if new management is implemented. These issues may describe concerns or obstacles to achieving the purpose of the plan/EIS. Issues may be questions, concerns, or other relationships, including beneficial ones (NPS 2015e).

This plan/EIS uses “impact topics” as headings to indicate which resources or values would be affected by each issue. One section addresses impact topics and actions proposed to remove mountain goats from the Olympic Peninsula. A separate section addresses issues and impacts that could occur in the North Cascades national forests if mountain goats are translocated there. The existing condition of the resources and values of these two areas are described in “Chapter 3: Affected Environment.” “Chapter 4: Environmental Consequences” provides a more detailed analysis of each impact topic presented below.

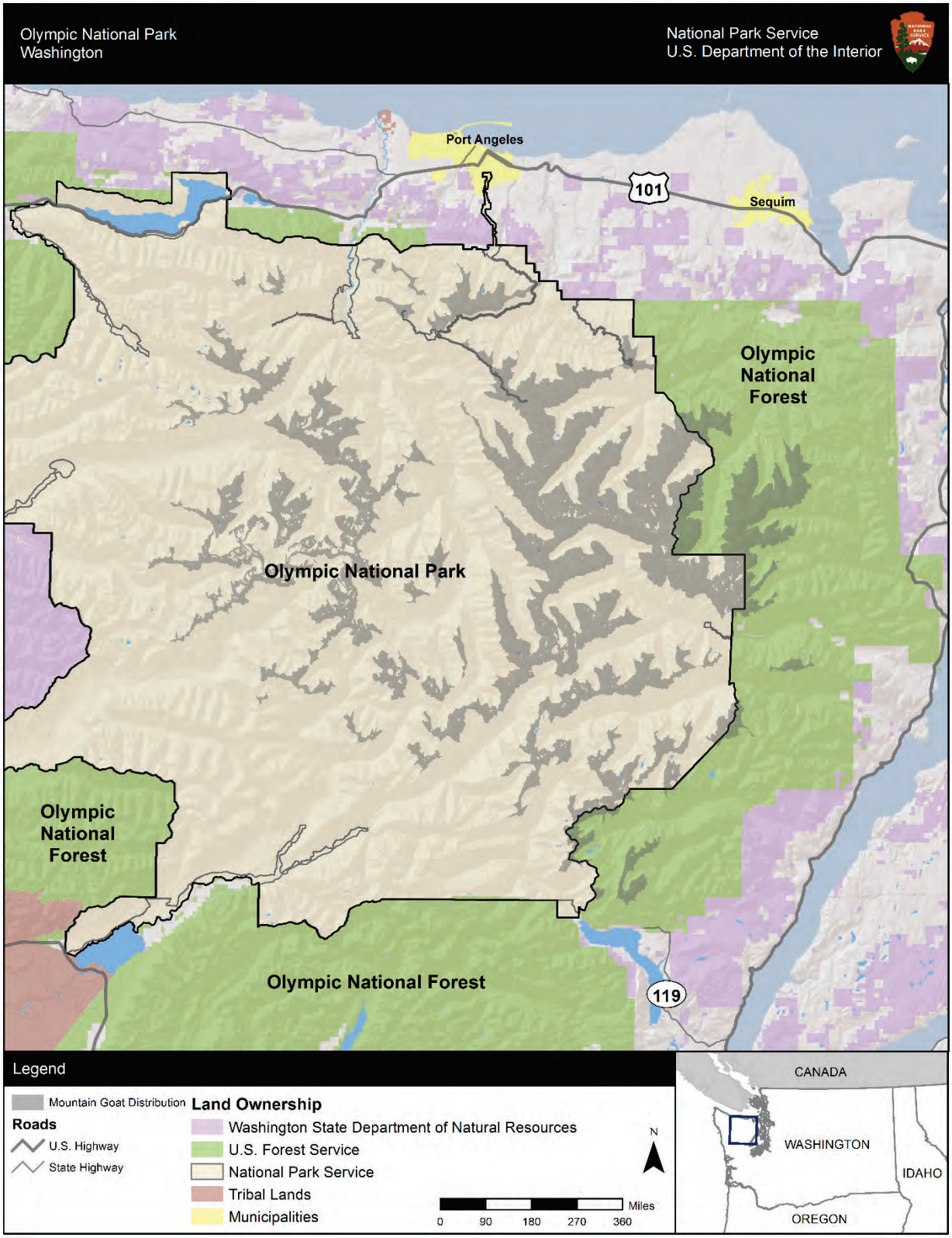


FIGURE 1. PROJECT AREA ON THE OLYMPIC PENINSULA

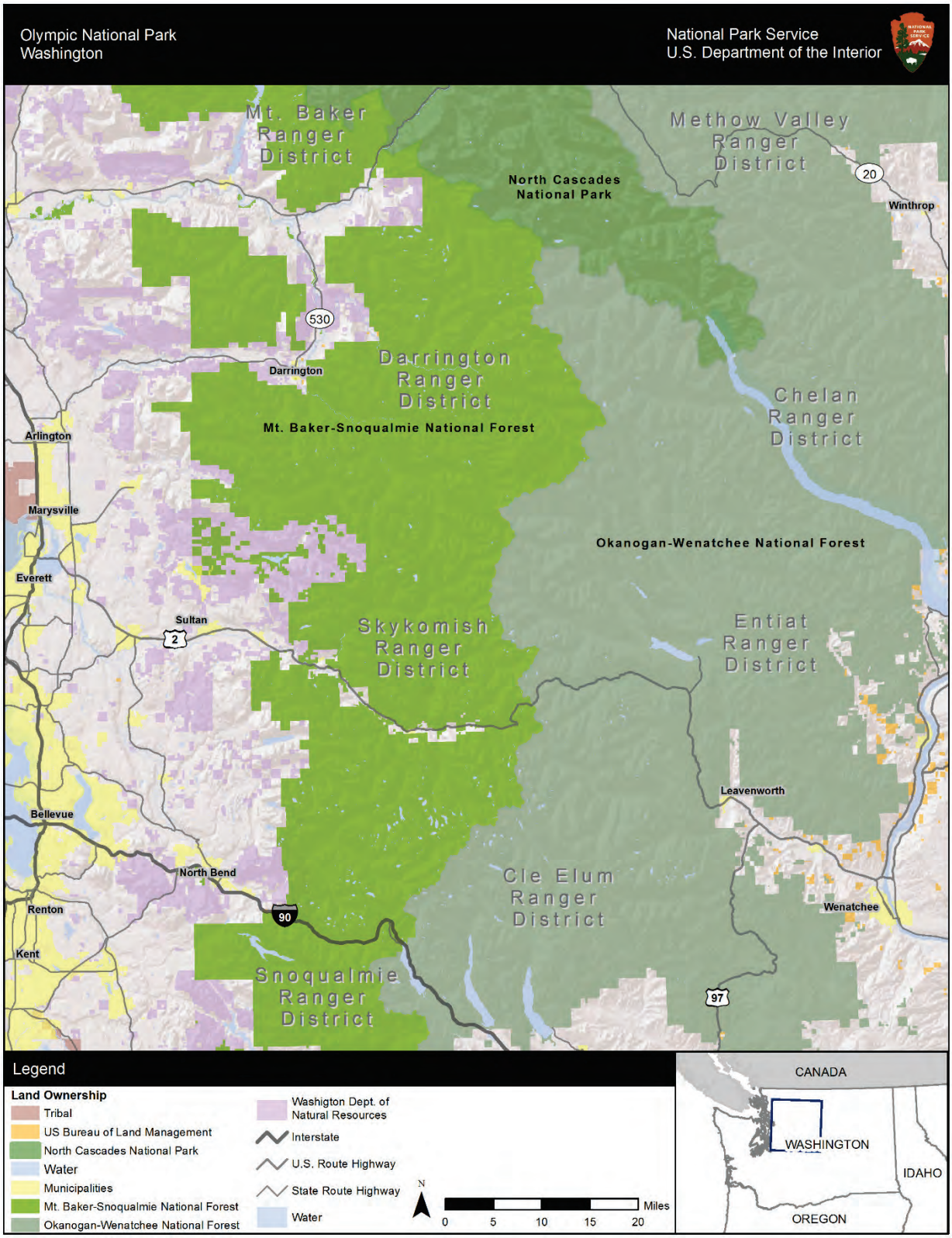


FIGURE 2. PROJECT AREA IN THE NORTH CASCADES NATIONAL FORESTS

Issues and Impact Topics – Olympic Peninsula

Mountain Goats

As noted above in the section "Mountain Goats on the Olympic Peninsula," the 12 mountain goats introduced to the Olympic Peninsula grew to a population of more than 1,000 mountain goats. Although the goat population significantly declined to approximately 300 goats following the removals conducted in the 1980s, and was stable at that lower number for over a decade, the mountain goat population in the Olympic Mountains was observed to begin increasing after 2004 at an average annual rate of 8% (Jenkins et al. 2016).

Introduced exotic species often disrupt established ecosystem processes and pose management problems for national parks. In this situation, mountain goats have modified vegetation within the Olympic Mountains, affecting endemic plants (NPS 1995). According to NPS *Management Policies 2006* (NPS 2006), the NPS is required to prevent the introduction of exotic species and to remove, when possible, or otherwise contain individuals or populations of these species that have already become established in parks. Likewise, the USDA Forest Service National Strategic Framework for Invasive Species Management provides a consistent, agency-wide approach to the prevention, detection, and control of invasive species (USDA 2013). Based on the following issue statement, this impact topic is carried forward for detailed analysis.

Issue Statement. Any action to manage exotic mountain goats in the park and adjacent Olympic National Forest will have a clear and direct impact on the Olympic Peninsula mountain goat population.

Wilderness Character

The congressionally designated Daniel J. Evans Wilderness (formerly the Olympic Wilderness) was established in 1988 and comprises about 95% of the park. In Olympic National Forest, five wilderness areas were designated by the 1984 *Washington State Wilderness Act*, including the Buckhorn Wilderness (44,258 acres), Colonel Bob Wilderness (11,961 acres), Mount Skokomish Wilderness (13,015 acres), The Brothers Wilderness (16,682 acres), and Wonder Mountain Wilderness (2,349 acres) (FS 1990). The NPS and USDA Forest Service are responsible for preserving wilderness character. Wilderness character is "a holistic concept based on the interaction of (1) biophysical environments primarily free from modern human manipulation and impact, (2) personal experiences in natural environments relatively free from the encumbrances and signs of modern society, and (3) symbolic meanings of humility, restraint, and interdependence that inspire human connection with nature" (Landres et al. 2015). Based on the following issue statements, this impact topic is carried forward for detailed analysis.

Issue Statement. The presence of mountain goats, an exotic species, in wilderness, and the impacts on sensitive alpine and subalpine plant communities from grazing and wallowing disturbance result in adverse impacts on the natural quality of designated wilderness in Olympic National Park and Olympic National Forest.

Issue Statement. Proposed activities associated with the management of mountain goats within the park and adjacent national forest, such as the use of aircraft, firearms, and area closures to remove mountain goats, could result in impacts on the untrammeled, natural, undeveloped, and solitude or primitive and unconfined recreational qualities of wilderness character.

Wildlife and Wildlife Habitat, Including Special-Status Species

Wildlife populations in the park and national forest have been largely shaped by geographic isolation of the Olympic Peninsula, which has produced high levels of endemism. This biogeography has also prevented several species that occur in similar habitat on nearby mountain ranges from inhabiting the Olympic Mountains, including mountain goats (Houston, Schreiner, and Moorhead 1994). From dense, mixed-conifer forests, to the subalpine meadows and rock slopes, the Olympic Peninsula is home to a variety of fish, birds, and other wildlife throughout these diverse habitats. This variety includes several endemic species (found nowhere else). The project area also contains habitat for a variety of species that are not federally listed, but have been designated as special-status species by the state or USDA Forest Service. For example, the Olympic pocket gopher (*Thomomys mazama melanops*) and the Olympic marmot (*Marmota olympus*) (USDA Forest Service sensitive species) occur within mountain goat habitat and it is possible that their habitat is indirectly impacted by mountain goat herbivory, trampling, and wallowing behaviors (NPS 1995). Based on the following issue statements, this impact topic is carried forward for detailed analysis.

Issue Statement. Proposed management activities associated with the use of staging areas for the management of mountain goats (including site preparation and any aircraft or vehicular traffic to and from sites), would have the potential to impact wildlife and wildlife habitat, including special-status species.

Issue Statement. Proposed management activities associated with management of mountain goats on the Olympic Peninsula (including actions associated with hazing, aversive conditioning, capture, and lethal removal), such as the use of aircraft or firearms, would have the potential to impact wildlife and wildlife habitat, including special-status species.

Vegetation, Including Special-Status Plant Species

Vegetation on the Olympic Peninsula is extremely diverse due to the elevational and climatic variety. Mountain goats occupy high-elevation alpine and subalpine vegetation communities. Within the summer range of mountain goats, vegetation communities range from subalpine meadows and herbaceous communities to scree and rock areas with little vegetation. In these areas, substrate stability and soil moisture are the primary factors in determining community distribution. The project area also contains habitat for a variety of species that are not federally listed, but have been designated as special-status species by the state or USDA Forest Service. Cotton's milkvetch (*Astragalus australis var. cottonii*), a state imperiled and endemic species, occurs in mountain goat habitat. Other special-status vegetation species with the potential to be impacted by mountain goats or mountain goat management include triangular-lobed moonwort (*Botrychium ascendens*), tall bugbane (*Cimicifuga elata*), great polemonium (*Polemonium carneum*), and cut-leaf synthrys (*Synthyris pinnatifida var. lanuginose*). Additionally, of 33 taxa of rare or endemic plants known to occur in the summer range of mountain goats, four endemic species are grazed by mountain goats and it is reasonable to expect that mountain goats, as generalist herbivores, would also eat other rare or endemic plant species (NPS 1995). Based on the following issue statements, this impact topic is carried forward for detailed analysis.

Issue Statement. Mountain goats damage and kill vegetation within sensitive alpine and subalpine communities through herbivory, trampling, and wallowing behaviors. Any management of mountain goats that would reduce or eliminate them from areas with sensitive alpine and subalpine vegetative communities would remove a large source of adverse impacts on these resources.

Issue Statement. Management activities could result in the removal of small trees and brush at staging areas.

Threatened or Endangered Species

Wildlife species listed as threatened or endangered under the federal *Endangered Species Act* (ESA) with the potential to be impacted by mountain goat management activities include the northern spotted owl (*Strix occidentalis caurina*) (listed as threatened under ESA) and marbled murrelet (*Brachyramphus marmoratus*) (listed as threatened under ESA). Although unlikely, management activities proposed by this plan/EIS could impact these two federally listed species. Based on the following issue statement, this impact topic is carried forward for detailed analysis.

Issue Statement. Proposed activities associated with the management of mountain goats on the Olympic Peninsula, such as the use of aircraft or firearms, would have the potential to impact threatened or endangered species, or designated critical habitat, during management activities.

Acoustic Environment

The natural soundscape (i.e., natural quiet) in park wilderness is a special resource to park visitors. The park is one of the best examples of a natural soundscape found anywhere in the national park system and includes natural sounds that are part of the biological or physical resources of the park (NPS 2008a). Based on the following issue statement, this impact topic is carried forward for detailed analysis.

Issue Statement. Potential activities associated with the management of mountain goats, specifically the use of aircraft and firearms, would result in noise that would be temporary and limited in duration but could in turn impact visitors, wildlife, and wilderness character within the park and adjacent national forest.

Soils

Alpine and subalpine soils in the Olympic Mountains are young and poorly developed, making them sensitive to disturbance. Mountain goats change soil erosion by wallowing, trailing, and trampling. Wallowing removes soil surface layers resulting in reduced water-holding capacity, reduced nutrients available for vegetation, increased soil aeration, and increased surface temperature. The soil disturbance from mountain goat wallowing provides less stability for plant regeneration. These changes to the soil can cause major shifts in plant community composition around wallow edges (NPS 1995). Based on the following issue statement, this impact topic is carried forward for detailed analysis.

Issue Statement. Mountain goats cause soil disturbance and erosion, which can impact soil integrity as well as the associated vegetative communities. Any management of mountain goats that would reduce or eliminate them from areas with sensitive soils would result in beneficial impacts on soils in the Olympic Mountains.

Archeological Resources

Mountain goat wallowing has the potential to degrade or destroy archeological resources in the park. Only one percent of the park has been surveyed for archeological resources. Mountain goat wallowing behavior has had an adverse impact on both documented and undocumented archeological resources and has resulted in previously unknown archeological resources being unearthed within the park (Conca pers. comm. 2015a). Based on the following issue statement, this impact topic is carried forward for detailed analysis.

Issue Statement. Mountain goat wallowing behavior has the potential to degrade or destroy archeological resources on the Olympic Peninsula.

Visitor Use and Experience

Because many of the areas that mountain goats inhabit are popular destinations for visitors to the Olympic Mountains, both in the frontcountry (e.g., Hurricane Ridge) and backcountry (e.g., Royal Basin), there is a high potential for interactions between mountain goats and humans (appendix A).

Hunting of mountain goats is prohibited within Olympic National Park, but is permitted in adjacent Olympic National Forest. This includes sport hunting as well as hunting by local tribal members. The mountain goat population crosses jurisdictional boundaries of the park and the national forest, limiting hunting opportunities, because the majority of mountain goats reside in the park. Based on the following issue statements, this impact topic is carried forward for detailed analysis.

Issue Statement. Visitors have indicated that the presence of habituated mountain goats deters them from hiking on trails within the park and adjacent national forest. Other visitors have indicated that the presence of mountain goats enhances the visitor experience. In addition, proposed mountain goat management activities could result in the temporary closure of areas or the use of helicopters that could disrupt visitor activities.

Issue Statement. Management activities proposed to reduce or eliminate mountain goats on the Olympic Peninsula could result in a reduced or eliminated mountain goat population within Olympic National Forest, substantially reducing or eliminating the potential for mountain goat hunting and thereby impacting recreational hunting opportunities.

Issue Statement. Management activities associated with the management of mountain goats, specifically the use of aircraft and firearms, would generate intermittent loud noises that could disrupt visitor enjoyment of natural soundscapes within the Olympic Mountains.

Visitor and Employee Safety

Habituated and salt-conditioned mountain goats interact with the public in many areas of the park and adjacent Olympic National Forest. These mountain goat-human interactions can range from neutral, to nuisance, to hazardous. Although attacks by mountain goats are rare, in 2010 a visitor was fatally gored by a mountain goat while hiking on a park trail. In Olympic National Forest in 1999, a similar incident occurred near Mt. Ellinor when a man was also gored in the thigh. In all reports of mountain goat-caused human injuries, the encounters were with large, mature male mountain goats in areas where there was a history of habituation and salt conditioning.

Because many of the areas that mountain goats inhabit are popular destinations for park visitors, there is a high potential for mountain goat-human interactions within the park and adjacent Olympic National Forest. Most notable are areas where mountain goats that are habituated to human presence have also become conditioned to seeking salts from humans. There are also safety issues that need to be addressed in the use of helicopters in steep alpine terrain. Based on the following issue statements, this impact topic is carried forward for detailed analysis.

Issue Statement. The presence of habituated and salt-conditioned mountain goats on the Olympic Peninsula can present threats to visitor and employee safety.

Issue Statement. Management operations associated with the capture or lethal removal of mountain goats may involve the use of helicopters within steep, uneven terrain, which could present a threat to visitor and employee safety.

Issues and Impact Topics – North Cascades National Forests

Wilderness Character

There are numerous designated wilderness areas in the North Cascades national forests, including the Glacier Peak Wilderness, Alpine Lakes Wilderness, and Henry M. Jackson Wilderness. Within these congressionally designated wilderness areas, the USDA Forest Service is responsible for preserving wilderness character. Wilderness character is "a holistic concept based on the interaction of (1) biophysical environments primarily free from modern human manipulation and impact, (2) personal experiences in natural environments relatively free from the encumbrances and signs of modern society, and (3) symbolic meanings of humility, restraint, and interdependence that inspire human connection with nature" (Landres et al. 2015). The definition of wilderness found in section 2(c) of the 1964 *Wilderness Act* identifies four qualities of wilderness character that unify all wilderness areas regardless of size, location, or any other feature. These four qualities are natural, untrammeled, undeveloped, and providing opportunities for solitude or primitive and unconfined recreation. A fifth quality, "other features of value," is often added to these four because wilderness may preserve other features that are of scientific, educational, scenic, or historical value. Based on the following issue statement, this impact topic is carried forward for detailed analysis.

Issue Statement. Potential activities associated with the translocation of mountain goats to the North Cascades national forests, including the use of aircraft to transfer mountain goats from staging areas to release sites, could result in impacts on wilderness character.

Wildlife, Including Sensitive and Management Indicator Species

The North Cascades national forests are home to a diversity of plant and animal species, which includes approximately 75 species of mammals and 200 species of birds that either pass through or use the region for a breeding area (NPS 2016a). To maintain these species, the USDA Forest Service has policies for developing and implementing conservation strategies for sensitive species (Regional Forester Sensitive, Management Indicator, and Survey and Manage). Sensitive species may require special management emphasis to ensure their viability and to preclude trends toward endangerment that would result in the need for federal listing (FS 2011). Based on the following issue statement, this impact topic is carried forward for detailed analysis.

Issue Statement. Management activities associated with the use of staging areas and release sites for the translocation of mountain goats (including site preparation and any aircraft or vehicular traffic to and from sites), would have the potential to impact wildlife, including sensitive and management indicator species.

Vegetation

Dominant vegetation zones include the western hemlock (*Tsuga heterophylla*), Pacific silver fir (*Abies amabilis*), mountain hemlock (*Tsuga mertensiana*), and subalpine fir (*Abies lasiocarpa*) zones. Much of the project area is within the alpine zone, and covered by glaciers. No Regional Forester Sensitive plants are expected to be affected. Based on the following issue statement, this impact topic is carried forward for detailed analysis.

Issue Statement. Translocation activities would require removal of small trees at staging areas and could result in the crushing of vegetation at landing locations.

Threatened or Endangered Species

Federally listed threatened or endangered wildlife species with the potential to have habitat overlapping with mountain goats or to be impacted by mountain goat management activities include northern spotted owl (*Strix occidentalis caurina*) (listed as threatened under ESA), marbled murrelet (*Brachyramphus marmoratus*) (listed as threatened under ESA), grizzly bear (*Ursus arctos horribilis*) (listed as threatened under ESA), Canada lynx (*Lynx canadensis*) (listed as threatened under ESA), gray wolf (*Canis lupus*) (listed as endangered in the western two-thirds of Washington under ESA), and wolverine (*Gulo gulo luscus*) (listed as proposed threatened). No threatened or endangered plants or fish in the North Cascades national forest area would be affected by mountain goat management activities. Based on the following issue statement, this impact topic is carried forward for detailed analysis.

Issue Statement. Management activities associated with the use of staging areas and release sites for the translocation of mountain goats, such as the use of aircraft, would have the potential to impact threatened or endangered species, or designated critical habitat.

Visitor Use and Experience

Because staging and release areas involved in mountain goat release activities in the North Cascades national forests overlap with areas used by the public, there is potential for impacts on visitor use and experience. Based on the following issue statements, this impact topic is carried forward for detailed analysis.

Issue Statement. Management activities associated with the use of staging areas and release sites for the translocation of mountain goats could result in impacts on visitor use and experience due to temporary trail, trailhead, and road closures, as well as the sight and sound of helicopters near areas of high recreational visitor use.

Issue Statement. The translocation of mountain goats to the North Cascades national forests could benefit visitor use and experience by providing an increased opportunity to view native wildlife and possibly increase mountain goat hunting opportunities in the future.

Visitor and Employee Safety

Because areas that mountain goats inhabit are also destinations open to visitors, there is a potential for mountain goat-human interactions in the North Cascades national forests. Based on the following issue statements, this impact topic is carried forward for detailed analysis.

Issue Statement. The translocation of habituated or salt-conditioned mountain goats to the North Cascades national forests, and their future population growth, could present a threat to visitor and employee safety.

Issue Statement. Management operations associated with the translocation of mountain goats may involve the use of helicopters over steep, uneven terrain, which could present a threat to visitor and employee safety.

Issues Eliminated from Further Consideration – Olympic Peninsula

In addition to the issues and impact topics described above that have been identified for further analysis in this plan/EIS, several others were raised during internal, agency, and public scoping. Using the same considerations for determining issues carried forward for detailed analysis, the interdisciplinary team

analyzed these issues and determined they did not warrant more detailed discussion. The following impact topics and issues were therefore removed from detailed consideration in the Olympic Peninsula sections of this plan/EIS.

Streaked Horned Lark, Yellow-billed Cuckoo, Taylor's Checkerspot, Whitebark Pine, and Threatened or Endangered Fish

According to the US Fish and Wildlife Service (USFWS) Information, Planning, and Conservation System website, three additional federally listed wildlife species and one candidate plant species have the potential to occur in the project area on the Olympic Peninsula. These species are the streaked horned lark (*Eremophilia alpestris strigata*) (listed as threatened under ESA), yellow-billed cuckoo (listed as threatened under ESA), Taylor's checkerspot butterfly (*Euphydryas editha taylori*) (listed as endangered under ESA), and whitebark pine (*Pinus albicalus*) (listed as a candidate species for the ESA). However, these species use habitats that would not be affected by proposed actions in this plan/EIS, or have never been documented as occurring in Olympic National Park or Olympic National Forest. Because management activities associated with this plan/EIS would not impact them, these four species are not carried forward for detailed analysis. No threatened or endangered fish on the Olympic Peninsula would be affected by proposed mountain goat management activities.

Water Quality and Hydrologic Resources

Although there is the potential for low levels of sedimentation due to erosion resulting from mountain goat wallowing behavior, these impacts are more closely related to the destruction of alpine soils than to water quality and hydrologic resources. As a result, this topic was dismissed from detailed analysis.

Air Quality, Greenhouse Gas Emissions, and Climate Change

Although management actions may result in emissions of criteria pollutants pursuant to the *Clean Air Act* and greenhouse gases due to the use of aircraft and other vehicles, contributions would be extremely low and would result in impacts on air quality and greenhouse gas emissions that would be below de minimis levels. As a result, air quality and greenhouse gas emissions were dismissed from detailed analysis.

The effects of climate change can result in increased stress to natural systems. A large and varied number of potential climate change impacts are anticipated within the Pacific Northwest, including decreased mountain snowpack, earlier snowmelt, potential extinction of local populations, loss of biological diversity, and many others (CIG 2015). Although climate change could impact the resources discussed in this plan/EIS, the alternatives are not expected to have an impact on climate change. For example, the management activities proposed to capture mountain goats would result in fossil fuel consumption from helicopters and trucks, but the greenhouse gas emissions associated with these activities would be negligible because of the limited number of flights that would be anticipated. As a result, climate change was dismissed from detailed analysis.

Unique Ecosystems, International Biosphere Reserve, World Heritage Sites

Park attributes have led to multiple international designations, including the park being named an International Biosphere Reserve in 1976 and being declared a World Heritage Site in 1981. These designations label the park as an area to be valued for study of biological evolution and natural processes that are largely free of human disturbance and as a natural and cultural property that represents an irreplaceable treasure of outstanding universal value. Few areas in the United States are designated as both an International Biosphere Reserve and World Heritage Site (NPS 2008a).

The park is recognized for ecosystem diversity that includes glacier-clad peaks, extensive alpine and subalpine meadows, and extensive old growth forests, which include one of the best examples of intact and protected temperate rainforests in the Pacific Northwest. Multiple major rivers systems offer some of the best habitats for anadromous fish species in the country (UNESCO 2015a).

According to the United Nations Educational, Scientific, and Cultural Organization, the primary danger to the integrity of the park's unique attributes is the presence of mountain goats. As a result of the isolation of the park, mountain goats never naturally dispersed to the Olympic Mountains and their introduction "may be causing significant changes in the natural ecosystem. The mountain goats have reduced plant cover, increased erosion, and shifted plant-community dominant species toward more resistant or less palatable species" (UNESCO 2015b).

Because threats to unique ecosystems and related designations are primarily concerning impacts on vegetation, soils, and wildlife, potential impacts on the park's special designations are addressed through analysis of these resources. Additionally, because action alternatives associated with this plan/EIS would reduce or eliminate mountain goats, an exotic species, from the natural ecosystem, these designations would not be negatively impacted. As a result, this topic was dismissed from detailed analysis.

Socioeconomic Resources

Although the State of Washington and the local tribes have a mountain goat hunting season on the Olympic Peninsula, and management of mountain goats on the Olympic Peninsula may result in a decreased huntable population outside of the park, this activity does not generate significant income and would therefore have no impact on socioeconomic resources in the area surrounding the park. Additionally, there is no tourism industry associated with mountain goats on the Olympic Peninsula. As a result, this topic was dismissed from detailed analysis.

Environmental Justice

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, provides that "each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations." A minority population exists within an affected area when either the minority population exceeds 50%, or the minority population is meaningfully greater than the minority population of the general population (CEQ 1997).

Minority populations on the Olympic Peninsula are largely made up of native tribal communities that participate in native forest harvest practices. As discussed for socioeconomic resources, the State of Washington and the local tribes have a mountain goat hunting season on the Olympic Peninsula, and management of mountain goats within the park may result in a decreased huntable population outside the park. However, although minority populations are present on tribal lands surrounding the park, tribal hunting activities do not generate significant income or subsistence and would therefore not disproportionately impact low-income or minority populations in the area surrounding the park. As a result, environmental justice was dismissed from detailed analysis.

Cultural Landscapes

A cultural landscape is "a reflection of human adaptation and use of natural resources and is often expressed in the way land is organized and divided, patterns of settlement, land use, systems of circulation, and the types of structures that are built. The character of a cultural landscape is defined both

by physical materials, such as roads, buildings, walls, and vegetation, and by use reflecting cultural values and traditions" (NPS 1998). Three of the four cultural landscapes within the park are located within designated wilderness areas. However, none of these cultural landscapes is in the project area for this plan/EIS and would not be impacted by the management of mountain goats. As a result, the cultural landscapes topic was dismissed from detailed analysis.

Historic Structures

Historic structures are defined as "material assemblies that extend the limits of human capability" (NPS 1998). Simply, this means a constructed work, usually immovable by nature or design, consciously created to serve some human activity. Historic structures within the project area include the Dodger Point Lookout, the Snowdome Research Facility, and two shelters in Glacier Meadows. However, these resources would not be impacted by the management of mountain goats. As a result, the historic structures topic was dismissed from detailed analysis.

Ethnographic Resources

Ethnographic resources are any "site, structure, object, landscape, or natural resource feature assigned traditional, legendary, religious, subsistence or other significance in the cultural system of a group traditionally associated with it" (NPS 1998). Ethnographic resources are a component of "Other Features of Value" considered in the definition of wilderness character. Ethnographic resources within the project area include beargrass and Alaska yellow cedar. However, the potential for adverse impacts on these resources from the management of mountain goats (presence of removal crews on the ground) would be very small and impacts from the removal of mountain goats would be beneficial over the long term. As a result, the ethnographic resources topic was dismissed from detailed analysis.

Exotic Plant Species

There are more than 300 exotic plant species within the Olympic Mountains. Many exotic plant species are found in disturbed areas of the frontcountry near roads. Exotic plant species are typically found at lower elevations not associated with mountain goat habitat, and generally would not be expected to successfully establish in alpine environments. If areas of exotic plant infestation were detected at staging areas, these areas would be avoided or approved mitigation measures would be applied. As a result, no impacts related to the spread of exotic species would be expected under any of the alternatives. This topic was therefore dismissed from analysis as a component of impacts on vegetation.

Impacts on Soils and Visitor Safety at Staging Areas

Staging areas would be located in previously disturbed areas with paved, graveled, or vegetated surfaces. Site preparation could be necessary to facilitate operations at some staging areas, which are in previously disturbed habitats, resulting in no measurable impacts on soils. As a result, staging areas were dismissed from analysis as a component of impacts on soils.

All staging areas have been selected in part on the basis of the ability of NPS, WDFW, and USDA Forest Service to control access, and all would be temporarily closed to the public while mountain goat management activities are taking place at the site. Thus, no opportunities for injury or other adverse visitor safety impacts on visitors would be expected to result from activities at staging areas. As a result, staging areas were dismissed from analysis as a component of impacts on visitor safety.

Impacts on Soils from Management Actions

Management actions would not permanently disturb soils or change soil profiles. Soils would be traversed and helicopters would touch down in some locations, but these actions would only cause slight, temporary disturbance to soils. Therefore, impacts on soils from management actions were dismissed from detailed analysis.

Issues Eliminated from Further Consideration – North Cascades National Forests

Issues and impact topics related to translocating mountain goats into North Cascades national forests area were analyzed by the USDA Forest Service. For some issues, it was determined that there would be no impacts or very limited impacts; therefore, these issues do not warrant more detailed discussion. The following issues and impact topics were therefore removed from detailed consideration in the North Cascades national forests section of this plan/EIS.

Water Resources

Mountain goat restoration activities would not be expected to involve the direct use of or activity in any water resources, including wetlands and floodplains. Given the anticipated nature, scope, and scale of restoration activities, potential impacts could be avoided through mitigation measures such as keeping equipment and personnel out of riparian areas and wetlands. The nine aquatic conservation strategy objectives have been considered and are found in appendix C. No impacts on water resources or water quality of those features are expected as a result of the implementation of mountain goat restoration activities; therefore, this topic was dismissed from further consideration.

Air Quality

The North Cascades national forests lie in the path of prevailing westerly winds blowing from rapidly growing urban-industrial and agricultural areas in the Puget Sound region. Pollutants such as particulate matter, ozone, acid deposition, mercury, and pesticides have been detected across the surrounding region. Some of the activities associated with mountain goat translocation activities would require fossil fuel consumption, such as the use of vehicles and helicopters to carry out prescribed management activities. However, the increase in emissions from these activities would be minimal over the short term, resulting in only negligible impacts on regional air quality relative to existing conditions, and these activities would be consistent with the *Clean Air Act.* This topic was therefore dismissed from further consideration.

Geology and Soils

Mountain goat translocation activities in the North Cascades national forests would not be expected to result in any direct ground disturbance. Although mountain goats are known to disturb soils, they are native to the North Cascades and currently inhabit these areas; therefore, any soil disturbance from additional mountain goats would be a natural and expected component of their native ecosystem. Given the anticipated nature, scope, and scale of mountain goat restoration activities, no impacts on geology or soil resources are anticipated; therefore, this topic was dismissed from further consideration.

Cultural and Historical Resources

There are no known cultural, historic, or archaeological resources within the project area that would be disturbed as a result of actions related to mountain goat restoration (Alford pers. comm. 2016). A review

of existing site data was conducted for the staging areas and release sites proposed on the Mt. Baker-Snoqualmie National Forest. There are no known significant archaeological or cultural sites in the proposed locations. In addition, the proposed staging and release activities do not have the potential to adversely affect cultural resources. In accordance with 36 CFR 800.3(a)(1), no consultation was necessary and the agency official has no further obligations under section 106 of the *National Historic Preservation Act*. The activities of a native species on the landscape is not an undertaking as defined per 36 CFR 800.11. Therefore, the agency has no consultation responsibilities in regards to the presence of goats and the *National Historic Preservation Act*. Because there would be no direct or indirect effects on cultural or archeological resources resulting from mountain goat release activities in the North Cascades national forests, this impact topic was dismissed from further consideration.

Visual Resources

Mountain goat restoration activities would not be expected to have any direct or indirect impacts on visual resources. Any visual impacts that may result from the presence of vehicles, equipment, and personnel during the implementation of mountain goat restoration activities are analyzed within the context of the impacts on visitor use and experience or wilderness character, as applicable. Therefore, this topic was dismissed from further consideration.

Climate Change and Greenhouse Gas Emissions

The reasons for dismissing climate change and greenhouse gas emissions are the same as stated above for the Olympic Peninsula.

Acoustic Environment

If mountain goats are translocated to the North Cascades national forests, the noise from the use of aircraft, particularly in designated wilderness areas, or other vehicles outside of wilderness areas could adversely affect wildlife, wilderness character, and visitor use and experience. The soundscape is expected to have intermittent and temporary impacts; however, these noise impacts are addressed within the context of the analysis of impacts on wildlife, wilderness character, and visitor use and experience; therefore, this topic was dismissed from consideration as a separate impact topic.

Exotic Species

The reasons for dismissing exotic species as an impact topic are the same as stated above for the Olympic Peninsula.

Environmental Justice

The reasons for dismissing environmental justice as an impact topic are the same as stated above for the Olympic Peninsula.

Wild and Scenic Rivers

The National Wild and Scenic Rivers System was created by congress in 1968 (Public Law 90-542; 16 United States Code (USC) 1271 et seq.) to preserve certain rivers with outstanding natural, cultural, and recreational values in a free-flowing condition for the enjoyment of present and future generations. Rivers are classified as wild, scenic, or recreational.

The Skagit Wild and Scenic River is designated as a Recreational and Scenic River to conserve its outstandingly remarkable fisheries, wildlife, and scenic values. Temporary use of an area, referred to as the Green Mountain Pasture staging area, would not affect the scenic quality of the Skagit River because the staging area is not visible from the edge of the wild and scenic river. The use of this staging area to receive and transfer mountain goats would be temporary, therefore would not adversely affect the scenic quality nor any of the other outstandingly remarkable values of the river.

The Snowking Meadow release site is near the Illabot Creek Wild and Scenic River. Augmenting existing native mountain goat populations in the wild and scenic river corridor by adding additional mountain goats to suitable habitat would not affect the existing wild or recreational values of Illabot Creek. Although the mountain goats would be placed within the designated recreational and wild corridor, there would be no adverse impacts on the free flow, water quality, or outstandingly remarkable values of the Illabot Creek.

For these reasons, this topic was dismissed for consideration as a separate impact topic.

Prime Farmland, Parkland, or Rangeland

There is no prime farmland, parkland, or rangeland within the project area and because mountain goats are not expected to use farmland, parkland, or rangeland they will then be removed by the WDFW if mountain goats are found on these locations. Therefore, no impact on these areas is expected and this topic was dismissed from further consideration.

Research Natural Areas

The Mount Stillaguamish release site is located just outside of the Perry Creek Research Natural Area. The Twin Peak translocation patch includes almost all of the 2,300-acre Research Natural Area. Perry Creek Research Natural Area was established to represent a mosaic of forest, valley bottom, aquatic, and subalpine communities including its diverse and rich assemblage of fern species. The Pacific Northwest Research Station Director has reviewed this project for consistency and concurs with the proposed translocation (FS Pacific Northwest Research Station 2016); therefore, this was dismissed for consideration as a separate impact topic.

Chapter 2:

Alternatives

CHAPTER 2: ALTERNATIVES

INTRODUCTION

The *National Environmental Policy Act* (NEPA) requires federal agencies to explore a range of alternatives representing substantively different options to meet the purpose and need, including alternatives considered but dismissed from detailed analysis; and to analyze impacts that any reasonable alternatives could have on the human environment. The "Environmental Consequences" chapter of this *Mountain Goat Management Plan / Environmental Impact Statement* (plan/EIS) presents the results of the analyses. The alternatives under consideration must include a no-action alternative, as prescribed by 40 CFR 1502.14. Alternative A in this plan/EIS is considered to be the no-action alternative because it is the continuation of current management as presented in the *Mountain Goat Action Plan* (appendix A). The three action alternatives presented in this chapter were developed by the interagency planning team, which included federal and state agencies, and through feedback received during the public scoping process (see "Chapter 5: Consultation and Coordination").

Each of the three action alternatives analyzed in this plan/EIS meets the management objectives to a large degree and addresses the purpose of and need for action as described in chapter 1. Because each action alternative responds to the objectives and is technically and logistically feasible to implement, all are considered "reasonable."

This chapter first provides an overview of the alternatives in table form. Next, the alternatives, including elements common to all alternatives, are described in detail. The remainder of the chapter presents alternatives that were considered but dismissed from further analysis; how alternatives meet the plan/EIS objectives; mitigation measures common to the action alternatives; the National Park Service (NPS) preferred alternative; and the environmentally preferable alternative.

OVERVIEW OF ALTERNATIVES

As required by NEPA, the alternatives described in this chapter represent options for managing mountain goats in Olympic National Park and adjacent areas of Olympic National Forest on the Olympic Peninsula. As a result of the alternatives development process, three action alternatives were identified for detailed analysis, two of which include actions to translocate mountain goats to National Forest System (NFS) lands administered by the Mt. Baker-Snoqualmie and Okanogan-Wenatchee National Forests (North Cascades national forests) in the North Cascades ecosystem. Table 1 shows a summary of actions proposed under each alternative and their associated management elements.

Outcomes of this planning process will result in a plan that will serve as the authorized Mountain Goat Management Plan for Olympic National Park. An implementation plan outlining detailed actions for mountain goat management on the Olympic Peninsula will be developed following completion of this planning process and formal selection of an alternative and a management plan.

TABLE 1. SUMMARY OF ALTERNATIVES AND THEIR MANAGEMENT ELEMENTS

Element	Alternative A: No Action	Alternative B: Capture and Translocation	Alternative C: Lethal Removal	Alternative D: Combination of Capture and Translocation and Lethal Removal
General Description of Alternative				
	Full implementation of the 2011 *Mountain Goat Action Plan* (appendix A). Manage individual mountain goats in visitor use areas, including hazing or lethal removal activities.	Capture mountain goats within the park and adjacent Olympic National Forest and transfer them to Washington Department of Fish & Wildlife (WDFW) for translocation to the North Cascades national forests.	Lethal removal of mountain goats within the park and adjacent Olympic National Forest.	Combination of management activities under alternatives B and C. Capture and translocation would take place prior to initiation of lethal removal activities. Once capture operations become unfeasible, use lethal removal of mountain goats.
Management Elements				
Nuisance Mountain Goat Control	Employ nuisance control based on a continuum of mountain goat-human interactions and the appropriate park responses as presented in the 2011 *Mountain Goat Action Plan* (appendix A). Specific actions range from hazing to lethal removal.	Employ nuisance control measures as needed on a case-by-case basis.	Same as alternative B.	Same as alternative B.
Information and Education	Continuation of current public education methods, including backcountry use notices, informational handouts, interpretive programs, and direct interaction between park staff and visitors.	Same as alternative A, with the addition of the following: • Increased education, including media outreach and website resources. • Detailed information provided to the public regarding potential areas of temporary closures.	Same as alternative B.	Same as alternative B.

Element	Alternative A: No Action	Alternative B: Capture and Translocation	Alternative C: Lethal Removal	Alternative D: Combination of Capture and Translocation and Lethal Removal
Helicopter Use	Helicopter use on the Olympic Peninsula for surveying or removing conditioned goats on an as-needed basis.	Use helicopters on the Olympic Peninsula and North Cascades national forests during two separate 2-week management periods in a given year: once in mid- to late July, and the second in late August to mid-September. Helicopter flight paths would be determined by weather, but would usually take the most direct routes to and from staging areas and areas where mountain goats are either being captured or released. A maximum of 384 flight hours could occur over 48 days across a 2-year period on the Olympic Peninsula. Table 2 provides estimated helicopter use on the North Cascades national forests.	Similar to alternative B, but would require no helicopter use in the North Cascades national forests. A maximum of 384 flight hours could occur over 48 days across a 2-year period on the Olympic Peninsula.	Combination of alternatives B and C, with helicopter use on the Olympic Peninsula and in North Cascades national forests. A maximum of 768 flight hours could occur over 96 days across a 4-year period on the Olympic Peninsula. Table 2 provides estimated helicopter use on the North Cascades national forests.
Staging Areas	Minimal use of established NPS staging areas for surveying or removing conditioned goats. No additional site preparation would be necessary.	Staging areas required for safe and accessible mobilization of staff and equipment during mountain goat management activities.	Similar to alternative B, although alternative C would have fewer flights and would have less use of the staging areas.	Combination of alternatives B and C.

Element	Alternative A: No Action	Alternative B: Capture and Translocation	Alternative C: Lethal Removal	Alternative D: Combination of Capture and Translocation and Lethal Removal
Receiving Locations	Not applicable.	Following transfer of mountain goats to WDFW at staging areas on Olympic Peninsula, mountain goats would be transported to the North Cascades national forests to supplement existing populations in areas identified as suitable for supporting larger conservation herds. Translocation would be managed by WDFW. Mountain goats may be translocated to other locations or entities as deemed appropriate by WDFW (e.g., translocation of mountain goat kids to zoos or transfer of mountain goats to other wildlife agencies outside of Washington State).	Not applicable.	Same as alternative B.
Management Access	Hiking into areas to haze or lethally remove mountain goats. Helicopter use to transport crews for emergencies.	Hiking into areas for ground-based capture operations. Helicopters used to drop off equipment (e.g., nets and crates), to drop off and pick up capture or release crews, to capture or release mountain goats in remote areas, and to transport mountain goats to staging areas or release sites. Helicopters would need to land in wilderness at these times (up to three landings for each capture).	Hiking into areas for ground-based lethal removal. Helicopter or fixed-wing airplane used for lethal removal of mountain goats from the air. Helicopter landings within wilderness may be necessary for lethal removal and mountain goat carcass retrieval, on an infrequent basis.	Combination of alternatives B and C.

Element	Alternative A: No Action	Alternative B: Capture and Translocation	Alternative C: Lethal Removal	Alternative D: Combination of Capture and Translocation and Lethal Removal
Tools for Capturing Mountain Goats	Drop nets, clover traps, and dart guns used to capture problem mountain goats for ear tagging or fitting with radio collars according to the *Mountain Goat Action Plan*.	Ground-based capture methods including drop nets, clover traps, and darting. Helicopter-based capture methods including net guns and darting. As applicable, use of methods in 351DM2 – 351DM3 "Aerial Capture, Eradication and Tagging of Animals (ACETA) Handbook" (DOI 1997).	Not applicable.	Same as alternative B.
Area Closures	Temporary short-term closures of limited areas for ground capture, hazing, and lethal removal actions.	Same as alternative A, with temporary short-term closures of certain trails and trailheads surrounding staging areas for takeoff and landing of helicopters. Closures could last the full duration of each 2-week management period, but would depend on specific management activities, environmental conditions, and behavior or density of mountain goats.	Same as alternative B.	Same as alternative B.
Baiting	Not applicable.	Salt blocks could be used as a tool to attract mountain goats for capture and to acclimate mountain goats to release areas.	Salt blocks could be used as a tool to attract mountain goats for lethal removal.	Combination of alternatives B and C.
Lethal Removal	Lethal removal of mountain goats displaying aggressive behaviors or presenting threats to human safety. Euthanize mountain goats with life-threatening injuries during management activities.	Euthanize mountain goats with life-threatening injuries during capture and translocation activities.	Lethal removal of mountain goats on the Olympic Peninsula using park staff, other federal personnel, hired contractors from Animal & Plant Health Inspection Service (APHIS) or US Department of Agriculture (USDA) Wildlife Services, state personnel, or trained volunteers.	Combination of alternatives B and C.

Element	Alternative A: No Action	Alternative B: Capture and Translocation	Alternative C: Lethal Removal	Alternative D: Combination of Capture and Translocation and Lethal Removal
Animal Welfare Tools and Considerations	All humane management methods and regulations would be taken into consideration and implemented as applicable.	Same as alternative A.	Same as alternative A.	Same as alternative A.
Number of Mountain Goats to be Removed				
Mountain Goat Population Goal	Not applicable.	Desired eventual population size of zero, while acknowledging that goal may not be met because a substantial percentage of mountain goats could be uncatchable or capture and translocation operations activities would cease once they become unfeasible. Estimated population reduction is approximately 50%.	Desired eventual population size of zero, while acknowledging that it may not be possible to lethally remove all mountain goats. At least 90% of the population would be removed.	Desired eventual population size of zero, while acknowledging that it may not be possible to capture or lethally remove all mountain goats. At least 90% of the population would be removed.
Initial Management	Displace habituated mountain goats from areas with high levels of visitor use according to the management continuum presented (appendix B).	Capture and translocate as many mountain goats as possible from the Olympic Peninsula. It is estimated that approximately 50% of the mountain goat population could be captured and translocated, or approximately 325–375 animals based on the projected 2018 population size.	Lethally remove as many mountain goats as possible from the Olympic Peninsula. It is estimated that at least 90% of the mountain goat population could be lethally removed, or approximately 625–675 animals based on the projected 2018 population size.	Combination of alternatives B and C. It is estimated that approximately 50% of the mountain goat population could be captured and translocated, or approximately 325–375 animals based on the projected 2018 population size. Capture and translocation would take place prior to lethal removal activities. It is estimated another 40% of the original mountain goat population (approximately 275–325 animals) would be lethally removed. Similar to alternative C, this would ultimately result in the removal of at least 90% of the mountain goat population.

Element	Alternative A: No Action	Alternative B: Capture and Translocation	Alternative C: Lethal Removal	Alternative D: Combination of Capture and Translocation and Lethal Removal
Maintenance Activities	Same as “initial management” element. Level of management effort would likely increase over time as the mountain goat population on the Olympic Peninsula would continue to increase.	Approximately 50% of the mountain goat population would remain following initial management. Maintenance activities would target mountain goats in areas that reoccupy areas of high visitor use. Maintenance activities are expected to require a greater level of effort than under alternatives C and D because fewer mountain goats would be removed during initial maintenance and it is expected the population would rebound to previous levels within 10 to 15 years.	At most, 10% of the mountain goat population would remain following initial management. Maintenance activities would be prioritized in areas of high visitor use and would target larger groups of mountain goats that appear most likely to increase in number.	Same as alternative C.

Element	Alternative A: No Action	Alternative B: Capture and Translocation	Alternative C: Lethal Removal	Alternative D: Combination of Capture and Translocation and Lethal Removal
Timing and Duration of Management Actions				
Initial Management	Existing management activities would continue, primarily in summer and fall. Duration of management activities would depend on visitor usage, environmental conditions, and behavior of mountain goats.	Duration of 3 to 5 years, with most of the activity in years 1 to 2. Most mountain goats would be captured and translocated in years 1 and 2, with decreasing feasibility or need in years 3, 4, and 5. Helicopter-based capture and translocation activities would take place during two 2-week management periods: one in mid- to late July and the second in late August to mid-September. Helicopters would operate up to a maximum of 12 days, and a maximum of 8 hours per day, although conditions would likely limit the actual number of days. Capture and translocation activities would take place primarily during cool early morning hours to reduce mountain goat distress.	Duration of 3 to 5 years, with most of the activity in years 1 to 3. Most lethal removal of mountain goats in years 1 to 3, with decreasing feasibility or need in years 4 and 5. Lethal removal would start with ground-based operations in the fall of year 1 using skilled public volunteers and park staff. Ground-based lethal removal activities would peak in the fall when park visitation is low, but could take place opportunistically at any time during the year as needed. In years 2 through 5, helicopter-based lethal removal activities would take place during two 2-week management periods: one in mid- to late July and the second in late August to mid-September. Helicopters would operate on up to a maximum of 12 days, and a maximum of 8 hours per day.	Duration of 3 to 5 years, with most of the activity in years 1 to 4. As a combination of alternatives B and C, mountain goats would first be captured and translocated in years 1 to 2, with decreasing feasibility or need in years 3, 4, and 5. Management would switch to lethal removal when mountain goats become more difficult to capture, there are no willing recipients, funding becomes limited, or it is no longer safe and efficient to capture mountain goats. Limited lethal removals in some areas could start as early as the fall of year 1 but are expected to start following the completion of the second round of captures in year 2 using skilled public volunteers and park staff.

Element	Alternative A: No Action	Alternative B: Capture and Translocation	Alternative C: Lethal Removal	Alternative D: Combination of Capture and Translocation and Lethal Removal
Maintenance Activities	Same as “initial management” element.	As early as 5 to 15 years after initial management and include the same capture and translocation activities, assuming there is available funding and WDFW is willing and able to translocate additional mountain goats or broker their translocation. The amount of time needed for capture operations would likely increase over time, as the mountain goat population decreases and mountain goats move to increasingly remote areas where capture operations would require greater effort.	The timing of maintenance activities would depend on the success of initial lethal removal of mountain goats, which if highly successful, additional lethal removal may not be needed at all, or may not be needed until 5 to 15 years following the cessation of initial management. Management activities would include use of ground-based and helicopter operations and would be short duration (1 to 5 days). Lethal removal of mountain goats under the maintenance phase would cease when it was determined that the cost for lethal removal operations exceeds the resources available, there is no funding available, or the risk to those engaged in lethal removal is determined to be too high.	Same as alternative C.

Element	Alternative A: No Action	Alternative B: Capture and Translocation	Alternative C: Lethal Removal	Alternative D: Combination of Capture and Translocation and Lethal Removal
Other Considerations				
Research and Monitoring	Potential may exist for research on the efficacy of hazing on altering mountain goat behavior, habitat use and movements. Periodic surveys would be needed to monitor the mountain goat population, which would include periodic (every 4 to 6 years) helicopter flights for approximately 6 days, for 4 to 5 hours per day.	Olympic Peninsula: Periodic surveys would be needed to monitor the mountain goat population, with the same frequency and duration as in alternative A. North Cascades national forests: Survival and movements of mountain goats would be tracked through the use of radio collars.	Olympic Peninsula: No need for aerial surveys, but may need reconnaissance flights prior to maintenance operations to search for remnant goats; likely over one to two mornings (4 to 8 hours over 2 days). Remnant mountain goats would be documented opportunistically during elk surveys. North Cascades national forests: No additional research because no goats would be translocated.	Olympic Peninsula: Same as alternative C. North Cascades national forests: Same as alternative B.
Carcass Handling and Disposal	Carcasses of mountain goats would be left in the field and would be moved approximately 325 feet from visitor use areas.	Same as alternative A, but carcasses could be donated for human consumption or to tribes or other willing recipients for horns and hides, depending on the condition of the carcass and arrangements that could be made.	With the projected lethal removal of at least 90% of the mountain goat population, there is a potential for approximately 625–675 carcasses to be left in the field. The actual number would be lower due to (1) removal of some carcasses from the back country by ground-based crews, and (2) removal of carcasses by helicopter near developed areas or where they can be safely transported to staging areas. Remaining carcasses would be in remote areas, and at least 325 feet from visitor use areas.	With the projected lethal removal of at least 40% of the mountain goat population, there is a potential for approximately 275–325 carcasses to be left in the field. The actual number would be less due to (1) removal of some carcasses from the back country by ground-based crews, and (2) removal of carcasses by helicopter near developed areas or where they can be safely transported to staging areas. Remaining carcasses would be in remote areas, and at least 325 feet from visitor use areas.

Element	Alternative A: No Action	Alternative B: Capture and Translocation	Alternative C: Lethal Removal	Alternative D: Combination of Capture and Translocation and Lethal Removal
Management Activities Outside of the Park	Management of nuisance mountain goats in Olympic National Forest by USDA Forest Service and WDFW would continue. Tribal and sport hunting would continue during the fall.	Same as alternative A, plus management activities would involve the capture and translocation of mountain goats outside of park boundaries, on Olympic National Forest lands.	Same as alternative A, plus management activities would involve the lethal removal of mountain goats outside of park boundaries, on Olympic National Forest lands.	Combination of alternatives B and C.

ALTERNATIVE A: NO ACTION

The Council on Environmental Quality (CEQ) requires that the alternatives analysis in an EIS "include the alternative of no action" (40 CFR 1502.14(d)). Alternative A, the no-action alternative, would be a continuation of existing management practices and assumes no new management activities would be implemented beyond those available when this plan/EIS planning process started.

The no-action alternative would be a continuation of existing management practices and assumes no new management activities would be implemented beyond those available when this plan/EIS planning process started.

Under the no-action alternative, options for the management of mountain goats in the park would be limited to those actions outlined in the *Mountain Goat Action Plan* (appendix A) and the *Mountain Goat Action Plan Continuum* (appendix B), which was revised by an NPS workgroup in 2015. The goal of the action plan is "that [mountain] goats in the park exhibit natural behaviors consistent with other portions of their range, to not have those natural behaviors altered by human use of their habitats (i.e., become habituated or conditioned), and to minimize the potential for hazardous mountain goat human encounters" (appendix A).

Unacceptable mountain goat behaviors include the following:

- failing to retreat when coming in sight of people;
- allowing people to approach within 150 feet;
- approaching and following people on trails or at camp or rest sites;
- aggressively seeking out areas where humans urinate and consuming soil and vegetation where human urine is deposited;
- making contact with clothing or equipment; chewing gear, seeking salt;
- displaying aggressive postures or behavior to people when encountered on or off trail;
- attacking and making contact with humans.

***habituated**: Habituated mountain goats have not necessarily become overly familiar with humans, but are comfortable in the presence of humans.*

***conditioned**: Conditioned mountain goats display aggressive (non-defensive) behavior toward humans, or have become overly familiar with humans.*

(Refer to the Glossary for complete definitions of these terms.)

Management under the *Mountain Goat Action Plan*, and therefore under alternative A, would be an integrated effort between all park divisions with an emphasis on preventing unacceptable mountain goat behavior. Management according to the action plan is set up according to a continuum of mountain goat-human interactions and the appropriate park response to each. For additional details regarding management activities associated with the no-action alternative, see the complete *Mountain Goat Action Plan* (appendix A).

Management Elements

Common management activities currently conducted in Olympic National Park, which would continue under the no-action alternative, are described below. Under a continuation of current management, an Olympic National Park biological technician would be on duty 7 days per week as funding allows

conducting foot patrols in problem areas (e.g., the Hurricane Ridge / Klahhane Ridge Trail complex) during times when mountain goats are known to actively interact with people (approximately late June until mid-September). Additional areas where mountain goats have been recently reported, or where mountain goats have historically interacted with humans, would be patrolled during daylight hours. When mountain goats are encountered, they would be evaluated for their level of habituation and hazed if they do not keep distances greater than 150 feet from humans. Tools used for hazing would include clapping, shouting, throwing rocks, yelling, and using paintball guns or nonlethal shotgun rounds. The NPS would continue to mark mountain goats that interact at close distances to people with paintballs or capture and radio-collar them if possible. Focused patrols would be conducted by rangers who are trained in animal hazing to educate visitors on hazing methods.

Under the no-action alternative, NPS would continue to collaborate with Olympic National Forest and WDFW partners to implement mountain goat management activities beneficial to the protection of park resources and visitors. Specific actions would include collaborating with Olympic National Forest to provide information to the public pertaining to safety guidelines for recreating in mountain goat habitat and coordinating with Olympic National Forest and the WDFW on nuisance mountain goat issues. The NPS may also coordinate with Olympic National Forest on closures in areas where mountain goat ranges are close to the boundary between the park and NFS lands, such as The Brothers, Buckhorn, and Mount Skokomish wilderness areas, as necessary. To monitor the future abundance of exotic mountain goats on the Olympic Peninsula, NPS would also coordinate with USDA Forest Service and WDFW to perform aerial population surveys.

In Olympic National Forest, the USDA Forest Service would continue to maintain voluntary visitor registries to record mountain goat sightings and interactions in areas with overlapping high visitor use and high mountain goat densities, such as Mt. Ellinor. Temporary area closures would continue to be implemented as necessary to protect human safety in the event of conflicts between humans and aggressive mountain goats. The USDA Forest Service would continue to conduct outreach to visitors in areas where mountain goats are known to occur, such as Mt. Ellinor, Mt. Washington, and other areas, and signs would be posted at trailheads advising visitors of mountain goat presence in the area. The USDA Forest Service would coordinate with WDFW as necessary regarding the lethal removal of nuisance mountain goats from NFS lands. Any actions on NFS lands would be carried out consistent with Forest Plan Standards and Guidelines (appendix D).

Other general management approaches that would continue to be available and employed under alternative A are described below.

Interpretive Tools. Park and national forest staff would continue to provide information and warnings regarding hiking safely with mountain goats, and educational opportunities to the public through interpretive programs and visitor interactions regarding the management of mountain goats on the Olympic Peninsula. Interpretation would include efforts to increase the public's awareness of the current mountain goat situation on the Olympic Peninsula, as well as associated management activities.

Nuisance Mountain Goat Control. In the *Mountain Goat Action Plan*, aversive conditioning consists of immediate and short-term hazing activities intended to modify mountain goat behavior and to drive mountain goats away from visitor use areas. Under the no-action alternative, nuisance control tools would vary from hazing actions, such as shouting and throwing rocks at mountain goats, to lethal removal of conditioned and aggressive goats, as described in the *Mountain Goat Action Plan* (appendix A).

Access. Park and national forest staff would primarily access mountain goat management areas on foot. Management activities under the no-action alternative would take place primarily in areas with high

visitor use that are accessed via hiking, but could also take place in more remote areas using helicopters as needed to complete necessary management activities.

Area Closures. Under the no-action alternative, it would be necessary to occasionally close areas of the park or national forest for human safety reasons or to conduct hazing activities associated with the no-action alternative. Often when hazing, management staff involve visitors in the process of shouting and throwing rocks at the mountain goats. If it is determined that lethal removal actions are required for a habituated mountain goat, that particular area of the park or national forest would be temporarily closed for the duration of the process. Closures for management may last from a few hours to a few weeks.

Lethal Removal. Under the no-action alternative, there would be the potential for lethal removal of individual mountain goats in the park and Olympic National Forest. This would involve using firearms such as high-powered rifles for the removal of mountain goats that have exhibited conditioned and aggressive behavior or have presented a clear threat to human safety. As necessary, park staff would be involved with such lethal removal and associated activities, which may include temporary area closures, shooting, and carcass handling. Each individual's role would be identified prior to lethal removal activities, and could include any of the actions noted above. The process for identifying mountain goats requiring lethal removal and specific protocols for lethal removal under the no-action alternative are described in the *Mountain Goat Action Plan* (appendix A) and is based on a continuum of observed mountain goat behavior (appendix B).

Timing and Duration of Management

The timing of management activities under alternative A would be based on the need for action, but would likely take place primarily during times of high visitor use within the park when there is greater potential for mountain goat-human interactions. The frequency of management activities would vary depending on the level of mountain goat-human interaction observed at a given time within the park. If mountain goat-human interactions are occurring often, then the frequency of management activities would increase. The short-term duration of management activities would vary depending on mountain goat responses to management activities. If management activities are effective, then the duration may last long enough to only haze the mountain goats out of an area. If mountain goats are not responsive to management activities, then the duration could increase to longer than one week or would take place sporadically throughout the spring and summer as mountain goats change their seasonal areas of concentrated use. The long-term duration of management activities would continue indefinitely into the future because the mountain goat population within the park would continue to increase.

Research and Monitoring

Under alternative A, research and monitoring activities would continue as necessary and based on available funding. There could exist future opportunity for research on the efficacy of hazing on altering mountain goat behavior, habitat use, and movements. Park staff would continue to perform mountain goat population monitoring, which would include periodic (every 4 to 6 years) helicopter flights for approximately 6 days, for 4 to 5 hours per day. Park and national forest staff would also continue to collect information on visitor interactions with mountain goats.

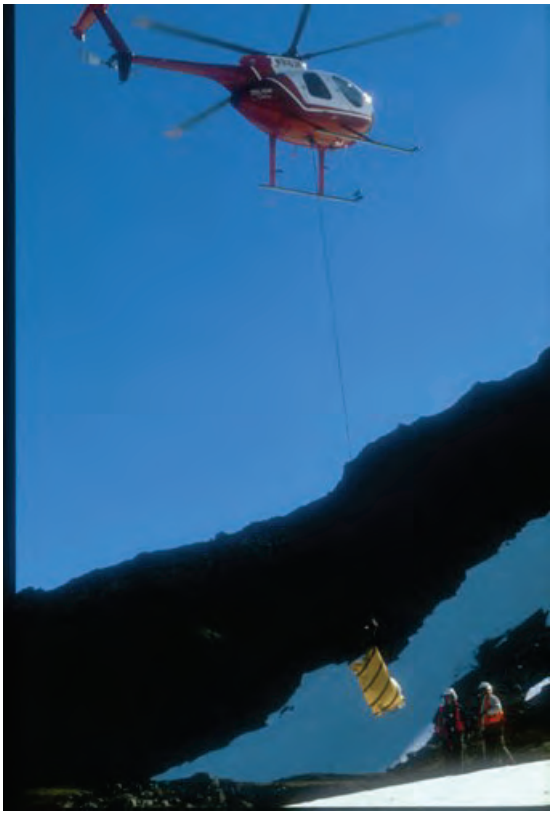
ELEMENTS COMMON TO ALL ACTION ALTERNATIVES (ALTERNATIVES B, C, AND D)

Some elements associated with mountain goat management on the Olympic Peninsula are considered common to all action alternatives. Implementation of any of the following actions is subject to available funding. Management elements that would be employed under all action alternatives are presented below.

Interpretive Tools. Under all action alternatives, park and national forest staff would provide information and educational opportunities to the public through interpretive programs and visitor interactions regarding the management of mountain goats on the Olympic Peninsula.

Under all action alternatives, there would be enhanced public outreach regarding actions related to the management of mountain goats and more in-depth interpretation. Interpretation would include efforts to increase the public's awareness of the current mountain goat situation within the park and adjacent areas in the Olympic National Forest, as well as about management activities that would be undertaken under the selected alternative. In addition to direct interactions between park interpretive staff and park visitors, interpretive tools could include enhanced outreach to media outlets, expanded website resources, additional backcountry notices, and informational handouts. Detailed information would be provided to the public regarding areas of potential temporary closures in the park and national forest.

Helicopters. Under all action alternatives, helicopters would be used during initial mountain goat management activities and less frequently for periodic maintenance activities as funding allows. The type of helicopter used would likely be either a Bell 206 or Hughes 500. Ideally, two helicopters could be used during mountain goat capture and translocation activities because it would be most efficient. However, the actual number and models of helicopters used would depend on what an approved contractor would use. Helicopter operations would take place over the course of two separate 2-week management periods in a given year, during which initial management activities would be most intensive. The first management period would likely be during mid- to late July, and the second would be during late August to mid-September. Taking into account the time needed to mobilize and demobilize, and depending on weather conditions, helicopter operations would more likely take place on 9 to 10 days out of the 2-week management period, but could be used for up to 12 days. Flight operations would take place for a maximum duration of 8 hours per day. Helicopters would operate from a combination of two out of five possible staging areas (described below) during any given 2-week management period. Helicopter flight paths would be determined by weather (cloud layers and winds), and helicopters would avoid high visitor use areas as much as possible. In general, helicopters would take the most efficient routes to and from the



Credit: NPS

Helicopter moving a mountain goat to a staging area for translocation

staging areas, most often flying over passes (e.g., Upper Cat Pass, Long Pass, and Boulder Creek Pass) and down river valleys such as the Elwha River Valley.

Area Closures. Under all action alternatives, there would be temporary area closures within both the park and national forests during management activities, which include lethal removal, capture, and translocation operations. Closures on NFS lands would be implemented under 36 CFR Part 261, Subpart B, "Prohibitions in Areas Designated by Order." In general, trails and campgrounds would remain open to the public in both backcountry and frontcountry areas as long as management personnel determine it is safe to do so. As applicable for each alternative, closures would include areas near ongoing management activities and immediately surrounding staging areas. There would be no parkwide or national forest-wide closures. Closures in specific areas could last for several days, potentially up to the full duration of the two separate 2-week management periods during each year when initial management activities are taking place. For example, backcountry and wilderness areas, including trails and campgrounds, on NPS or NFS lands with high mountain goat densities and high levels of visitor use (including High Divide, Hurricane Hill, Klahhane Ridge, Mt. Olympus, Lake of the Angels, Lena Lakes, Mt. Ellinor, and other areas) would be closed during management operations taking place in those areas, in order to allow for more efficient management of larger mountain goat populations and to ensure operator and visitor safety. If certain staging areas were used, closure of nearby trailheads and campsites could be implemented for safety reasons during the use of those staging areas. These closures may include the Hurricane Hill Trailhead near the Hurricane staging area, as well as the Mt. Ellinor and Mt. Washington trailheads and the Big Creek Campground trail system near the Mt. Ellinor staging area. No frontcountry campground closures are anticipated, although campgrounds located near staging areas, such as the Big Creek Campground near the Mt. Ellinor staging area, the Deer Park Campground near the Deer Park staging area, or the Lena Lakes Campground near the Hamma Hamma staging area, would have signs posted notifying campers of ongoing management activities. The NPS would coordinate a schedule of area closures six months in advance, or as soon as is feasible, with the Wilderness Information Center, which issues wilderness use permits, to ensure that no permits are issued for areas impacted by management activities. In addition, area closure signs would be posted at the Hamma Hamma staging area when it is in use, even though it is already gated and locked. Olympic National Forest closures associated with the Hamma Hamma staging area would be coordinated through the recreation and wilderness program. Closures would be advertised to the public and would also be coordinated with wilderness and law enforcement rangers, volunteer staff, and all other agency staff that could potentially be working in closed areas.

Staging Areas. Under all action alternatives, staging areas would be required for mobilization of staff and equipment during management activities. The use of helicopters to access remote areas of the park and national forest would require a safe and accessible space for taking off, landing, and refueling. Staging areas would require easily navigable road access with an adequate road surface for ease of access by trucks that would be transporting mountain goats, as well as trucks carrying fuel for helicopters. Space for animal care and handling would be required for the action alternatives that involve capture and translocation activities; this would include areas for unloading mountain goats from slings, providing veterinary care, processing, and loading mountain goats into vehicles for transport to receiving areas. Areas for helicopter landing would be located adjacent to mountain goat handling areas, but would be located far enough away to ensure maintain goat and employee safety. Five staging areas have been identified; three in the park and two on NFS lands. Each staging area is described below; the northern staging areas located in the park are shown in figure 3 and the southern staging areas on NFS lands are shown in figure 4.

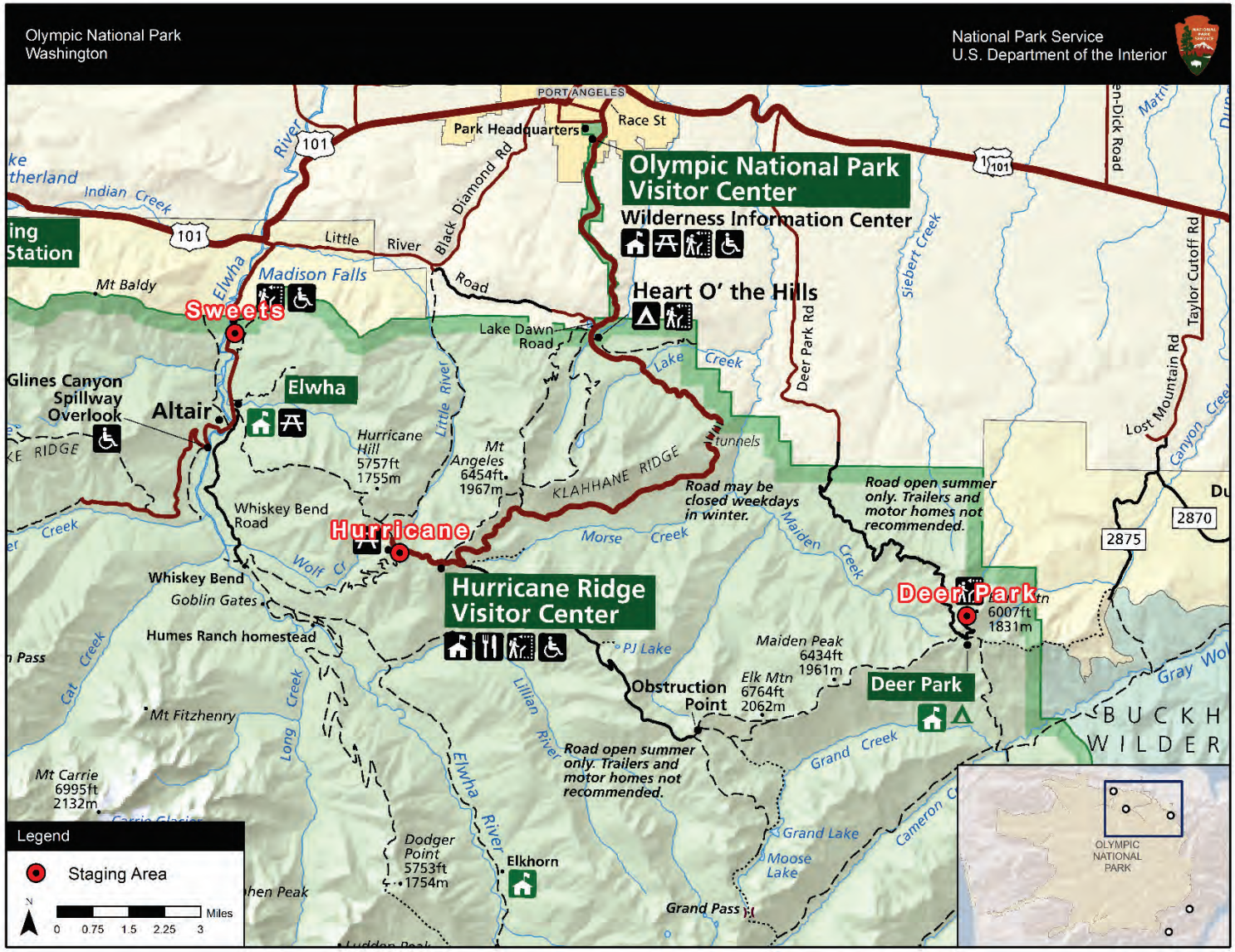


FIGURE 3. NORTHERN STAGING AREAS IN OLYMPIC NATIONAL PARK

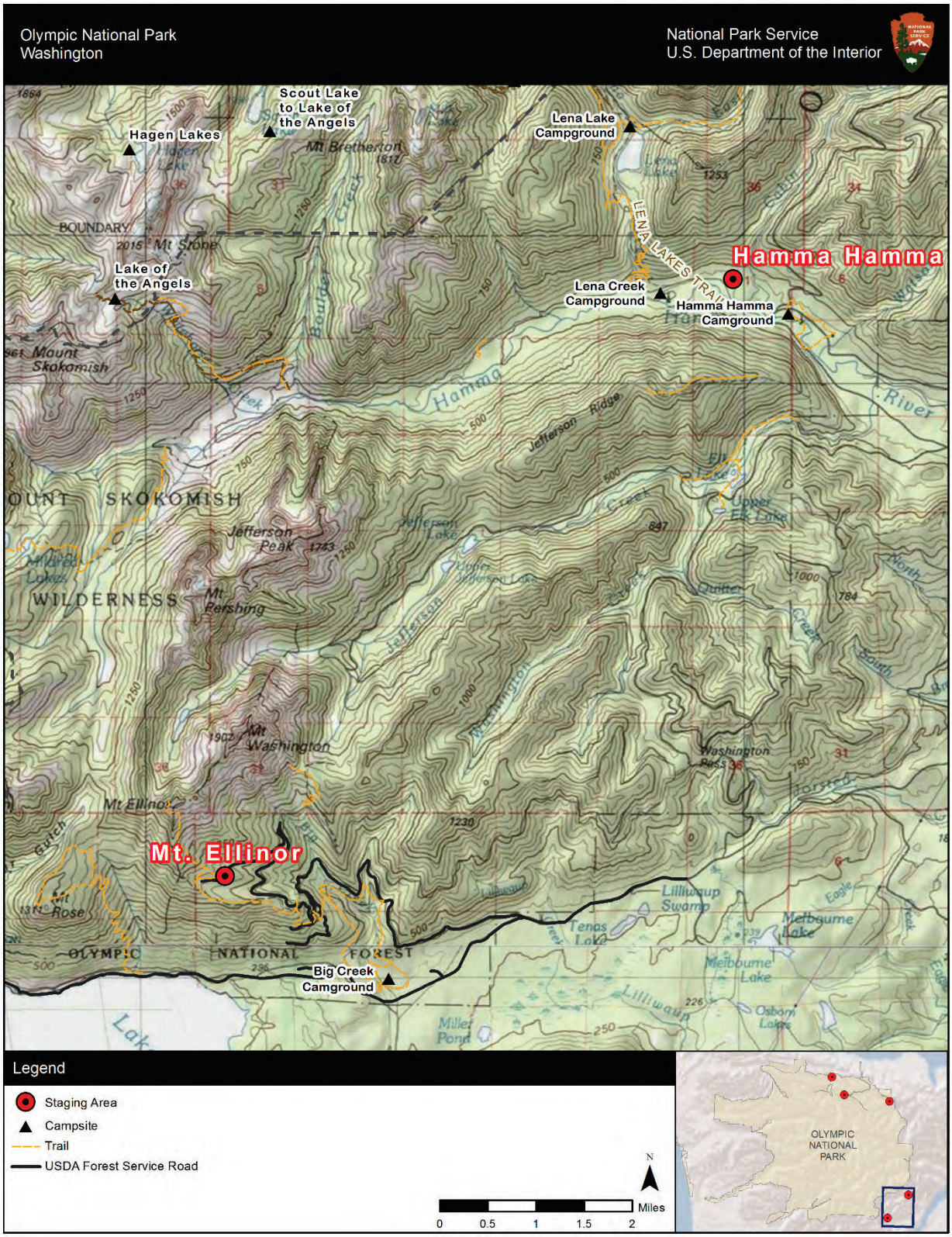


FIGURE 4. SOUTHERN STAGING AREAS IN OLYMPIC NATIONAL FOREST

Sweets—The Sweets staging area is located in the park and is the furthest northwest and lowest elevation of the five staging areas. At approximately 275 feet above sea level, it is accessed by a paved road (Olympic Hot Springs Road) and is located by the Madison Falls Trailhead parking lot. This area is already used for helicopter-based management activities in the park. Helicopters can land in the meadow to the south of the parking lot. Site preparation at this staging area would consist of mowing and removing shrubs and a limited number of small trees (less than 20 inches in diameter at breast height) within the meadow. Areas surrounding the staging area would generally not be closed to use, with the possible exception of the Madison Falls Trailhead, a day-use trail, if the decision were made that staging activities could affect hiker safety. No road closure would be necessary, but public access would need to be controlled during the use of this staging area because this road is used to access the upper Elwha River Valley.

Hurricane—The Hurricane staging area is located in the park, at the Hurricane Hill Trailhead parking lot, a paved parking area accessed via Hurricane Hill Road and approximately 1 mile beyond the Hurricane Ridge Visitor Center (figure 3). Its elevation is approximately 5,000 feet above sea level. Both the Hurricane Hill Trailhead and overflow parking area at Picnic Area B are anticipated to be used, and these areas would be temporarily closed during operations. Picnic Area A would remain open during operations and Hurricane Hill Road would be closed between Picnic Area A and Picnic Area B. Some small (less than 20 inches in diameter at breast height) subalpine firs and snags may need to be removed, and the area near the bulletin board may need to be leveled to allow safe helicopter operation. Use of this staging area would require closure of the Hurricane Hill Trail, a day-use trail, for the duration of staging activities.

Deer Park—The Deer Park staging area is located in the park and is the northeastern-most and highest elevation of the five staging areas (figure 3). At approximately 6,000 feet above sea level, the helicopter landing is on a flat, graveled area on a ridgetop accessed by Deer Park Road. Staging activities would be either adjacent to the landing area, near the Deer Park Ranger station or possibly nearby in a loop of the campground. Minimal site preparation would be necessary but some small (less than 20 inches in diameter at breast height) trees and snags may need to be removed at this staging area. Access to the Deer Park site is easily controlled, so if the site is used, it is possible that a temporary closure would only be required in the immediate vicinity of ongoing operations. The trail from Obstruction Point to Deer Park Trail would not likely need to be closed unless visitor safety concerns are identified. There is a primitive campground near the staging area as well, and campers at this site would be impacted by helicopter noise.

Mt. Ellinor—The Mt. Ellinor staging area is located on NFS land at the Upper Ellinor Trailhead parking lot, in the southeastern portion of the Olympic Mountains (figure 4) at approximately 3,500 feet above sea level. The site is accessed via a maintained, gravel NFS Road 2419-014. NPS would use the 0.25-acre trailhead parking lot as a landing zone, and could use a 0.3-acre gravel area north of the trailhead for additional parking if necessary (figure 4). A small number of small diameter (less than 8 inches in diameter at breast height) conifer trees would need to be removed to create a clear helicopter flight path. The trailhead area would need to be closed during operations, since much of the parking area would be taken up with operational needs. This staging area would not be used during July in order to reduce disturbance to park and national forest visitors. Big Creek Campground, located less than 2 miles from the staging area, would remain open and visitors would likely hear helicopter noise.

Hamma Hamma—The Hamma Hamma staging area is located on NFS land and is the southeastern-most of the five staging areas (figure 4), at approximately 700 feet above sea level. The site is an irregularly-shaped, 3.3-acre area that formerly hosted a gravel pit on NFS Road 2500-011. The ground surface is composed of areas of gravel and low vegetation. It is in a flat area, accessed by paved roads, located off of a spur that is gated; therefore, public access could be easily controlled with a temporary closure when in use. Some tree clearing (< 0.25 acre) would be necessary in areas along the perimeter of the site to create a clear 300-foot helicopter flight path. Trees would all be less than 20 inches in diameter at breast

height and would consist of a mix of alders and conifers. The Lena Lakes and Hamma Hamma campgrounds are both located approximately 0.75 mile away and helicopters would be audible to campers, but a flight path would be designated in order to minimize impacts.

Staging areas would not be located in designated wilderness, and would be located on previously disturbed, large, flat, open areas such as disturbed meadow areas or trailhead parking lots. For each 2-week management period, two staging areas would be operational: one on the northern side of the Olympic Mountains and one on the southern side, to reduce flight time and stress for mountain goats, conserve fuel, and provide for flexibility given changing weather conditions. Whenever possible, helicopters would use the staging areas closest to the locations of ongoing management activities, as indicated by the general helicopter flight paths between staging areas and mountain goat habitat shown in figure 5. For example, mountain goats from Mt. Olympus, High Divide, and the Bailey Range area would most likely be taken to either the Sweets or Hurricane staging area, and mountain goats from the Mt. Ellinor area would be taken to the Mt. Ellinor staging area. Operations concentrating on mountain goats in the northeastern portion of the Olympic Mountains would use the Deer Park staging area. Approximately 50% of flights would be operating from staging areas in the northern portion of the range and 50% of flights would be operating from staging areas in the southern portion of the range. Some minor improvements (e.g., ground leveling and grading, removal and trimming of vegetation, and treatment for noxious weeds) may be required in some of the staging area locations; however, any improvements would be made within the existing footprint of the disturbed area. Improvements to staging areas would be implemented by NPS for staging areas located on park land and by the USDA Forest Service (or partners) for staging areas located on NFS lands.

Baiting. Salt blocks may be placed in remote areas of the park and national forest to attract mountain goats to suitable areas for carrying out management activities. Pre-baiting with salt and trace mineral blocks up to one year prior to removal actions can increase mountain goat management effectiveness. Locations would be identified to provide for the greatest efficacy of either capture or lethal removal depending on the alternative being implemented. Baiting areas would either be located away from public use areas or temporarily closed to public access to minimize mountain goat-human conflicts. Bait sites would consist of a salt block enclosed within an impermeable livestock feed tub, as shown in figure 6, to prevent salt from leaching into soils or impacting vegetation. Salt blocks would be removed once management activities are complete to limit effects on other wildlife species.

Lethal Removal. Under all action alternatives, there would be the potential for lethal removal of mountain goats. The number of mountain goats, methods, and timing for lethal removal would vary for each action alternative. Under all alternatives, mountain goats that sustain life-threatening injury during management activities would be dispatched as quickly as possible to minimize suffering. The decision to euthanize an injured mountain goat would be made on site by a wildlife veterinarian who is certified in zoological medicine.

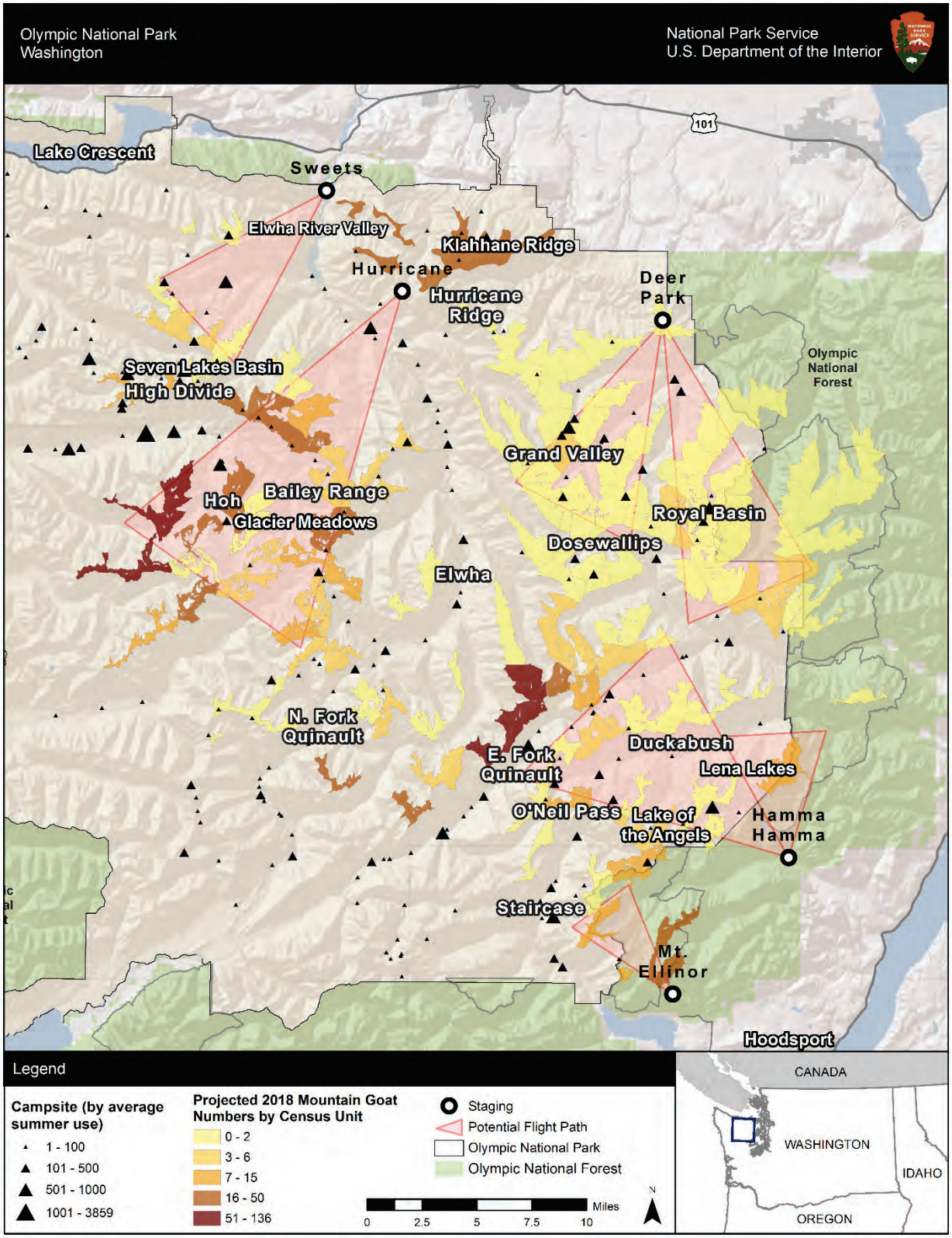


FIGURE 5. PROJECTED MOUNTAIN GOAT DENSITY, STAGING AREAS, AND POTENTIAL FLIGHT PATH AREAS ON THE OLYMPIC PENINSULA

Salt Bait Site Setup for Bighorn and Mtn Goats

- Sm. livestock feed tub
- 3 24" long 3/8" rebar
- Stick rebar in pickup receiver hitch as far as it will go and bend in hook
- Cut 50# salt block in quarters, one quarter per tub (used skill saw)
- Welded wire fencing 2"x4" mesh, bend alternate grid opening wider as in photo
- Pound rebar as shown thru wire and parallel to inside of tub wall
- Pile large rocks as shown

FIGURE 6. EXAMPLE OF SALT BLOCK SITE

The NPS would strive to use the most humane techniques possible for animal capture, transport, and handling, given the existing circumstances, to maximize individual animal welfare and health.

Animal Welfare Tools and Considerations. The NPS would strive to use the most humane techniques possible for animal capture, transport, and handling, given the existing circumstances, to maximize individual animal welfare and health. When capturing mountain goats for translocation, management activities would be designed to maximize the humane treatment of animals, including attempting to capture dependent young together with nannies when possible in order to enhance the likelihood of survival. This may include but would not be limited to trapping nannies with young in clover traps and transporting them together to holding areas (if young did not enter the traps, it is expected that they could be caught adjacent to nannies with net guns). When using helicopters, dependent young could be captured along with the nannies by isolating nannies together with their young during pursuit using net guns to capture both animals in the same area, and keeping them together during transport, processing, and translocation. If immobilizing drugs are used, nannies would be captured first, and then young as they stayed near the immobilized adult or once the adult is caught pursuing the dependent young. Although management personnel would have the ability to use methods deemed appropriate at the time of capture, kids would be live captured with net guns to the extent possible, as opposed to being immobilized with drugs. If drive traps are used, these would be implemented following the methods described by Smith (2010). Nannies and their young would be transported together in the same helicopter flight. Translocation activities would be conducted in accordance with WDFW translocation protocols. When conducting lethal removal using firearms, consideration would be given to the choice of firearm and shot placement to ensure the humaneness of the action.

Carcass Handling and Disposal. Under all action alternatives, mountain goat carcasses resulting from management activities could be left in the field, but the number of carcasses that would remain varies among alternatives. Carcasses that result from aerial operations would remain in place if the carcasses are

in steep and remote terrain, and would decay during the following winter and spring. Carcasses that are near areas of high human use would be relocated at least 325 feet away when safe to do so. Crews conducting ground-based lethal removal would remove as much carcass material as they are safely able to carry. Any mountain goat carcasses within occupied Olympic marmot habitat would also be removed from the field in order to eliminate the potential attraction of coyotes, an effective predator of Olympic marmot. Most carcasses would be moved by ground crews; however, in more remote areas, carcasses may need to be moved by helicopter. When feasible, mountain goat carcasses would be donated for processing and human consumption, provided that the meat has not been contaminated by drugs and the carcass can be safely removed from the field. Carcasses would be provided to the Skokomish Indian Tribe, or other willing recipients who may wish to obtain hides and horns.

ALTERNATIVE B: CAPTURE AND TRANSLOCATION

Under alternative B, mountain goats would be captured within the park and on adjacent areas in Olympic National Forest and translocated to the North Cascades Mountains. Based on aerial surveys, it is estimated that about 90% of the mountain goat habitat on the Olympic Peninsula occurs within Olympic National Park (Jenkins et al. 2016). Consequently, most capture operations would be focused within the park, as opposed to the national forest (figure 5). Areas in the Olympic National Forest where captures would likely be conducted, where high visitor use overlaps with mountain goat habitat, include the following areas: near Mt. Ellinor, Mt. Washington, and Mt. Jupiter; in the Buckhorn Wilderness / Mt. Townsend area; in the Mount Skokomish Wilderness; in The Brothers Wilderness; and in the Lena Lakes area. For mountain goat capture activities in Olympic National Forest, the NPS would coordinate closely with USDA Forest Service staff. WDFW would assist at the staging areas with processing of captured mountain goats and preparing them for transport and relocation. Skilled animal capture experts that are approved by the Office of Aviation Safety would be contracted to complete capture operations. Although capture operations would not be completed by NPS employees, for the purposes of NEPA analysis, contractors are considered to be the same as NPS employees.

Subsequent translocation would be conducted at the discretion of WDFW to areas of the Mt. Baker-Snoqualmie and Okanogan-Wenatchee National Forests (North Cascades national forests) in the North Cascades Mountains in Washington State, where mountain goats are native and the augmentation of existing populations would further mountain goat conservation efforts (e.g., improve genetic diversity and enhance demographic vigor to depleted populations). Over the course of 3 to 5 years, mountain goats would be captured through the use of helicopters and via ground-based capture and transported by helicopter to specified staging areas for transfer to WDFW. WDFW would then translocate mountain goats to receiving areas in crates, by refrigerated truck. If necessary, mountain goats would be transported using pickup trucks with ice blocks placed in their crates or at night when temperatures are coolest.

Management Elements

In addition to management elements that are common to all action alternatives, the potential management elements that could be employed under alternative B are presented below.

Access. Management activities under alternative B would involve several tools for accessing remote areas of the park and Olympic National Forest. Park staff would access frontcountry and accessible backcountry and wilderness areas via foot in order to bait and trap mountain goats. Helicopters could be used to access backcountry and wilderness areas to drop off and pick up ground crews that may be engaging in ground-based capture techniques. Spotter aircraft, consisting of either fixed-wing aircraft operating from the Port Angeles airport or small helicopters operating from staging areas, could be used to identify areas for aerial capture operations. Helicopters would be used to capture mountain goats and to

transport them to one of two staging areas that would be in operation during a given management period. Helicopters would land in backcountry and wilderness areas to provide access for animal handling crews to process and prepare mountain goats for sling loading and transport by helicopter to staging areas. Given the potential need to drop off and pick up ground capture crews as well as transport captured mountain goats, an average of three helicopter landings per mountain goat capture event would be necessary under this alternative.

Capturing Mountain Goats. Mountain goats would be captured in the park and Olympic National Forest through a variety of potential methods, including air- and ground-based capture methods. From the air, mountain goats would be captured through either the use of tranquilizing darts shot from specialized guns or net guns delivered from a helicopter. Capture operations may include the use of a small fixed-wing aircraft or helicopter to assist in spotting mountain goats for capture. Ground-based capture methods could include drop nets, clover traps, and darting. Helicopters would be used to transport animal handlers to the capture sites and to transport captured mountain goats to staging areas. Once mountain goats are netted or darted, the helicopter would land to drop off the crew in order to subdue the animals for transport. Mountain goats would be subdued, placed in a transport bag, and attached to a helicopter by a sling for transport to staging areas where they could be safely prepared for translocation. A portion of the mountain goats captured would be transported to a staging area in the northern portion of the Olympic Mountains and the remaining mountain goats would be transported to a staging area in the southern portion of the range. Captured mountain goats may or may not be sedated prior to transporting them to staging areas.

To minimize stress, capture operations would seek to herd mountain goats over a 1- to 2-minute period per mountain goat and pursuits lasting for more than 5 minutes would be abandoned. Animal processing time—from when the handler reaches the animal on the ground until the animal is in the transport bag—would typically be less than 10 minutes. The animal would be blindfolded, fitted with horn caps, and then placed in specially designed bags that minimize stress and overheating. An animal would wait in a bag for transport for a maximum of 1 hour, depending on ambient temperature. A maximum of four mountain goats would be transported by sling at a time, and maximum ferry times to staging areas would be 45 minutes.

Capture efficiency would be greatest at the onset of operations, when mountain goats are naive and a significant portion of the population is in terrain where capture can be achieved safely. As the program continues, the remaining mountain goats would seek areas where operations are more difficult (steep, rocky terrain), and would be more likely to flee from the helicopter in order to elude capture.

The determination about whether it is no longer safe to capture more mountain goats, from a human and mountain goat safety standpoint, would be made by a consensus of the project lead, consulting veterinarians, and the capture contractor, and would be based on the rate and type of capture-related mountain goat mortalities and environmental conditions. Ceasing operations would also be based on capture efficiency. When it takes approximately three times as long to safely capture a mountain goat, as compared to the hours during the initial capture operation phase during the first year, capture operations would cease.

Following transport of captured mountain goats to staging areas, animals would be processed by NPS and WDFW veterinarians prior to transferring them to WDFW possession, at which point they would be loaded into transport boxes and placed onto trucks for transport to receiving locations at the discretion of WDFW. Processing would include checking mountain goats for sex, age, and health status. This may or may not involve taking blood and fecal samples. All animals would be checked and deemed to be in good condition for transport prior to loading. Animals may be fitted with radio collars or other markings to better monitor and evaluate survival after release.

Capture efforts would focus on areas of sensitive resources, high numbers of mountain goat-human interaction, and areas with high densities of mountain goats. Figure 5 shows projected mountain goat distribution and abundance for 2018. Mountain goat-human interactions would be most likely along park trails. Hurricane Ridge, High Divide, and Lake of the Angels have the highest number of mountain goat-human interactions recorded from 2011 to 2013 (appendix A).

In the years following initial management, if the mountain goat population increases and it is determined that additional capture and translocation are needed to meet NPS management objectives, WDFW may consider either translocating more mountain goats, or brokering their translocation to other willing recipients. Future participation by WDFW is not guaranteed and would be dependent on WDFW funding, whether WDFW is close to meeting mountain goat recovery objectives in the North Cascades national forests area, or the availability of other receiving locations.

Lethal Removal. Lethal removal would not be included as a management tool under alternative B. However, if mountain goats were to sustain life-threatening injury as a part of capture and translocation activities, or were found injured prior to capture, then they would be dispatched as quickly as possible, using firearms or other approved means of euthanasia. The decision to euthanize an injured mountain goat would be made on site by a wildlife veterinarian.

Number of Mountain Goats to Be Removed

Initial Management. Initial capture and translocation actions would most likely involve the capture of approximately 50% of the projected 2018 mountain goat population for translocation by WDFW, or roughly 325–375 animals. The goal of initial management is to reduce the population of mountain goats to a level where maintenance activities could keep the population from rebounding to pre-reduction numbers. Capture operations would continue until there are no additional mountain goats available for capture, the cost per effort exceeds the resources available, there is no funding available, there are no willing recipients of captured mountain goats, or the risk to those engaged in capture operations is determined to be too high.

The goal of initial management is to reduce the population of mountain goats to a level where maintenance activities could keep the population from rebounding to pre-reduction numbers.

Maintenance Activities. Maintenance activities would consist of additional capture and translocation efforts as described above, which would be focused in areas of high visitor use and areas experiencing high levels of resource damage in order to mitigate ongoing impacts by the remnant mountain goat population. Maintenance activities would be performed opportunistically and periodically, during such times that it is effective to conduct capture and translocation operations. However, these operations would be limited by the accessibility of mountain goats for capture, funding, availability of receiving locations and willing recipients, and the risk to those engaged in capture operations. Maintenance would be necessary to keep the population at lower levels, because after a 50% initial reduction, the population would likely stabilize over several years but then increase over time, and could reach previous levels within 10 to 15 years, based on the park's past management experience.

Maintenance activities are those actions that would be taken after initial management to keep mountain goat populations low and avoid their conflicts with humans.

Timing, Duration, and Intensity of Capture and Translocation Actions

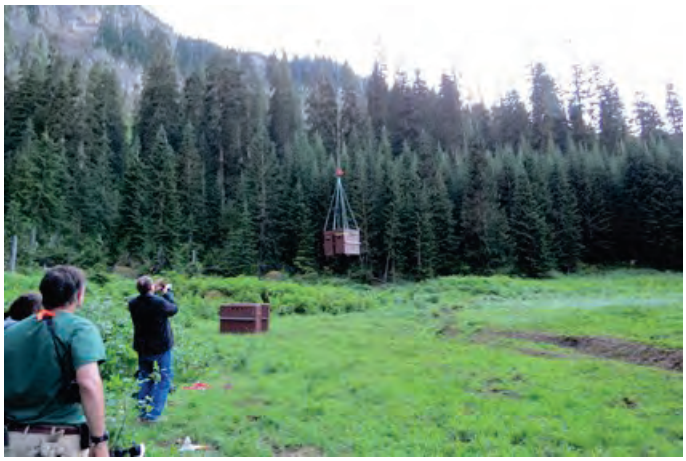
Initial Management. Under alternative B, initial management would involve the capture and translocation of as many mountain goats as possible. Initial management activities under alternative B could last 3 to 5 years, with most of the activity in years 1 and 2. The capture and translocation of mountain goats would continue if necessary and feasible in years 3, 4, and 5, meaning there would be additional mountain goats available for capture, there would be willing recipients of captured mountain goats, funding would remain, the cost per effort would not exceed the resources available, and the risk to those engaged in capture operations would not be too high.

Initial management activities are anticipated two times per year: once in mid- to late July, and once in late August to mid-September. The management period for each operation would last 2 weeks and capture operations could take place on up to 12 days per management period. Taking into account the time needed to mobilize and demobilize, and potential inclement weather, helicopter operations would more likely be conducted on 9 to 10 days out of each 2-week management period, although a maximum of 12 days could be fully used. Helicopter operations would last up to 8 flight hours per day, so there would be a maximum possible total of 96 flight hours over each 2-week management period, which would be divided between flights to the staging areas on the northern side of the Olympic Mountains and staging areas in the national forest on the southern side. A maximum of 384 helicopter hours over 48 days would be anticipated for capture operations on the Olympic Peninsula in years 1 and 2. Helicopters may land up to 864 times during capture operations (approximately 2 or 3 times per mountain goat). Capture operations would take place primarily from sunrise to mid-morning (around 11 a.m.) when temperatures are lower to facilitate the safe capture and transfer of mountain goats. Operations could continue later in the day if appropriate weather conditions exist (temperature and wind), mountain goats are still visible later in the day, and there are sufficient daily flight hours available. Operations would cease no later than one hour before sunset. Capture operations would be suspended if excessive heat posed a threat to animal safety. The specific duration of a given management activity would vary depending on environmental conditions, distance from a staging area to the management area where mountain goats are being captured, and mountain goat behavior or density.

Maintenance Activities. Maintenance activities under alternative B would take place opportunistically and periodically if and when mountain goats increase in population, which is expected to be as early as 5 to 15 years following initial management. The timing of maintenance activities would depend on the recovery of the mountain goat population following the estimated 50% population reduction. The timing of maintenance-phase capture and translocation activities would be cyclical (e.g., every 5 to 10 years) and the duration during a given year would involve 2-week management periods, using helicopters and other management elements as under initial maintenance activities. The amount of time needed for capture operations would likely increase over time, as the mountain goat population decreases and mountain goats move to increasingly remote areas where capture operations would require greater effort. As with the no-action alternative, future surveys to monitor the abundance and distribution of mountain goats on the Olympic Peninsula would continue with the use of helicopters approximately every 4 to 6 years for approximately 6 days, for 4 to 5 hours per day.

Translocation to North Cascades National Forests

The action of translocating mountain goats captured on the Olympic Peninsula would be overseen by WDFW, including the transportation of mountain goats to one of nine staging areas in the North Cascades national forests and their release to nearby alpine habitat. Twelve release sites are identified both within and outside of designated wilderness on the Mt. Baker-Snoqualmie and Okanogan-Wenatchee National Forests. Mountain goats are a native species on these national forests in the Cascade Mountains. These 12 release sites contain high quality, unoccupied mountain goat habitat, where populations have not recovered even after many years of protection. Mountain goats translocated from the Olympic Peninsula would be managed according to Washington State law.



Credit: WDFW

Helicopter lowering mountain goat crates during a previous translocation project

After processing and transport of mountain goats from the Olympic Peninsula to staging areas in the North Cascades national forests, the animals would be transported via helicopter to release sites that have been determined based on accessibility and other requirements of receiving locations by WDFW, in cooperation with the USDA Forest Service. WDFW would work closely with the NPS and USDA Forest Service throughout the translocation process. WDFW would provide all necessary support for the transport and release of captured mountain goats as quickly as possible, ideally within approximately 24 to 36 hours of capture.

To reduce stress and capture-related mortality, mountain goats would be released as soon as possible after capture. Mountain goats would likely be transported overnight from staging areas on the Olympic Peninsula to staging areas in the North Cascades national forests, and released the following morning. Vehicular transport would be done when temperatures are cool, by either refrigerated trucks or pickup trucks. Mountain goats would be airlifted by helicopter from one of nine staging areas in the North Cascades national forests, one or two crates at a time, to one of 12 release sites. Approximately 6 to 12 mountain goats would be released together at a time (nannies first), allowing subsequent animals to see and smell previously released animals. Approximately 25 to 45 helicopter flights would take place between staging areas and each release site (10 to 25 flights to deliver and 10 to 25 flights to return crates, gear, and personnel to receiving area) in order to release approximately 20 to 45 mountain goats at each release site (Harris pers. comm. 2015a). The numbers of translocated mountain goats and associated helicopter trips and total flight times are summarized in

Credit: WDFW

Biologists releasing a mountain goat from a crate during a previous translocation project

table 2 for each staging and release site in the North Cascades national forests. These sites are shown in figure 7. The process for the identification of the release areas is provided in appendix I.

Helicopters would not need to land in order to lower mountain goats in crates to the release sites. Round-trip helicopter flights between staging and release sites would require an average of about 11 minutes per trip for mountain goat placement and an additional 2 minutes per trip to land and off load crew members. Approximately 100 meters of temporary, plastic, portable "snow fencing" would be flown to each release site and erected to herd mountain goats from release site toward escape terrain, a technique used successfully in the Passmore mountain goat translocation in British Columbia from 1990 to 1992 (Blood 2001), as well as reintroduction to Mt. Jefferson, Oregon (ODFW/CFWSRO 2010).

The actual timing of release would vary based on when the mountain goats are captured on the Olympic Peninsula, transported to staging areas, and then transferred to release sites by helicopter. Capture and translocation activities would be undertaken two times per year in 2-week intervals (e.g., 2 weeks in mid- to late July and 2 weeks in late August to mid-September). Capture (via helicopter on the Olympic Peninsula) and release (via helicopter in the Cascades) are weather dependent and could be delayed by hours or days in cases of inclement weather.

It is not possible to predict the exact number of days or the sequence of days (e.g., consecutive days or every other day) that each site would be used, because it is not known how many mountain goats would be captured and ready for transport on any given day. However, this analysis assumes that to translocate 25–35 mountain goats to a given release site, 3 to 4 days of work would be required (i.e., 6 to 12 mountain goats transported and released per day). These days would be spread across both of the 2 to 3 years of expected translocation activities (summers of 2018 through 2020), but may extend up to 5 years if necessary.

Transporting Equipment and Personnel to and from Release Sites. Three helicopter trips would be required for the operation of each release site for communication, transfer of gear, transfer of personnel, or other unanticipated events. The first two helicopter flights would be to transport ground staff (six individuals) from the staging area to the release site. A third flight would transport additional supplies and equipment (portable and flexible cloth material, posts to hold it). Helicopters would need to land at release sites to allow for personnel and equipment loading. Following the release of mountain goats at each site, an additional three helicopter flights would be required to transfer gear and personnel back to the staging areas.

Temporary Placement of Salt Blocks. Salt blocks could be placed at each release site to help provide a central "meeting place" for mountain goats released. Salt would be placed in a manner to minimize introducing salt to the environment, in a manner similar to that shown in figure 6. Salt blocks would be one-time installations that would be removed approximately one year after installation by ground crews hiking to the area. Only one salt block would be used at each wilderness release site. The salt blocks would be placed in a small tub that would not be visible to most visitors, and the salt would be buried under snow for much of the winter months. Any salt and other components of the bait sites remaining the following summer would be removed.

TABLE 2. SUMMARY OF STAGING AND RELEASE SITES IN THE NORTH CASCADES NATIONAL FORESTS AND CORRESPONDING HELICOPTER TRIPS NEEDED

Type	Name	Ownership	Wilderness	Temporary Closure needed?	Number of goats*	Number of Helicopter Trips	Total Flight Time (minutes)
Staging	Alpental parking	MBSNF / Private	No	No, lot is already closed to public.			
Release	Chikamin	OWNF	Alpine Lakes	No	30	36	468
Release	Kaleetan	MBSNF	Alpine Lakes	No	30	36	288
Release	Preacher Mountain	MBSNF	Alpine Lakes	No	30	36	504
Staging	FSR 49	MBSNF	No	Possible road closure. Some tree/vegetation removal (<1/4 acre) to accommodate helicopter landing.			
Release	Upper White Chuck Basin	MBSNF	Glacier Peak	No	40	46	736
Release	Cadet Lake Ridge	MBSNF	Henry M. Jackson	No	34	40	200
Staging	Independence Lake Trailhead	MBSNF	No	Temporary trailhead closure.			
Release	Mount Stillaguamish	MBSNF	No	No	34	40	289
Staging	CERCLA site	MBSNF	No	No, already behind a locked gate.			
Release	Vesper Sperry	MBSNF	No	No	34	40	383
Staging	Proctor Creek	Private	No	Possible road closure.			
Release	Mt. Index	MBSNF	No	No	34	40	320
Staging	Swamp Creek	OWNF	No	No			
Release	Tower Mountain	OWNF	No	No	34	40	320
Staging	Green Mountain pasture	MBSNF	No	No, site is off the road behind a gate.			
Release	Buckindy	MBSNF	Glacier Peak	No	34	40	480
Staging	Irene Creek rock pit	MBSNF	No	Possible road closure. Some tree/vegetation removal (<1/4 acre) to accommodate helicopter landing.			
Release	Snowking meadow	MBSNF	Glacier Peak	No	34	40	636
Staging	150 pit	SPU	No	N/A			
Release	Goat meadow	SPU	No	No	20	26	312

MBSNF = Mt. Baker-Snoqualmie National Forest; OWNF = Okanogan-Wenatchee National Forest; SPU = Seattle Public Utilities

* The total number of mountain goats to be released is an approximate maximum capacity for each release site. Fewer mountain goats may be released at some locations.

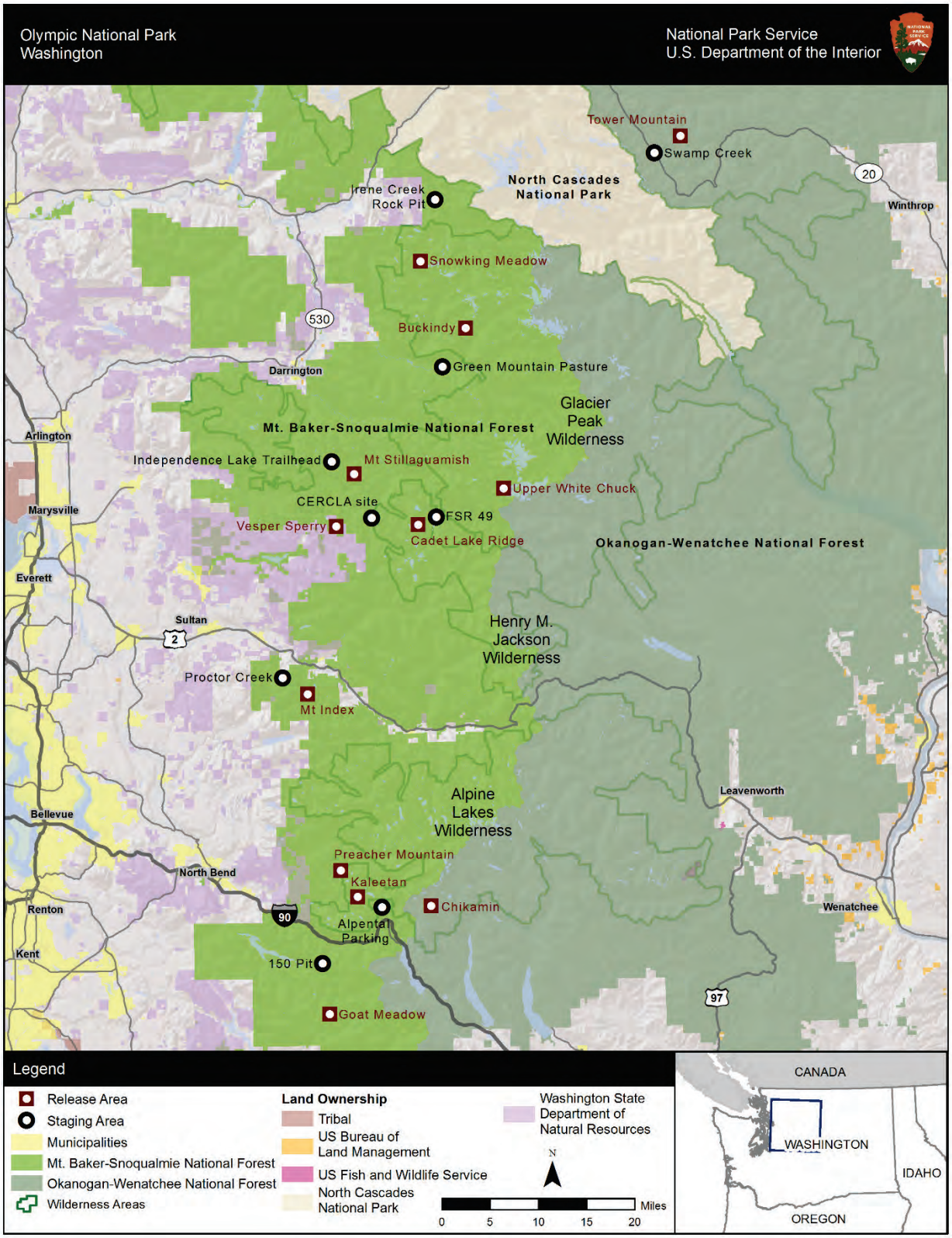


FIGURE 7. STAGING AREAS AND RELEASE SITES IN THE NORTH CASCADES NATIONAL FORESTS

Research and Monitoring

Under alternative B, research and monitoring activities would continue, based on available funding. Possible research and monitoring could involve management efficacy analysis and mountain goat population studies. Mountain goat population surveys would remain necessary in order to monitor the population, and would be conducted in a similar manner as under the no-action alternative. This would include periodic (every 4 to 6 years) helicopter flights for approximately 6 days, for 4 to 5 hours per day.

Mountain goats translocated to the North Cascades national forests would be marked to allow for research into the success of translocation and restoration efforts. Most animals would be radio-collared, and if funding allows, GPS collars would be used that wirelessly transmit locations and a mortality signal. Some animals would be only ear tagged; the ear tags would fall off eventually. A radio collar would remain on the animal for the rest of its life. Any tagging or collaring would be done at staging areas after capture and before release and would occur outside of designated wilderness.

ALTERNATIVE C: LETHAL REMOVAL

Under alternative C, lethal removal would be used to eliminate or significantly reduce mountain goats from the park and adjacent areas in Olympic National Forest. Mountain goats would not be translocated under this alternative. Specific management activities for the lethal removal of mountain goats would include the use of helicopters to access backcountry and wilderness areas and helicopter-based use of firearms to lethally remove mountain goats from all areas on NPS and NFS lands on the Olympic Peninsula. In addition, park staff and other authorized personnel (including skilled public volunteers) would access backcountry and wilderness areas on foot in order to lethally remove mountain goats in areas that are accessible by foot. In more remote areas where mountain goats are too sparsely distributed for efficient ground-based lethal removal, or where foot access is not practical, a helicopter would be used. Under this alternative, up to 625–675 mountain goat carcasses could be left on the landscape over the course of the duration of initial management activities spanning several years, assuming that at least 90% of the projected population would be removed and ground operators would not be able to remove the majority of carcasses (see the section “Number of Mountain Goats To Be Removed,” below). The number of carcasses left on the landscape would be reduced by ground-based shooters packing out as many of the carcasses as safely possible. Carcasses would be left primarily in inaccessible portions of the mountain goat habitat. Ground crews would enter the backcountry and wilderness in order to move mountain goat carcasses at least approximately 325 feet away from high visitor use trails or other high visitor use areas in order to prevent conflicts between visitors and predators or scavenging animals and to avoid visitors viewing any carcasses. On the infrequent occasion when it is not feasible for ground crews to move a carcass, a helicopter could be used.

Management Elements

In addition to management elements common to all action alternatives, the potential management elements that could be employed under alternative C are presented below.

Access. Management activities under alternative C could include several methods for accessing remote areas of the park and adjacent NFS lands for lethal removal actions. Helicopters may be used as the primary method for lethally removing mountain goats from remote areas of the Olympic Peninsula, potentially with the assistance of spotter aircraft (fixed-wing aircraft or small helicopters, depending on the contractor). Helicopters may also be used to drop off or pick up ground-based crews that would be entering backcountry and wilderness areas to lethally remove mountain goats or to move carcasses; generally, helicopters would touch down briefly to unload and retrieve ground-based crews, although this

would be infrequent. Ground-based crews would access areas by foot. Some may have limited pack horse support to get to base camps.

Lethal Removal. Alternative C would involve the use of firearms for lethal removal of mountain goats in the park and in Olympic National Forest. These would likely consist of shotguns for helicopter-based lethal removal activities and high-powered rifles for ground-based lethal removal activities. Ammunition would be non-toxic. Personnel involved could include skilled public volunteers, NPS or other federal personnel, hired contractors from APHIS or USDA Wildlife Services, or state personnel.

The NPS is unique among federal land management agencies in its mandate regarding hunting. Unlike the Bureau of Land Management and the USDA Forest Service, NPS lands are closed to hunting, except where it is specifically authorized by Congress. Approximately 76 of the 417 NPS units are open to hunting; Olympic National Park is not one of those units.

Because management of a large ungulate population has become a challenge in many parks, some units have used public volunteers to assist with lethal removal operations (Powers et al. 2016).

The park staff would work with the WDFW and the NPS Biological Resources Division to design and implement a program to recruit and select volunteers. Because of the remote location and challenging terrain where mountain goats reside on the Olympic Peninsula, the park would have a thorough screening process for volunteers, which would include nationwide recruitment. Specific characteristics of a skilled public volunteer would include the following:

- Clear criminal record, with no game violations.
- Record of taking and passing hunter education course in their home state.
- Record demonstrating skill and ability to safely shoot large ungulates in mountainous, wilderness terrain.
- Experience with cross-country travel and navigation in road-less and trail-less terrain.

All skilled public volunteers would be required to meet the following requirements:

- Pass a shooting test.
- Be physically able to hike and camp for extended periods in the Daniel J. Evans Wilderness.
- Attend one day of training and orientation.
- Supply their own suitable firearm.
- Use government supplied nontoxic ammunition, or supply their own equivalent supplies.
- Follow guidelines on where to hunt and how to interact with park visitors and respect park resources.
- Follow NPS guidelines on culling practices.
- Follow guidelines for “leave-no-trace” camping.
- Pack out as much meat as safely possible.
- Dispose of remaining carcass materials following NPS guidelines.
- Gather required biological samples and data on the number of goats seen and culled.

For lethal removal operations that take place near and outside of the park's boundary, within Olympic National Forest, NPS would coordinate with the USDA Forest Service, WDFW, and tribes to predetermine areas where mountain goats may be pursued for lethal removal outside of the park. Lethal removal would be conducted during initial management, in conjunction with continued tribal and sport hunting. Lethal removal could take place anywhere within occupied mountain goat range in the national forest, but would be most likely in areas near Mt. Ellinor, Mt. Washington, and Mt. Jupiter; in the Buckhorn Wilderness / Mt. Townsend area; in the Mount Skokomish Wilderness; in The Brothers Wilderness; and in the Lena Lakes area. After initial management has ceased, NPS would rely on tribal and sport hunting to reduce or eliminate the mountain goat populations outside the park.

Number of Mountain Goats To Be Removed

Initial Management. Initial management would involve lethally removing as many mountain goats as possible. The intent of initial management would be to reduce the population of mountain goats to zero, acknowledging that this objective may be difficult to achieve. At a minimum, the population would be reduced to a level where only limited population growth would be expected following initial reduction, and implementation of maintenance activities would eventually reduce the mountain goat population to zero. Lethal removal would be significantly more efficient and effective than mountain goat captures under alternatives B and D, because lethal removal could take place more quickly than capturing mountain goats. It is expected that at least 90% of the projected 2018 mountain goat population, or approximately 625 to 675 mountain goats, could be removed during the initial management phase.

Maintenance Activities. At most, 10% of the mountain goat population may remain following initial management. Maintenance activities under alternative C would involve opportunistic lethal removal of mountain goats by park staff, other federal personnel, hired contractors from APHIS or USDA Wildlife Services, state personnel, or skilled public volunteers who would enter backcountry and wilderness areas primarily on foot during the summer and fall seasons; however, helicopter-based lethal removal would also be necessary to target any mountain goats remaining in remote areas that are inaccessible by foot due to steep and rugged terrain. It is anticipated that maintenance activities could eventually reduce the number of mountain goats to zero.

Timing, Duration, and Intensity of Lethal Removal Actions

Initial Management. Under alternative C, initial management would involve the lethal removal of as many mountain goats as possible. Initial management activities under alternative C could last 3 to 5 years, with most of the activity in years 1 to 3. Lethal removals would be conducted only if necessary in years 4 and 5. In an effort to reduce the use of helicopters for lethal removal, management would start with ground-based activities, using skilled public volunteers and park staff in year 1. Ground-based removals with skilled public volunteers would start in September, after the peak visitor use season, and would focus on goats that are in accessible areas throughout the initial management period. In years 2 and 5, helicopter-based lethal removal would occur within the same two 2-week management periods as described under alternative B, one in mid- to late July and another in late August to mid-September. Although fewer days may be needed, for purposes of the analysis helicopter operations would last up to 8 flight hours per day, so there would be a maximum possible total of 96 flight hours over each 2-week management period. A maximum of 384 helicopter hours over 48 days would be anticipated for lethal removal operations on the Olympic Peninsula in years 2 and 3. Although fewer helicopter landings would be anticipated under alternative C than under alternative B, there may be up to 100 landings for the removal of mountain goat carcasses. Ground-based lethal removal would peak in the fall, but could take place opportunistically at any time during the year as needed.

Maintenance Activities. Maintenance activities under alternative C would be conducted if and when mountain goats return to areas where it is safe and efficient to conduct lethal removal operations. The timing of maintenance activities would depend on the success of initial management activities. If initial management is effective at removing at least 90% of the mountain goat population, maintenance activities are likely to be needed 5 to 15 years later since it may take years for mountain goats to reoccupy areas that are accessible for lethal removal operations. However, maintenance-phase lethal removal could take place as soon as one year after initial management ends in the unlikely event that large numbers of mountain goats still remain in unexpected areas. As opposed to alternative B, maintenance activities under alternative C would be infrequent and of short duration (1 to 5 days) because initial management activities are anticipated to reduce the mountain goat population by at least 90%, although the remaining mountain goats would likely move to increasingly remote areas where removal operations require additional time. Both ground- and helicopter-based lethal removal would be considered for maintenance activities and would depend on the accessibility of where targeted mountain goats remain, funding availability, and logistical requirements. Similar to the initial management period, helicopter-based lethal removal activities would take place during the same two 2-week management periods in mid- to late July and late August to mid-September, while ground-based lethal removal could take place opportunistically any time during the year. Maintenance activities would be prioritized in proximity to areas of high visitor use and areas experiencing high levels of resource damage. Lethal removal of mountain goats under the maintenance phase would cease when it was determined that the cost for lethal removal operations exceeds the resources available, there is no funding available, or the risk to those engaged in lethal removal is determined to be too high.

Research and Monitoring

Under alternative C, research and monitoring activities would continue, based on available funding. Similar to alternative B, possible research and monitoring efforts could involve management efficacy analysis and mountain goat population studies. There would be less need for aerial surveys, but reconnaissance flights could be needed prior to maintenance operations to search for remnant goats; these surveys would likely be conducted over one to two mornings (4 to 8 hours over 2 days). Remnant mountain goats could also be documented opportunistically during elk surveys.

ALTERNATIVE D: COMBINATION OF CAPTURE AND TRANSLOCATION AND LETHAL REMOVAL (PREFERRED ALTERNATIVE)

Under alternative D, a combination of capture and translocation and lethal removal tools would be used to eliminate or greatly reduce mountain goats from the park and adjacent areas in Olympic National Forest. The intent of initial management would be to reduce the population of mountain goats to zero, acknowledging that this objective may be difficult to achieve. The specific management elements and actions that could be used for capture and translocation are described in the description of alternative B. The specific management elements and actions that could be used for the lethal removal of mountain goats are described in alternative C. The intent of alternative D is to prioritize capture and translocation activities prior to focusing on lethal removal activities. Once a point of diminishing returns for safe and efficient capture operations is reached, management would continue using lethal removal activities.

Management Elements

In addition to management elements common to all action alternatives, the management elements that could be employed under alternative D are the same as described for alternative B (for translocation) and alternative C (for lethal removal).

Number of Mountain Goats To Be Removed

Initial Management. Similar to alternative C, it is anticipated that initial management under alternative D would remove at least 90% of the projected 2018 mountain goat population, or approximately 625 to 675 mountain goats. Capture and translocation would take place prior to lethal removal activities. Thus, compared to alternative C, alternative D could take one year longer to reduce mountain goat numbers because capture and translocation operations would require more resources than exclusive lethal removal. It is estimated that approximately 50% of the mountain goat population could be captured and translocated, or approximately 325–375 animals based on the projected 2018 population size. It is expected that the remaining goats – at least 40% of the original mountain goat population or approximately 275–325 animals – could be lethally removed.

Maintenance Activities. At most, 10% of the mountain goat population may remain following initial management. Similar to alternative C, maintenance activities under alternative D would involve opportunistic ground-based lethal removal of mountain goats in accessible areas, and helicopter-based lethal removal in remote areas that are inaccessible by foot due to steep and rugged terrain. It is anticipated that maintenance activities could eventually reduce the number of mountain goats to zero.

Timing, Duration, and Intensity of Capture, Translocation, and Lethal Removal Actions

Initial Management. Under alternative D, initial management would involve the capture and translocation of as many mountain goats as possible, similar to alternative B, followed by a switch to lethal removal, similar to alternative C. Initial management activities under alternative D could last 3 to 5 years, with most of the activity in years 1 to 4. This may be one year longer than alternatives B or C, as a result of the combined management approaches and the goal of translocating as many mountain goats as possible prior to a transition to lethal removal. It is anticipated that nearly all management activities in year 1 would consist of live capture and translocation, which would continue to be the primary reduction tool during year 2. In year 1, capture operations would focus on locations where mountain goats can be safely captured and where they are interacting with visitors and resources. Some capture operations would continue into year 3 in the event of weather-related or other logistical constraints in years 1 and 2. Some lethal removal could be scheduled as early as the second capture operation in year 1, but only for those mountain goats that are determined to be uncatchable. The timing and duration of capture and translocation operations within a year would be the same 2-week management periods as described for alternative B, resulting in up to 384 hours of helicopter use over 48 days on the Olympic Peninsula in years 1 and 2.

It is anticipated that the success rate for capturing mountain goats would diminish over time and a greater proportion of mountain goats would be lethally removed after 2 years of effort. Capture operations would continue until there are no additional mountain goats available for capture, the cost per effort exceeds resources available, there is no funding available, there are no willing recipients of captured mountain goats, or the risk to those engaged in capture operations is determined to be too high. It is anticipated that management would likely switch to almost exclusively lethal removal by some time during the years 3 or 4 of initial management, but could begin as early as year 2. Ground-based lethal removal would most likely start in the fall of year 2, directly after the second capture operation is completed. Once a switch to lethal removal is made, the timing and duration of both air- and ground-based lethal removal efforts within a year would be similar to those described for alternative C. The timing and duration of aerial operations for lethal removal within a year would be the same 2-week management periods as described for alternative C, resulting in up to 384 hours of helicopter use over 48 days on the Olympic Peninsula in years 3 and 4. Across years 1 through 4, a maximum of 768 hours of helicopter use could occur over 96

days. Helicopters may land up to 904 times during capture operations (approximately 2 or 3 times per mountain goat during capture activities and up to 40 times for carcass removal).

Maintenance Activities. Maintenance activities under alternative D would be conducted if and when mountain goats return to areas where it is safe and efficient to conduct lethal removal operations. The timing of maintenance activities would depend on the success of initial management activities. If initial management is effective at removing at least 90% of the mountain goat population, maintenance activities are likely to be needed 5 to 15 years later since it may take years for mountain goats to reoccupy areas that are accessible for lethal removal operations. However, maintenance-phase lethal removal could take place as soon as one year after initial management ends in the unlikely event that large numbers of mountain goats still remain in unexpected areas. As opposed to alternative B, maintenance activities under alternative D would be infrequent and of short duration (1 to 5 days) because initial management activities are anticipated to reduce the mountain goat population by at least 90%, although the remaining mountain goats would likely move to increasingly remote areas where removal operations require additional time. Both ground- and helicopter-based lethal removal would be considered for maintenance activities and would depend on the accessibility of where targeted mountain goats remain, funding availability, and logistical requirements. If more feasible in some locations, NPS would also rely on tribal and sport hunting to maintain or eliminate the mountain goat populations outside the park. Maintenance activities would be prioritized in proximity to areas of high visitor use and areas experiencing high levels of resource damage. Lethal removal of mountain goats under the maintenance phase would cease when it was determined that the cost for lethal removal operations exceeds the resources available, there is no funding available, or the risk to those engaged in lethal removal is determined to be too high. After initial management has ceased, NPS would rely on tribal and sport hunting to maintain or eliminate the mountain goat populations outside the park.

Translocation to North Cascades National Forests

Translocation operations under alternative D would be similar to those described for alternative B.

Research and Monitoring

Under alternative D, research and monitoring activities would be similar to those described for both alternatives B and C.

HOW ALTERNATIVES MEET OBJECTIVES

All alternatives analyzed in this plan /EIS were individually assessed in light of how well they would meet the objectives of this plan/EIS, which are described in chapter 1. Table 3 compares how each of the alternatives carried forward for consideration would meet the plan/EIS objectives.

TABLE 3. SUMMARY OF HOW ALTERNATIVES MEET PROJECT OBJECTIVES

Objective	Alternative A: No Action	Alternative B: Capture and Translocation	Alternative C: Lethal Removal	Alternative D: Combination of Capture and Translocation and Lethal Removal
Develop a scientifically based method for the management of exotic mountain goat populations in an extensive mountainous wilderness area.	Does not meet the objective; no such method is developed under no action.	Meets the objective; all action alternatives were developed based on science of mountain goat population ecology and behavior.	Same as alternative B.	Same as alternative B.
Reduce or eliminate impacts on sensitive environments and unique natural resources from mountain goats in the park.	Does not meet the objective; impacts projected to get worse based on increased mountain goat populations.	Partially meets the objective but would require long-term management to sustain reduced population. This could result in disproportionate impacts in some areas based on mountain goat presence in areas where capture is not possible.	Meets the objective. Goats would be removed from the landscape in the fastest and most efficient manner. Would require little long-term management of the goat population.	Same as alternative C, but initial actions associated with live capture may take longer. Would require little long-term management of mountain goat population.
Reduce or eliminate the potential for visitor safety issues associated with mountain goats in the park and in Olympic National Forest.	Somewhat meets the objective, but safety concerns could get worse based on increased mountain goat populations.	Partially meets the objective. Would greatly reduce safety risks but not eliminate them. The goal of eliminating mountain goats is not likely to be reached because the population of mountain goats would continue to persist and eventually grow.	Meets this objective with a goal of elimination. Mountain goats would be removed from the landscape in the fastest and most efficient manner. Would require little long-term management of mountain goat population.	Meets this objective with a goal of elimination. Mountain goats would be removed from the landscape in a faster and more efficient manner compared to alternative B. Would require little long-term management of mountain goat population.
Further public understanding of the Olympic high-elevation ecosystems and native species, and the ecology and conservation of mountain goats in their native range.	Partially meets objective. Would provide public information about current situation but would not include the opportunity for better understanding of mountain goat population ecology based on actions taken and monitoring.	Would provide better opportunities for understanding of mountain goats in their native range and the ecology of the ecosystem through implementation and monitoring involved in the alternative.	Same as alternative B, but would not provide positive messaging for conservation of mountain goats in their native range.	Would provide the best opportunities for both furthering public understanding of the Olympic high-elevation ecosystems and native species and providing positive messaging for conservation of mountain goats in their native range.

Objective	Alternative A: No Action	Alternative B: Capture and Translocation	Alternative C: Lethal Removal	Alternative D: Combination of Capture and Translocation and Lethal Removal
Protect the biosphere reserve and natural heritage designations of Olympic National Park and preserve the integrity of these designations.	Does not meet the objective because the presence of exotic mountain goats is considered a threat to the designations.	Somewhat meets the objective because although the exotic mountain goat population would be substantially reduced, it is expected that they could not be eliminated	Fully meets the objective because this action would likely result in removal of all exotic mountain goats.	Same as alternative C.
Protect the wilderness character of designated park wilderness and wilderness in Olympic National Forest.	Does not meet the objective because would result in both short- and long-term impacts from mountain goats.	Would have the most severe short-term impacts and would not resolve long-term impacts, since it would perpetuate issues associated with management. Would alleviate some impacts from mountain goat behavior.	Meets the objective. Although it would have short-term adverse impacts; it would have long-term benefits.	Similar to alternative C but the short-term impacts would last slightly longer because of the additional time needed for capture before changing over to lethal removal.
Work cooperatively with co-managers of mountain goats or habitats in Washington State (USDA Forest Service, WDFW, and tribes).	Partially meets this objective because NPS would continue to cooperate with Olympic National Forest but would not assist with the needs of WDFW, USDA Forest Service, and tribes in the Cascades.	Meets the objective to a large degree in working across boundaries.	Meets the objective to some degree in cooperating with the USDA Forest Service on the Olympic Peninsula.	Same as alternative B.
Support the wildlife management objectives of cooperating agencies and tribes, to the extent practicable, with respect to mountain goats	Does not meet the objective because it would not help WDFW achieve its management goal of restoring depleted populations of mountain goats in the North Cascades national forests.	Meets the objective by working across boundaries to help WDFW achieve its management goal of restoring depleted populations of mountain goats in the North Cascades national forests, and by involving tribes in the disposal of mountain goats.	Same as alternative A.	Same as alternative B.
Provide opportunities to reestablish or augment sustainable native mountain goat populations in suitable mountain goat habitat on NFS lands in the North Cascades national forests.	Does not meet the objective because there would be no translocation of mountain goats to the North Cascades national forests.	Meets the objective because of translocation of mountain goats to suitable habitat in the North Cascades national forests.	Same as alternative A.	Same as alternative B.

ALTERNATIVES CONSIDERED BUT DISMISSED FROM FURTHER ANALYSIS

A number of additional alternatives addressing mountain goat management within the Olympic Mountains were considered based on the results of internal discussion and public and agency scoping. These alternatives were not carried forward for detailed analysis because they would not meet the purpose, need, or objectives of the plan/EIS; would be inconsistent with NPS mandates; would be legally or technically infeasible; or would require a major change to a law, regulation, or policy. This section discusses those alternatives considered and why each was dismissed from further analysis.

Increased Nuisance Control

An increase in the level of nuisance control within the park was considered as an alternative for the management of mountain goats within the park, particularly as it relates to bands of mountain goats in areas of high visitor use. However, this alternative would not meet plan objectives because there would still be impacts on sensitive resource areas and over time the mountain goat population would continue to increase within the park. As a result, this alternative would not meet the stated purpose, need, and objectives of this plan/EIS.

In addition, increased nuisance control would be redundant with the no-action alternative. Under the no-action alternative, NPS would have the discretion to manage individual mountain goats and bands of mountain goats. NEPA does not require consideration of alternatives that are significantly similar to other alternatives. Since the no-action alternative would be similar in nature to an alternative that focused on increased nuisance control, increased nuisance control was dismissed as a stand-alone alternative.

Fertility Control

Although fertility control has been demonstrated to be effective in controlling individual animal fertility and in very limited circumstances of population growth rate of closed, easily accessed, small populations, it was determined that fertility control would not be an effective tool for meeting the plan/EIS objectives of reducing or eliminating impacts from exotic mountain goats. Where fertility control has been successful, it has limited population growth, but has not eliminated wild ungulate populations.

Populations in which fertility control has been successfully applied include permanent sterilization of feral horses that are accessible for annual round-up (Collins and Kasbohm 2017), or small, contained, and easily accessible island populations of horses (Kirkpatrick and Turner 2008), white-tailed deer (Rutberg, Naugle, and Verret 2013), and bison (Duncan, King, and Kirkpatrick 2013). These conditions do not exist in the Olympic Mountains. The planning team estimates that no more than 50% of the goat population could feasibly be captured, leaving the remaining 50% of the goat population capable of reproduction; the goat population would not only persist, but impacts would grow over time.

Chemical agents, such as immunocontraceptive vaccines (e.g., native PZP or GnRH vaccines), require repeated doses to the same animal, to be highly effective at suppressing fertility. Due to the remote, rugged, and extreme terrain where the mountain goats reside, helicopter darting during the summer months would be necessary to either capture or vaccinate the goats. This would require several months of flying each year (e.g., surveys where animals are counted from a distance and the helicopter does not get close enough to dart every individual seen, require flying for 6–7 days and cover half of the terrain). In the Olympic Mountains, such a program would be costly, impactful, and not effective for eliminating goats or their impacts because it would be impossible to treat a sufficient number to significantly impact population dynamics. In addition, over time, goats would learn to avoid helicopters and a diminishing

proportion of the population would be accessible via helicopter. These conditions are consistent whether darting animals with an immunocontraceptive or capturing them for permanent sterilization (e.g., ovariectomy, vasectomy, or castration). The primary obstacle in using fertility control in the Olympic Mountains is access to animals.

Even if the access issues were resolved, there is currently no regulated or registered chemical contraception product for use in mountain goats. Chemical contraception products are only approved for feral horses, burros, white-tailed deer, and other cervids (i.e., GonaCon Immunocontraceptive Vaccine, GonaCon-Equine, Zonastat-H, Zonastat-D). Therefore, in addition to extreme logistical challenges, there are legal roadblocks to the use of these products in mountain goats.

The use of fertility control adversely affects wilderness values because it is not a natural process. Fertility control as an authorized management action would have a negative effect on the untrammeled and natural qualities of wilderness character because it would be an intentional manipulation of the biophysical environment. Administering fertility control measures would be time and resource intensive and would require years of repeated management action in wilderness. Male and female goats are very difficult to distinguish from each other and the amount of time and costs associated with either darting all goats or capturing all goats to inject only the females or castrate all the males would be impractical. Fertility control on female goats would have to be repeated indefinitely to be effective. Goats that have been treated would need to be tagged and possibly collared and tracked. This would create further adverse effects on the untrammeled, natural, and undeveloped qualities of wilderness character. If all goats were to be indiscriminately darted from the air, this would be an adverse effect on the undeveloped quality of wilderness character, and would affect opportunities for solitude and primitive and unconfined recreation because noise from helicopters would disrupt the natural soundscape and area closures to visitors may need to be in effect during darting operations. Most concerning is that these actions would need to take place on a regular basis to be effective until all exotic goats are eliminated. This would greatly extend impacts to wilderness character beyond those of alternatives C or D. If any female goats are missed in this process, the population would continue to increase. The more time that is needed to administer fertility control increases the chance that the population would continue to grow since not all goats would be treated within the first year or two unless the action is implemented on a much more frequent basis than the two 2-week periods each year as identified for alternatives C and D. This would mean extensively more helicopter flights, more staff on the ground, and more area closures to visitors - all on an indefinite basis.

Introduction of Wolves

The gray wolf (*Canis lupus*) was extirpated from the Olympic Peninsula in the 19th century. Consideration was given to reintroducing this apex predator to the park as a potential means for managing mountain goats since it is a native species. However, this alternative would be ineffective in meeting the plan/EIS objectives because predation by wolves would not play a significant role in limiting mountain goat populations, particularly where other prey species such as Roosevelt elk (*Cervus canadensis roosevelti*) are available. As a result, this alternative would be inconsistent with NPS mandates for managing exotic species because mountain goat populations would not be reduced to a level at which impacts on natural resources and human safety would be alleviated.

Use of Salt Blocks as a Long-term Management Measure

This alternative would involve placing salt blocks strategically within the park in order to attract mountain goats away from areas with high visitor use as well as areas with high levels of endemic species. This alternative would not meet the plan/EIS objectives and would be inconsistent with NPS

mandates because mountain goats would continue to impact natural resources and human safety within the park. Additionally, the use of salt blocks would not be consistent with maintaining wilderness character in the park. Although this alternative could result in concentration of impacts away from important park resources, it could result in impacts on species native to the park (e.g., deer, elk and marmots) that may be attracted to the salt blocks, which could make them more susceptible to predation or diseases. This was dismissed as a stand-alone alternative for the management of mountain goats within the park; however, it may be used as a management element within the action alternatives being considered.

Public Hunting in the Park

During public scoping for this plan/EIS, several comments were received advocating for public hunting within the park as a tool for managing mountain goats. An alternative that involved public hunting to manage mountain goats inside the park would be inconsistent with existing law and regulatory authority regarding public hunts in the park. The likelihood that congress would change its longstanding policy regarding hunting in parks is remote and speculative (Natural Resources Defense Council, Inc. v. Morton, 458 F.2d 827 (D.C.C. 1972); National Rifle Association v. Potter, 628 F. Supp. 903 (1986); Headwaters, Inc. v. Bureau of Land Management, 914 F.2d 1174, 1181 (9th Cir. 1990); Seattle Audubon Society v. Moseley, 80 F.3d 1401, 1404 (9th Cir. 1996); Kootenai Tribe of Idaho v. Veneman, 313 F.3d 1094 (9th Cir. 2002)). In 1984, after careful consideration of congressional intent with respect to hunting in national parks, the NPS promulgated a rule (236 CFR 2.2) that allows public hunting in national park areas only where "specifically mandated by federal statutory law." The NPS has reaffirmed this approach in the NPS *Management Policies 2006* (NPS 2006).

Congress has not authorized hunting in any legislation for the park. Therefore, to legally allow hunting at the park, congress would need to specifically authorize hunting and NPS would need to promulgate a new regulation to implement the congressional action.

In conclusion, the NPS eliminated public hunting within the park as a reasonable alternative for managing mountain goats for the following reasons: allowing a recreational hunt would require changes to federal law; case law supports dismissing an alternative that would require a major change in long-standing basic policy; and other alternatives, such as using trained park staff, other federal personnel, hired contractors from APHIS or USDA Wildlife Services, state personnel, or trained volunteers, would be more effective in adhering to NPS policy, meeting the plan/EIS objectives, and ensuring public safety.

Tribal Hunting in the Park

During public scoping for this plan/EIS, comments were received advocating for tribal hunting within the park as a tool for managing mountain goats. However, although tribes reserved hunting on "open and unclaimed" lands under various Stevens' treaties, the park is not considered "open and unclaimed." As such, any tribal hunting would need to be considered similarly to public hunting. Therefore, the NPS eliminated tribal hunting within the park as a reasonable alternative for managing mountain goats for the same reasons as eliminating public hunting within the park.

Hunting Outside the Park

An alternative that would increase hunting of mountain goats in areas surrounding the park was suggested as a way to decrease the mountain goat population on the Olympic Peninsula, potentially resulting in a decreased population within the park. Hunting of mountain goats on adjacent lands managed by tribes and the USDA Forest Service is currently authorized by tribes and by WDFW. The NPS has no authority to

dictate management activities on these adjacent lands. The NPS would, however, coordinate with the USDA Forest Service and WDFW to identify potential opportunities for maximizing harvest of mountain goats within the adjacent Olympic National Forest. However, this would not address reducing goat populations inside the park.

Discontinue Management – Allow Mountain Goat Population to Fluctuate Naturally

During the public scoping process, comments were received suggesting that mountain goat populations within the park should not be actively managed and that they should be allowed to fluctuate naturally. This alternative would be inconsistent with NPS *Management Policies 2006* related to the removal of exotic species. These policies require that exotic species be managed "up to and including eradication" (NPS 2006). Additionally, impacts under this alternative would increase over time as the mountain goat population continued to increase within the park. As a result, discontinuing management of mountain goats would not meet the purpose and need of this plan/EIS.

Capture and Translocate Mountain Goats within the Olympic Peninsula

An alternative that would capture mountain goats within the park and translocate them to other areas on the Olympic Peninsula was suggested. This alternative was eliminated from further consideration because it would be likely that mountain goats would return to the park and would continue to impact natural resources and human safety, given that the majority of mountain goat habitat on the Olympic Peninsula is within park boundaries. Additionally, once mountain goats returned to the park, impacts would increase over time as the mountain goat population continued to increase within the park. This alternative was also eliminated because WDFW does not want additional mountain goats on NFS lands on the Olympic Peninsula.

Capture and Euthanize Mountain Goats

An alternative that would capture mountain goats within the park and chemically euthanize them at the location of capture was eliminated from further consideration. This alternative would not be considered a good use of park resources, because it would be financially and technically more efficient to use other American Veterinary Medical Association approved euthanasia methods. Lethal removal would also align more closely to humane animal care standards due to the quickness of culling compared to a prolonged stress associated with capture.

Fencing

An alternative that would construct a fence around the boundaries of the park or sensitive alpine ecosystems was eliminated from further consideration for many reasons including the following: fencing would interfere with native wildlife species and ecosystem processes; fencing would not address impacts on natural resources and visitor safety within the park; and fencing would present issues associated with development within designated wilderness areas.

Removal and Translocation of Mountain Goats Using Only Ground-based Methods

The planning team considered and dismissed options that do not involve helicopter use, because those alternatives would not be feasible or effective given that the majority of mountain goats reside in remote and inaccessible alpine habitats for all or most of the year; the importance of releasing as many goats as possible into each selected translocation area for each event in an effort to reduce impacts on wilderness character and reduce pressure on available resources (time, staff, and funding); and the safety risks posed to personnel by the remote and rugged terrain. The final EIS has incorporated options that reduce helicopter use under alternatives C and D in an effort to limit as much as practical the short-term adverse impacts on wilderness character. Also under alternatives C and D, park staff and other personnel would access wilderness areas on foot to lethally remove mountain goats in all areas that are accessible by foot.

To remove mountain goats by ground-based efforts only would take a tremendous amount of time and resources and even with these resources, would still likely be impossible. Without the use of helicopters to remove goats, the population would increase more rapidly than removal efforts would be able to address. This would lead to further long-term damage to wilderness resources and increased issues with visitor experience, and may eventually lead to impairment of the park's natural and wilderness resources.

MITIGATION MEASURES

The following mitigation measures were identified by both the NPS and USDA Forest Service for all actions discussed in this chapter. This list is followed by specific project design criteria that are specific to and are followed by the USDA Forest Service; some of the project design criteria may be included in the mitigation measures listed below.

General

- Helicopter staging area preparation, if necessary, would be scheduled prior to the proposed action, preferably during the early to late fall, unless otherwise agreed.
- Project staff would coordinate flight schedules and paths with Naval Air Station Whidbey Island to ensure that operations on the Olympic Peninsula or in the North Cascades national forests do not interfere with active military training routes.
- Helicopter flight paths would avoid highly developed areas and residences.
- During management activities at staging areas, staging areas that are not already behind gates would be otherwise secured.

Mountain Goats

- Capture and translocation efforts would strive to minimize stress and to protect the welfare of individual animals, including attempts to keep nannies and kids together.

Wilderness

- Public notification of activities affecting wilderness would be provided, and appropriate information would be distributed at visitor centers.
- Project staff would access wilderness areas via foot or by riding stock where possible, without risking life or limb. This would be considered for travel to sites accessible by trail or non-technical cross-country travel (e.g., without the use of crampons, ice axes, rope, or other specialized equipment). "Leave no Trace" principles would be applied during all management activities.
- Foot travel would be considered for both baiting mountain goats ahead of time and during the capturing operational period, to limit impacts on wilderness character from the use of motorized equipment and mechanized transport and impeding solitude or primitive recreation from helicopter operations. Capture sites to be considered for primitive travel of personnel include, but are not limited to, Marmot Pass in the Buckhorn Wilderness and Mt. Ellinor in the Mount Skokomish Wilderness.
- Duration and geographic scope of actions and disturbances would be minimized in wilderness areas.

Acoustic Environment

- Helicopter flight paths would be a minimum of 500 feet above marbled murrelet and northern spotted owl habitat.
- Helicopter flight paths to and from staging areas would be designed to minimize noise impacts on wildlife and visitors to the greatest practicable extent.
- Temporary area closures in the immediate vicinity of mountain goat capture, lethal removal, and release operations would minimize noise impacts on backcountry and wilderness visitors.

Wildlife and Wildlife Habitat

- Once established based on conditions, previously agreed upon travel corridors and flight altitudes for helicopters would be used during operations.
- Contractors and other project workers would properly store and dispose of food and garbage while working on site.
- Staging areas would be located in areas that are previously disturbed, and would necessitate the least impact on wildlife and wildlife habitat.
- Lead-free ammunition would be used for lethal removal activities to prevent environmental contamination.

Vegetation

- Inspections for invasive plants would take place prior to any activities at staging areas.
- If existing invasive plant infestations are documented, or if management activities introduce any invasive plants into the project area, they will be treated with appropriate herbicide, mechanical, or manual methods when practical.

- Vegetation removal would be minimized near staging areas as necessary to facilitate helicopter flight paths and safe operating procedures.
- All equipment and tools shall be cleaned completely and free of weeds, seed, debris, and mud to prevent the introduction or spread of exotic, invasive plants.
- Prior to entering the backcountry and wilderness, all workers shall check boots, backpacks, and tools for weed seeds, mud that could harbor weed seeds, and plant parts to prevent the spread and introduction of invasive plants.

Threatened or Endangered Species

- If any individual northern spotted owl or marbled murrelet is observed during project operations, a wildlife biologist would be notified and measures to minimize or eliminate take would be applied.
- Once established based on conditions, previously agreed upon travel corridors and flight altitudes for helicopters would be used during operations.

Soils

- At staging areas, restoration activities would be conducted, such as soil aeration and restoration and erosion control structures (if needed) to reverse the effects of compaction.
- At staging areas, removal of loose rock in pits would be minimized as necessary, but would be required for safe helicopter operation.

Archeological Resources

- If previously unidentified cultural resources are encountered during implementation of the project, activities would cease pending an investigation and evaluation of these materials by a qualified archeologist, who would determine appropriate mitigation measures. Project staff would fulfill its consultation requirements in accordance with 36 CFR 800.11.
- Baiting locations would be reviewed by cultural resource staff prior to their use to ensure that baits are not placed within or near archeological sites.
- Staging areas would be surveyed if ground disturbing activities are required. These would go through Washington State Historic Preservation Office (SHPO) review prior to implementation and use.

Visitor Use and Experience

- Project vehicles would maintain a speed at or below 15 mph along unpaved roads leading to and from staging areas.
- A traffic control plan would be developed for NFS Road 2419 and NFS Road 2500 prior to implementation, and would be coordinated with wilderness and law enforcement rangers, volunteer staff, and all other agency staff that could potentially be working in closed areas.
- Mountain goat capture or lethal removal efforts would strive to minimize disturbance to areas of high public visitation and pursuit of mountain goats via helicopter would be aborted if humans are observed in the immediate area.

- Mountain goats considered by NPS and/or WDFW to be habituated would only be translocated to remote release areas. No aggressive mountain goats would be translocated.

Visitor and Employee Safety

- A communication plan would be developed by the NPS, USDA Forest Service, and WDFW that would include information on the purpose and need of management activities and any associated temporary area closures to visitors. News releases, signage, website, and other forms of communication would be prepared well in advance of proposed mountain goat management activities.

- Project staff would be properly trained regarding adherence to safety protocols identified in the Olympic National Park *Mountain Goat Action Plan* (appendix A).
- Equipment would be well-maintained and helicopter flights would only take place during favorable weather conditions. In addition, an aviation safety plan would be developed and a safety briefing would be performed for each day of aerial operations.

Project Design Criteria

The USDA Forest Service developed the following project design criteria to address overall project objectives, to minimize resource impacts, and ensure Forest Plan or legal compliance. They are based on law, policy, and the professional judgment of the USDA Forest Service resource specialists.

Olympic National Forest

- A special use permit would be issued to WDFW for use of the staging areas within the Olympic National Forest. Furthermore, a public communication plan would be developed by the USDA Forest Service, in coordination with NPS and WDFW.
- Where there are site-specific uncertainties about the applicability of a restriction, an appropriate USDA Forest Service specialist would be consulted. Any request for modification to a project design criterion is subject to approval by the Forest Responsible Official, in consultation with appropriate resource specialists.
- Additional project design criteria that apply to proposed management activities in the Olympic National Forest are described in table 4.

TABLE 4. PROJECT DESIGN CRITERIA FOR THE OLYMPIC NATIONAL FOREST

Feature	Definition / Description	Management Requirement Description	Applicable Area
Staging Areas			
Helicopter landing (staging area) preparation	Helicopter landing sites, including grading surface and clearing of vegetation	All helicopter landing sites would be reconstructed for staging areas prior to the proposed action, preferably during the early-late fall, unless otherwise agreed. Some vegetation may need to be removed to facilitate helicopter flight paths and safe operating procedures. Any clearing or removal of merchantable timber shall be treated in accordance with USDA Forest Service policy and decked in a location designated by the USDA Forest Service. Disposal of all clearing, slash, debris and other unsuitable material generated shall only be placed within an area designated by the USDA Forest Service and approved for that purpose. Any proposed changes to the physical character, slopes, access roads, etc., within the pit boundary shall be approved in advance by the USDA Forest Service prior to conducting the work.	Hamma Hamma gravel pit (NFS Road 2500-011), Mt. Ellinor Trailhead, and NFS Road 2419-014
Treat existing infestations of invasive plants	Invasive plant infested areas	Invasive plant inspections must take place prior to any operations within or adjacent to the existing pit or quarry limits. Existing invasive plant infestations would be treated with appropriate herbicide, mechanical, or manual methods before ground disturbing activities begin when practical. If timing or resources prevent treatment before the project begins, then infestations would be treated in the project area upon completion of the project in order to prevent invasive plants from colonizing the disturbed ground.	Hamma Hamma gravel pit (NFS Road 2500-011), Mt. Ellinor Trailhead, and NFS Road 2419-014
Invasive plant infestations	Cleaning of vehicles	All equipment to be used shall be cleaned and inspected in order to prevent the infestation or spread of invasive plants.	Hamma Hamma gravel pit (NFS Road 2500-011), Mt. Ellinor Trailhead, and NFS Road 2419-014
Recreation			
Visitor safety	Notification of planned activities	A communication plan would be developed by the NPS, USDA Forest Service and WDFW that includes information on the ecological purpose and need of the activity and any temporary area closures for visitors. News releases, signage, website, and other forms of communication would be prepared well in advance.	Applies to all areas
NFS Road 2419 and 2500	Area restrictions	A traffic control plan would be developed for NFS Road 2419 and NFS Road 2500 prior to implementation. A temporary and limited closure of NFS Road 2419 would be required during goat translocation. Involvement with federal law enforcement officials would be needed.	NFS Road 2419 and 2500

Feature	Definition / Description	Management Requirement Description	Applicable Area
Mt. Ellinor Trailhead and adjacent trail system	Area restrictions	During translocation of goats to the Mt. Ellinor staging area, limited areas may be temporarily closed for a 2-week period (late August to mid-September). Project vehicles must maintain a speed at or below 15 mph along this section of road.	Mt. Ellinor Trailhead and adjacent trails
Helicopter flight path	Areas of avoidance	When possible, helicopter overflight paths would avoid high developed areas and residences.	Applies to all areas
Wilderness			
Designated wilderness	Area restrictions	A news release would be prepared well in advance. Temporary and limited area closures during capture, translocation, and lethal removal would take place in two periods in 2-week intervals (mid- to late July and late August to mid-September).	Mount Skokomish Wilderness, The Brothers Wilderness, Buckhorn Wilderness, Wonder Mountain Wilderness, Colonel Bob Wilderness
Designated wilderness	Area restrictions	Staff would access wilderness areas via foot or riding stock where possible, without risking life or limb. This should be considered for travel to sites accessible by trail or non-technical cross-country travel (e.g., without the use of crampons, ice axes, rope or other specialized equipment). Foot travel should be considered for both baiting mountain goats ahead of time and during the capturing operational period, to limit trammeling and impeding solitude/primitive recreation from helicopter operations. Capture sites to be considered for primitive travel of personnel include, but are not limited to, Marmot Pass in the Buckhorn Wilderness and Wilderness portions of Mt. Ellinor, Mount Skokomish Wilderness.	Mount Skokomish Wilderness, The Brothers Wilderness, Buckhorn Wilderness, Wonder Mountain Wilderness, Colonel Bob Wilderness
Archeology			
Previously undetected archeological, historical, or cultural resources	Area restrictions	If subsurface archeological evidence or previously unidentified cultural resources were located during implementation of the project, activities would cease pending an evaluation of cultural eligibility by a qualified USDA Forest Service archeologist, who would determine appropriate mitigation measures. The USDA Forest Service would fulfill its consultation requirements in accordance with 36 CFR 800.11.	Applies to all areas
Vegetation			
Invasive weeds		Actions conducted or authorized by written permit by the USDA Forest Service that would operate outside the limits of the road prism, would require the cleaning of all heavy equipment prior to entering NFS Lands. If weeds were present in the project area, all equipment and gear must be cleaned before leaving the project area to avoid spreading the infestation further. If weeds were present in the project area, work from relatively weed-free areas into the infested area.	Applies to all areas

Feature	Definition / Description	Management Requirement Description	Applicable Area
Wildlife			
Individual spotted owls or marbled murrelets	Adult or young spotted owls or marbled murrelets observed during project operations	If any individual spotted owl or marbled murrelet is observed during project operations, a USDA Forest Service wildlife biologist would be notified and measures to minimize or eliminate harassment will be applied.	Applies to staging areas
Marbled murrelets	To minimize nest predation by corvids (crows, ravens, jays)	Contractors and other project workers would properly store and dispose of food and garbage while working on site.	Applies to all areas

North Cascades National Forests

Table 5 shows the project design criteria for the North Cascades national forests.

TABLE 5. PROJECT DESIGN CRITERIA FOR THE NORTH CASCADES NATIONAL FORESTS

Feature	Definition / Description	Management Requirement Description	Applicable Area
Staging Areas			
Helicopter landing (staging area) preparation	Helicopter landing sites, including grading surface and clearing of vegetation	Helicopter staging sites would be reconstructed prior to the proposed action, preferably during the early-late fall, unless otherwise agreed. Some vegetation may need to be removed or mowed to facilitate helicopter flight paths and safe operating procedures. Loose rock in pits may need to be removed for safe helicopter operation.	Irene Creek rock pit, Curry Gap TH - FR 49, Green Mountain Pasture - FR 26, FR 62
Recreation			
Visitor safety	Notification of planned activities	A communication plan would be developed by the NPS, USDA Forest Service, and WDFW that includes information on the ecological purpose and need of the activity and any temporary area closures for visitors. News releases, signage, website updates, and other forms of communication would be prepared well in advance.	Applies to all areas
Gated staging areas	No restrictions	These areas are all located behind gates.	Green Mountain Pasture, Monte Cristo Comprehensive Environmental Response, Compensation, and Liability Act site, Alpental Parking Lot, FR 62 may or may not be gated

Feature	Definition / Description	Management Requirement Description	Applicable Area
Ungated staging areas	Area restrictions	Temporary and limited road closures during translocation of goats to release sites would be required for FR 1550 and FR 49. This would result in closure of the La Rush/Bear Lake and Curry Gap Trails while translocation staging is taking place. This may be scheduled during two periods in 2-week intervals (mid- to late July and late August to mid-September). A special use permit would be issued to the WDFW as needed for implementing closures.	FR 1550, FR 49, FR 62, Independence Lake Trailhead
Helicopter flight path	Areas of awareness	Some release sites are in areas with active military training routes. Project should check flight schedule with Naval Air Station Whidbey Island.	Applies to all areas, but in particular the White Chuck Basin and Chikamin Ridge (Alta Mountain) release sites
Wilderness			
Designated wilderness	Area restrictions	A news release would be prepared well in advance. Follow mitigation for release sites documented in the Minimum Requirements Analysis (appendices E and F).	Glacier Peak Wilderness, Henry M. Jackson Wilderness, and Alpine Lakes Wilderness
Archeology			
Previously undetected archeological, historical, or cultural resources	Area restrictions	If subsurface archeological evidence or previously unidentified cultural resources were located during implementation of the project, activities would cease pending an evaluation of cultural eligibility by a qualified USDA Forest Service archeologist, who would determine appropriate mitigation measures. The USDA Forest Service will fulfill its consultation requirements in accordance with 36 CFR 800.11.	Applies to all areas
Vegetation			
Invasive weeds		Actions conducted or authorized by written permit by the USDA Forest Service that would operate outside the limits of the road prism, would require the cleaning of all heavy equipment prior to entering NFS Lands. If weeds were present in the project area, all equipment and gear must be cleaned before leaving the project area to avoid spreading the infestation further. If weeds were present in the project area, work from relatively weed-free areas into the infested area.	
Wildlife			
Individual northern spotted owls or marbled murrelets	Adult or young spotted owls or marbled murrelets observed during project operations.	If any individual spotted owl or marbled murrelet is observed during project operations, a USDA Forest Service wildlife biologist would be notified and measures to minimize or eliminate harassment would be applied.	Applies to staging areas

Feature	Definition / Description	Management Requirement Description	Applicable Area
Marbled murrelets	To minimize nest predation by corvids (crows, ravens, jays)	Contractors and other project workers would properly store and dispose of food and garbage while working on site.	Applies to all areas

NATIONAL PARK SERVICE PREFERRED ALTERNATIVE

The preferred alternative is the alternative that "would best accomplish the purpose and need of the proposed action while fulfilling [the NPS] statutory mission and responsibilities, giving consideration to economic, environmental, technical, and other factors" (46.420(d)). The preferred alternative ultimately may not be the selected alternative and identification of the preferred alternative is not a final agency decision.

The NPS has identified "Alternative D, Combination of Capture and Translocation and Lethal Removal," as the preferred alternative because it meets the purpose and need for action and allows the NPS to reduce or eliminate impacts on park resources from mountain goats, which includes interference with natural processes, native species, and natural habitats, while reducing potential public safety issues associated with the presence of mountain goats in the park.

The NPS has identified "Alternative D, Combination of Capture and Translocation and Lethal Removal," as the preferred alternative. In identifying the preferred alternative, NPS considered factors such as public safety, long-term management, impacts on park resources, and how well the alternatives meet the purpose and need and objectives of the plan. The preferred alternative best accomplishes the purpose and need for action, in accordance with NPS Director's Order 12 Handbook (NPS 2015e), because it would allow the NPS to reduce or eliminate impacts on park resources from mountain goats, which includes interference with natural processes, native species, and natural habitats, while reducing potential public safety issues associated with the presence of mountain goats in the park. At the same time, alternative D meets NPS statutory mission and responsibility because mountain goats would be translocated, contributing to conservation of the species in their native range where populations have been historically depleted. Although the preferred alternative would require more time and would have more short-term impacts related to the reduction of mountain goats on the landscape compared to alternative C, it would remove mountain goats from the landscape in a faster and more efficient manner compared to alternative B, and it would result in beneficial environmental impacts over the long term. Alternative D would provide the best opportunities to further public understanding of both the Olympic high-elevation ecosystems and native species as well as the ecology and conservation of mountain goats in their native range. Alternative D meets the objective of working cooperatively with co-managers of mountain goats or habitats in Washington State (USDA Forest Service, WDFW, and tribes) and also meets the objective of providing opportunities to reestablish or augment sustainable native mountain goat populations in suitable mountain goat habitat on NFS lands, whereas alternative C does not.

ENVIRONMENTALLY PREFERABLE ALTERNATIVE

CEQ NEPA regulations define the environmentally preferred alternative as the one that "…causes the least damage to the biological and physical environment; it also means the alternative which best protects, preserves and enhances historic, cultural and natural resources."

The environmentally preferable alternative is identified upon consideration and weighing of long-term environmental impacts against short-term impacts in evaluating what is the best protection of these resources. The NPS has identified "Alternative D, Combination of Capture and Translocation and Lethal Removal," as the environmentally preferable alternative because this alternative "causes the least damage to the biophysical and physical environment, and best protects, preserves, and enhances" the natural resources being analyzed (NPS 2015e). Alternatives A and B would result in greater environmental impacts than alternatives C or D because the duration of management activities under alternatives A and B would involve more long-term management, and the mountain goat population would likely persist and potentially grow larger. When considering the broader geographic scale, alternative D would eliminate the need for long-term management and associated impacts related to mountain goats on the Olympic Peninsula, but unlike alternative C, would also contribute to conservation of the species in their native range in areas in Washington outside of the Olympic Peninsula where populations have been historically depleted.

The NPS has identified "Alternative D, Combination of Capture and Translocation and Lethal Removal," as the environmentally preferable alternative because this alternative "causes the least damage to the biophysical and physical environment, and best protects, preserves, and enhances" the natural resources being analyzed.

Chapter 3:

Affected Environment

CHAPTER 3: AFFECTED ENVIRONMENT

INTRODUCTION

The "Affected Environment" describes existing conditions for those elements of the natural and cultural environments that could be affected by implementing the alternatives considered in this *Mountain Goat Management Plan / Environmental Impact Statement* (plan/EIS). These include (1) areas of Olympic National Park and Olympic National Forest on the Olympic Peninsula, from where mountain goats could be removed; and (2) areas in the North Cascades national forests, where mountain goats could be translocated. This Affected Environment chapter is therefore divided into two subsections addressing the affected environment of the Olympic Peninsula in Part One, followed by the North Cascades national forests in Part Two.

On the Olympic Peninsula, mountain goat habitat comprises approximately 150,000 acres of high-elevation alpine and subalpine lands that are free of glacial ice and above 4,675 feet in elevation and within approximately 360 feet of steep rocky slopes (Jenkins et al. 2011a, 2016). Therefore, management activities associated with this plan/EIS would take place primarily above 4,000 feet, but some activity could take place in lower elevation areas during winter months. Management activities associated with alternatives B, C, and D would require multiple staging areas (as described in chapter 2) located strategically on both National Park Service (NPS) and National Forest System (NFS) lands. The discussion of the affected environment is limited to only those resources that may be affected by actions taken in identified mountain goat habitat and surrounding the staging areas (see figure 5 in chapter 2). The natural environment components addressed in this plan/EIS for the Olympic Peninsula include mountain goats, wilderness character, wildlife and wildlife habitat, vegetation, threatened or endangered species, acoustic environment, and soils. The cultural component addressed is archeological resources. Visitor use and experience and visitor and employee safety are also addressed. The influence of climate change on impact topics that may be affected by actions taken in this plan/EIS are described in the appropriate impact topic section in "Chapter 4, Environmental Consequences."

For the North Cascades national forests, discussion of the affected environment is limited to resources in the Mt. Baker-Snoqualmie National Forest and Okanogan-Wenatchee National Forest, and includes the following topics: wilderness character, visitor use and experience, visitor and employee safety, threatened or endangered species, wildlife including sensitive and management indicator species, and vegetation.

PART ONE – OLYMPIC PENINSULA

GENERAL PROJECT SETTING

Olympic National Park

The isolated peninsula has at least 24 endemic taxa—16 fauna and 8 flora—that are not found anywhere else on earth.

The park encompasses 922,651 acres of three distinct ecosystems on the Olympic Peninsula: rugged glacier-capped mountains, more than 70 miles of wild Pacific coast, and vast stands of old-growth and temperate rain forest. The park includes one of the largest wilderness areas in the contiguous United States; 95% (876,447 acres) of the park is designated as the Daniel J. Evans Wilderness, offering visitors a chance to experience the diversity of the park in its natural state. The park includes habitat for more than 1,100 species of native plants, nearly 300 species of birds, and nearly

65 species of mammals. The isolated peninsula has at least 24 endemic taxa—16 fauna and 8 flora—that are not found anywhere else on earth (NPS 2008a, 2010b).

Olympic National Forest

Similar to the park, Olympic National Forest encompasses a broad diversity of the landscapes present on the Olympic Peninsula, from rain forests to deep canyons to high mountain ridges to ocean beaches. This diverse forest reaches the mid-elevations of the Olympic Mountains and surrounds Olympic National Park. The forest includes 88,265 acres of designated wilderness, all of which lies adjacent to the park boundary (FS 2016a).

MOUNTAIN GOATS

Mountain goats (*Oreamnos americanus*) are native to the alpine regions of North America from southeastern Alaska to Washington, Idaho, western Montana, and likely portions of Oregon (Matthews and Heath 2008). The species was introduced to areas outside of their historical range throughout the 1900s, including the Olympic Mountains of Washington. Over the last century, mountain goats have become established across most of Olympic National Park (Innes 2011; Houston, Schreiner, and Moorhead 1994).

Mountain goats are hoofed mammals known as ungulates. They inhabit high-elevation alpine and subalpine habitats, and are most prevalent in areas with rugged and steep terrain and cool areas with persistent snow. Mountain goats are typically reclusive, but will occasionally approach humans. In some areas where unhunted populations come into repeated contact with humans, mountain goats have become habituated to the presence of humans, allowing people to approach closely and at times approaching people (appendix A; Holyrod 1967). When threatened or alarmed, mountain goats will seek steep rocky areas, often referred to as escape terrain.

Mountain goats have a thick white coat with brown hairs sometimes present. Both males and females have black horns that are approximately 8 to 10 inches long. The body sizes of males and females remain the same for approximately the first 3 years of development. Mature males typically weigh between approximately 210 and 350 pounds, whereas females range from 130 to 165 pounds (Côté and Festa-Bianchet 2003). Mountain goats tend to gain the most body mass each year between early June and mid-September, which is due to changes in fat and protein accumulation from increased forage availability and quality (Festa-Bianchet and Côté 2008; Ellis et al. 2007).

Although they can congregate in large groups of up to 100 animals, mountain goats in most portions of their range occur in small groups that range from two to more than a few dozen animals, composed of adult females (nannies), their dependent young (kids), and occasionally a few associated males and females (WDFW 2016b). Adult males (billies) are usually solitary or found in small groups except during the breeding season (rut) when they seek out breeding females. Within groups, mountain goats have an established hierarchy and a fair amount of intraspecific aggression. Males and females both have sharp horns that can cause severe injury. Consequently, mountain goats have evolved behaviors in which dominance and aggression are communicated through display and aggressive contact is avoided, minimizing the chance for injury (appendix A).

In most situations, female mountain goats are dominant to males, and dominance appears to increase with age. Dominance status has been observed to persist even after horns are lost. The breeding season generally begins in October and extends through December (Geist 1964). Onset of sexual maturity usually ranges from 2 to 4 years of age in females and from 2 to 3 years of age in males. Typically, only the most mature and dominant males breed. Behavior of billies during rut includes pitting and brush

rubbing. Pitting involves a male mountain goat sitting on the ground with an arched neck and head looking toward the ground. The male then paws quickly and vigorously with a front leg, throwing snow and dirt at his belly, hind legs, and flanks creating a rutting pit. This often results in males having a "dirty trousers" appearance of dark patches on flanks, rump, and bellies (Geist 1964). Brush rubbing involves a male standing and rubbing glands located at the base of its horns on shrubs or bunches of grass by brushing the frontal area of its skull from side to side (appendix A). Males attempt to court individual females or females in small bands (groups consisting of multiple mountain goats) (Ellis et al. 2007). After a female accepts a male's courtship, he may become part of her nursery band (Geist 1964). Nursery bands usually consist of four to five individuals, but many increase to 15 to 20 after young are born (Blood 2000).

The gestation period for female mountain goats usually ranges between 185 and 195 days, with young often being born between May and June. Female mountain goats usually have one kid per gestation period; however, they can produce twins when conditions are favorable. During parturition, females may isolate themselves from other mountain goats. Mountain goat offspring are precocial (able to move freely) within about 45 minutes of birth (Ellis et al. 2007). Young will likely begin to consume vegetation at 1 week old and are weaned at 4 months. After approximately 2 weeks of seclusion post-birth, the mother and offspring return to the nursing band (Côté and Festa-Bianchet 2003; Peek 2000; Festa-Bianchet and Côté 2008; Toweill et al. 2004).

In the Olympic Mountains, mountain goats mostly occupy high-elevation alpine and subalpine vegetation communities at or above treeline, which generally averages approximately 4,750 feet in the central Olympic Mountains (Jenkins et al. 2011a). Specifically, mountain goats spend summer at elevations above 3,900 feet and winter on steep south- and southeast-facing rock outcrops and cliffs between 2,680 feet and 5,056 feet. Use of the landscape by mountain goats is largely dependent on forage availability, which is mainly influenced by snow cover or moisture availability. In summer, foraging mountain goats typically occupy alpine and subalpine meadows. In winter, their habitat use is determined by snow depth and hardness, and the amount of palatable vegetation exposed by wind. Male mountain goats may forage below the tree line during winter, where snow accumulation is limited by tree canopy cover (Côté and Festa-Bianchet 2003; Gross et al. 2002; Schreiner and Woodward 1994).

Sub-alpine habitat in Olympic National Park

Mountain goats are generalist herbivores, consuming a variety of herbaceous and woody plants. They will select highly nutritious flowers, seed heads, and growing leaves when available. Moreover, mountain goats consume underground plant structures, including fern rhizomes, roots, bulbs, and tubers. Their summer diet consists of approximately 52% grasses, 30% forbs, and 16% browse of woody plants. In the winter, the mountain goat's diet shifts to approximately 60% grasses, 8% forbs, and 32% browse (leaves and soft shoots of coniferous and deciduous vegetation). Vegetative genera consumed in these seasons include species in the following genera: *Poa* (grasses), *Agropyron* (grasses), *Festuca* (grasses), *Koeleria* (grasses), *Carex* (sedges), *Mertensia* (forbs), *Salix* (shrubs), *Picea* (spruce), *Abies* (fir), and *Betula* (birch) (Houston, Schreiner, and Moorhead 1994; Côté and Festa-Bianchet 2003).

Some mountain goat populations have distinct summer and winter ranges, whereas others remain in the same area throughout the year. Annual mountain goat home range sizes vary from 2 to 10 square miles. Summer ranges are often larger than winter ranges, as winter ranges can be reduced to less than 1 square mile. Furthermore, migration distances vary from 1 mile to 10 miles (Côté and Festa-Bianchet 2003; Gross et al. 2002; Houston, Schreiner, and Moorhead 1994; Johnson and Lockard 1983).

Natural or man-made mineral sources used by mountain goats provide minerals (e.g., sodium, magnesium, and sulfur) and buffering compounds (carbonates and clays) important to mountain goat nutrition and digestion. Natural mineral sources used by mountain goats may be dry-earth or wet, although mountain goats appear to prefer dry-earth sources. Mountain goats will travel long distances in order to reach these mineral sources, often at the risk of predation (Ayotte, Parker, and Gillingham 2008; Côté and Festa-Bianchet 2003; Ayotte et al. 2006; Rice 2010). There are no known natural salt licks in the Olympic Mountains. Mountain goats therefore seek out human-produced sources of salt (such as sweat and urine) (appendix A). On the Olympic Peninsula, mountain goats normally begin seeking out mineral sources in April to early June and stop in early autumn.

Mountain Goats on the Olympic Peninsula

Approximately 12 mountain goats were introduced to the Olympic Peninsula near Lake Crescent from 1925 to 1929, prior to establishment of the park. By the early 1980s, the mountain goat population in the park had grown to more than 1,000 individuals, with mountain goats occupying most available habitat on the Olympic Peninsula (Jenkins et al. 2012). At that time, the highest density of mountain goats was on Klahhane Ridge and included more than 200 individuals (appendix A). The park implemented a series of live capture operations during the 1980s, removing several hundred mountain goats and reducing the population to less than 400 by 1990. The population was stable at approximately 300 mountain goats from 1994 to 2004; however, in 2011, the population appeared to have started growing at an average annual rate of 4.9% since previous surveys (Jenkins et al. 2012).

In 2011, mountain goat survey methodologies were updated, and the surveys encompassed a slightly larger area. Based on the new survey methods, the 2016 range-wide mountain goat population in the Olympic Mountains is estimated to be approximately 625 goats (Jenkins et al. 2016). After adjusting survey results to compensate for the updated survey method, researchers found that the goat population had been growing at an average annual rate of 8% from 2004 to 2016 (Jenkins et al. 2016). Based on the calculated average annual growth rate of 8% from 2004 to 2011, an estimated 725 mountain goats could populate the Olympic Peninsula by 2018 (Jenkins et al. 2016). Of these 725 mountain goats, an estimated 90% would be located either within the park or in areas immediately adjacent to the park (Happe pers. comm. 2015b). The projected distribution of mountain goats in 2018 is shown in figure 5 in chapter 2.

Mountain goat population trends on the Olympic Peninsula appear to be consistent with the hypothesis that climate influences mountain goat populations differently depending on precipitation. Mountain goats increased primarily in the western Olympic Mountains during the period of low snowpack during the 1990s until recently, supporting the idea that mountain goats were formerly limited by severe winter weather on the west side of the Olympics. In contrast, mountain goat abundance in the eastern and southern Olympic Mountains did not increase in response to the milder conditions. It is possible that recent low winter snowpack, which benefited the mountain goat population in the western Olympic Mountains, may have limited the mountain goat population in the dry eastern Olympic Mountains. A strong correlation was identified between April snow depths and mountain goat reproductive rates in the following year in the Klahhane Ridge area of the eastern Olympic Mountains. This is likely related to the availability and nutrient content of green forage, which is dependent on snowfield persistence in subalpine areas during summer months. A lack of available, nutrient-rich forage likely impacts the nutritional condition of mountain goats (Jenkins et al. 2011a).

Given that the current and projected distribution of mountain goats in the project area overlap with many areas of high visitor use, there is high potential for mountain goat-human interactions. The nature of mountain goat-human interactions in the park can vary widely, ranging from benign (observing goats from several hundred feet away across a ridge) to extremely hazardous (appendix A). Details pertaining to specific mountain goat-human interactions are discussed further in the "Visitor and Employee Safety" section of this chapter.

WILDERNESS CHARACTER

The Wilderness Act

The purpose of the *Wilderness Act* of 1964 is "to secure for the American people of present and future generations the benefits of an enduring resource of wilderness." The act defines wilderness as an area "where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain," and "an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation." The act also states that wilderness is to be "protected and managed so as to preserve its natural conditions." Wilderness "generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable," and has "outstanding opportunities for solitude or a primitive and unconfined type of recreation" (section 2(c)). Wilderness areas, according to the *Wilderness Act*, are to be "devoted to the public purposes of recreational, scenic, scientific, educational, conservation, and historical use."

To ensure an enduring resource of wilderness, the *Wilderness Act* (section 4(c)) prohibits certain uses within wilderness: "there shall be no temporary road, no use of motor vehicles, motorized equipment, or motorboats, no landing of aircraft, no other form of mechanical transport, and no structure or installation within such area." The exception for utilizing these prohibited uses is only if they are "necessary to meet minimum requirements for the administration of the area."

NPS *Management Policies 2006* require all management decisions affecting wilderness to be consistent with the minimum requirement concept. This concept is a documented two-step process to determine if administrative actions, projects, or programs proposed by the park with the potential to affect wilderness character, resources, or the visitor experience are necessary for administering the area as wilderness, and if necessary, how to minimize impacts related to implementation of the proposal (NPS 2006).

Wilderness Character

The primary management mandate of the *Wilderness Act* for the federal agencies administering wilderness is to preserve the wilderness character of the area (Use of Wilderness Areas, section 4(b)). This legal requirement is also addressed in section 2(a) of the *Wilderness Act*: "a National Wilderness Preservation System…shall be administered…so as to provide for the protection of these areas, the preservation of their wilderness character." In addition, section 4(b) states that while administering the area for "other purposes for which it may have been established," the agencies are directed to also preserve the wilderness character of an area.

Defining Wilderness Character

Wilderness character is not explicitly defined in the *Wilderness Act*. An interagency effort to provide direction related to wilderness character monitoring was developed, and lately updated in the document *Keeping It Wild 2: An Updated Interagency Strategy to Monitor Trends in Wilderness Character Across the National Wilderness Preservation System* (Landres et al. 2015). The definition for wilderness

character found in *Keeping It Wild 2* is derived from the statutory definition of wilderness in section 2(c) of the *Wilderness Act*.

Wilderness character, as described in *Keeping It Wild 2* (Landres et al. 2015), is "a holistic concept based on the interaction of (1) biophysical environments primarily free from modern human manipulation and impact, (2) personal experiences in natural environments relatively free from the encumbrances and signs of modern society, and (3) symbolic meanings of humility, restraint, and interdependence that inspire human connection with nature. Taken together, these tangible and intangible values define wilderness character and distinguish wilderness from all other lands."

Wilderness character is a holistic concept based on the interaction of (1) biophysical environments primarily free from modern human manipulation and impact, (2) personal experiences in natural environments relatively free from the encumbrances and signs of modern society, and (3) symbolic meanings of humility, restraint, and interdependence that inspire human connection with nature.

The Five Qualities of Wilderness Character

According to *Keeping It Wild 2*, the conceptual definition of wilderness character cited previously is linked to a practical meaning of wilderness character by using a framework of "qualities," based on the *Wilderness Act*. Together, the qualities represent the primary tangible aspects of wilderness character. They link the statutory definition of wilderness to both on-the-ground conditions in wilderness and the outcomes of wilderness stewardship. Monitoring the condition of these qualities over time assesses how attributes of wilderness character may be changing and whether the agencies are ensuring that wilderness character is preserved.

Four of the wilderness character qualities apply to all wilderness areas: untrammeled, natural, undeveloped, and solitude or primitive and unconfined recreation. A fifth quality, other features of value, may or may not exist within a wilderness. The five qualities of wilderness character are described below (Landres et al. 2015).

Untrammeled

An untrammeled wilderness is essentially one that is unhindered and free from the intentional actions of modern human control or manipulation.

The untrammeled quality is preserved or sustained when actions to intentionally control or manipulate the components or processes of ecological systems inside wilderness (e.g., suppressing fire, stocking lakes with fish, installing water catchments, or removing predators) are not taken. The untrammeled quality is further degraded by actions that intentionally manipulate the biophysical environment (e.g., the removal of nonnative species, intervention in the behavior or lives of native plants and animals, projects to restore the natural conditions of wilderness, and interference in natural processes and energy flows).

The wildness and untamed nature of the Olympic Mountains was renowned for many years before the area was established as a national park. The area has been called wilderness long before its congressional designation as such, and its untrammeled quality was valued and emphasized before the adoption of the term by the writers of the *Wilderness Act*. To this day, the Daniel J. Evans Wilderness has remained largely unhindered and free from modern human control. Although Native Americans have lived in the wilderness for thousands of years and we do not fully understand the influence they had on the landscape, the wilderness of the Olympic Peninsula has received very little noticeable anthropogenic manipulation.

Natural

A natural wilderness is one where ecological systems are substantially free from the effects of modern civilization.

The natural quality is preserved when there are only indigenous species and natural ecological conditions and processes, and may be improved by controlling or removing non-indigenous species or by restoring ecological conditions. The natural quality is degraded by human-caused change to the natural environment (i.e., human-caused effects on plants, animals, air, water, ecological processes, etc.).

All of the Daniel J. Evans Wilderness lies within Olympic National Park, thus the natural ecological conditions, processes, and indigenous species described under the natural resources issues and impact topics described in this plan/EIS also apply to the natural wilderness character quality. These topics include wildlife, wildlife habitat, vegetation, threatened or endangered species, soils, and the acoustic environment.

Various anthropogenic factors are affecting the Olympic ecosystem and thus affect the natural quality of wilderness character. These include habitat fragmentation from logging on surrounding lands; the poaching of cedar, salal, and moss; and commercial fisheries that affect anadromous fish on their way back to spawn in wilderness areas. Wolves were extirpated in the early 1900s, which would have had top-down effects on the abundance and distribution of their primary prey of elk, as well as indirect influences on faunal and floral communities at lower trophic levels. The establishment of the park in 1938 offered protection for the mountain goat population by no longer allowing hunting to occur, resulting in goats continuing to damage vegetation including endemic and rare alpine plants and soils.

While mostly found in frontcountry sites, a number of nonnative invasive plant species are found within the wilderness, such as Canada thistle (Cirsium arvense) and Herb-Robert (Geranium robertianum). Most park nonnative plants are perennials that are particularly persistent and difficult to eradicate, and could disrupt native plant communities. The seed of nonnative plants can be dispersed by wind and wildlife; in addition, livestock, human clothing, and equipment can be vectors for dispersal. Other visitor activities that may affect the natural quality of wilderness character include stepping on fragile high country vegetation that can impact plant communities for a century or beyond, and harvesting or trampling of intertidal organisms that can damage marine nurseries. Such actions are not unusual within wilderness areas on the Olympic Peninsula.

Undeveloped

An undeveloped wilderness is essentially one without permanent improvements or the sights and sounds of modern human occupation.

The undeveloped quality is preserved or sustained when modern structures, installations, habitations, motor vehicles, motorized equipment, or other mechanical transport is not used in wilderness. It is improved when these prohibited uses are removed or reduced.

The first well-documented expeditions by Euro-Americans to the Olympic Peninsula did not occur until the late 18th century. It was not until the late 19th century that the first pioneers began to more thoroughly explore and settle the Olympic Peninsula. Occupation and modification of land now within the wilderness was mainly small-scale or short-lived. With the establishment of Olympic National Park, the area was managed largely as wilderness keeping development limited; no roads were constructed that bisect the mountainous core of the wilderness. Thus, the development remains largely unnoticeable over most of the wilderness areas on the Olympic Peninsula.

Ranger stations and associated tent platforms, administrative cache boxes, research equipment, and other installations are found throughout the wilderness. While Olympic ranger patrols, trail maintenance, and resource monitoring and scientific research are important for responsibly managing the wilderness, the associated structures are evidence of modern human occupation and influence. The administrative use of motorized equipment and mechanical transport for management activities, although permitted when it is the minimum requirement, in turn degrades the primitive nature of wilderness areas through the development, occupation, or modification of the land by humans.

Solitude or Primitive and Unconfined Recreation

Wilderness provides outstanding opportunities for recreation in an environment that is relatively free from the encumbrances of modern society, and the benefits and inspiration derived from self-reliance, self-discovery, physical and mental challenge, and freedom from societal obligations.

The solitude or primitive and unconfined recreation quality is preserved or improved by management activities that reduce visitor encounters, reduce signs of modern civilization inside wilderness, remove agency-provided recreation facilities, or reduce management restrictions on visitor behavior. The solitude or primitive and unconfined recreation quality is degraded by sights and sounds of human activity (solitude), and by facilities that decrease self-reliant recreation and management restrictions on human behavior (primitive and unconfined).

The ecological diversity of wilderness areas in Olympic National Park and Olympic National Forest provides an array of wilderness-supported opportunities. Within rainforest valleys, along coastal beaches, by high mountain lakes, and on glacier-covered peaks, visitors can experience solitude, a deep connection with nature, discovery, and revitalization, escape the constraints of society, and enjoy personal challenge and self-reliance.

Trailheads leading into wilderness areas on the Olympic Peninsula lie within a 5-hour drive of more than 10 million people, yet despite this accessibility to millions of people, opportunities for solitude are readily available. The vastness of the wilderness allows visitors to spend part of a day or several weeks hiking, backpacking, riding stock, skiing, or snowshoeing. For many visitors, the opportunity of watching wildlife in its natural setting enhances the feeling of solitude, which includes viewing exotic mountain goats.

Both easy and challenging hiking trails into the wilderness areas require graduated self-reliance, based on the route selected and an individual's skill. The general lack of facilities within the wilderness for visitor convenience and comfort also requires visitors to depend on their own self-sufficiency and resourcefulness.

Development is expanding into the foothills outside the park and national forest, continuing to modify the scenic vistas looking out from the wilderness. Lights from surrounding urban areas affect the night sky in wilderness, and overhead aircraft, whether military, commercial, or administrative flights, are an ongoing reminder of civilization. The numbers of researchers and research installations in the wilderness impact the solitude of visitors. Bridges, toilets, and technology reduce opportunities for self-reliance. Designated campsites, signs, and other recreational infrastructure in the wilderness areas on the Olympic Peninsula protect valuable park resources but simultaneously confine recreational experiences.

Other Features of Value

This quality captures important elements or "features" of a particular wilderness that are not covered by the other four qualities, and are truly unique and essential to the character of that wilderness.

The *Wilderness Act* states that wilderness "may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value." Typically, other features of value occur in a specific wilderness location, such as archeological, historical, or paleontological features; some, however, may occur over a broad area such as an extensive geological or paleontological area, or a cultural landscape. This quality is preserved when these "other features of value" are preserved. The other features of value quality is degraded by deterioration or loss of integral site-specific features of value.

The designated wilderness areas on the Olympic Peninsula have been part of the homeland to native peoples for much longer than it has been considered "wilderness," and Native Americans have lived on the Olympic Peninsula for at least 14,000 years. Eight tribes continue to recognize a relationship to the park based on traditional land use, origin, beliefs, and ethnographic landscapes: the Lower Elwha Klallam Tribe, Jamestown S'Klallam Tribe, Port Gamble S'Klallam Tribe, Skokomish Indian Tribe, Quinault Indian Nation, Hoh Tribe, Quileute Nation, and Makah Tribe. While native ties to this land are ancient and the designation of the area as wilderness is a modern concept, the relationship between Native Americans and wilderness areas is an important component of the area's cultural heritage. Thus, ethnographic resources associated with Native American tribes represent the other features of value within the wilderness areas. Ethnographic resources, according to NPS *Management Policies 2006*, are the cultural and natural features of a park that are of traditional significance to traditionally associated peoples (NPS 2006a, section 5.3.5.3). Plants and animals, landscapes, and spiritual aspects that are fundamental to the culture of the surrounding tribes are vital elements of the park's wilderness character.

Impacts on ethnographic resources in the wilderness include illegal harvest, high visitation in sensitive areas, park operations, rising sea levels, and other natural events such as floods and fires that could threaten ethnographic resources and their associated sites. However, ethnographic resources were dismissed from detailed analysis (see chapter 1), and so this characteristic is not analyzed in chapter 4 of this EIS.

Wilderness in Olympic National Park

Olympic National Park was established in 1938 to protect diminishing herds of Roosevelt elk, safeguard disappearing old-growth forests, and preserve its wilderness conditions (NPS 2008a; Wilderness.net 2016).

The 1964 *Wilderness Act* requires that federal land management agencies conduct studies on roadless areas within their jurisdiction for possible wilderness designation. A *Proposed Wilderness/Final Environmental Impact Statement for Olympic National Park* was completed in 1974 that proposed 96% of the park as wilderness. The wilderness recommendation was sent to congress and a Senate bill was introduced but never acted on. In accordance with agency policy, the proposed lands were managed as *de facto* wilderness. In 1988 the Washington State congressional delegation introduced legislation for large portions of all three national parks in the state to be designated as wilderness areas. On November 16, 1988, President Ronald Reagan signed the *Washington Park Wilderness Act* (PL 100-668) into law, designating 876,669 acres, approximately 95%, of Olympic National Park, as the Daniel J. Evans Wilderness (formerly the Olympic Wilderness) and another 378 acres as potential wilderness additions (NPS 2008a). In 2012, the *Quileute Tsunami Protection Act* transferred park lands, including approximately 222 acres of the Daniel J. Evans Wilderness, to the Quileute Nation. The 876,477 wilderness acres remaining still encompass about 95% of the park (figure 8). The Daniel J. Evans

Wilderness is extremely diverse, with glacier-covered mountains, subalpine lakes and meadows, heavily forested glacier-carved river valleys, old-growth coniferous forests, and a stretch of wild Pacific Ocean coastline (NPS 2014a). Day hiking and backpacking are popular activities in the Daniel J. Evans Wilderness, and the park trails and campsites are the most conspicuous human disturbance to the wilderness. There are 611 miles of maintained trails and more than 1,300 campsites, and the Pacific Northwest National Scenic Trail traverses 140 miles through the park, passing east to west through the heart of the wilderness. A variety of structures are maintained for the purpose of wilderness management, primarily along trail corridors or in camp areas. This includes four ranger station cabins, several temporary ranger station tents, 18 shelters, over 80 toilets, and other facilities such as radio repeaters and research equipment.

The Daniel J. Evans Wilderness has some of the highest overnight use of any NPS managed wilderness or backcountry area. With 17,197 parties, 49,777 visitors and 105,645 user nights (i.e., the number of visitors multiplied by the number of nights that visitors stay in wilderness) in 2015, wilderness overnight use has steadily increased since 2011. The interior of the park accounts for approximately 52% of the overnight wilderness use. Coastal wilderness use accounts for 48% of overnight wilderness use, its popularity largely due to the uniqueness of the experience which provides year-round, snow-free access to rare ocean coast wilderness.

Wilderness in Olympic National Forest

The Olympic Mountains have been described as wilderness since the 19th century. In the early 1900s, development of the wilderness began with construction of trails, shelters, and ranger stations for administrative use by the US Department of Agriculture (USDA) Forest Service (NPS 2008a). However, it was not until 1984 that the *Washington State Wilderness Act* created five wilderness areas in the Olympic National Forest. These five wilderness areas include the Buckhorn Wilderness, 44,258 acres; Colonel Bob Wilderness, 11,961 acres; Mount Skokomish Wilderness, 13,015 acres; The Brothers Wilderness, 16,682 acres; and Wonder Mountain Wilderness, 2,349 acres (FS 1990).

The smallest wilderness area in the national forest, Wonder Mountain, is the most primitive because it has no high-use camping areas and no trails within its boundaries. This is largely due to its rugged terrain and dense vegetation. The second smallest wilderness, Colonel Bob, has two major camping areas within its boundaries. With only 13 miles of rugged trail, the wilderness largely attracts rock climbers and has very little utility for pack and saddle stock. The Mount Skokomish and The Brothers Wilderness areas have 17.9 miles and 16.3 miles of trails, respectively. The Mt. Ellinor Trail in the Mount Skokomish Wilderness is one of the most popular trails in the national forest (Shaw 2011). High levels of camping use in these areas is mostly limited to the lakes and the Duckabush River corridor.

The Buckhorn Wilderness is the largest wilderness area in the national forest. With 68.7 miles of trail, easy accessibility, significant opportunities for pack and saddle stock use, and open meadows for off-trail camping, the Buckhorn Wilderness has the most visitation of all five wilderness areas. It is traversed by the Pacific Northwest National Scenic Trail and popular use areas in Buckhorn include Camp Handy, Marmot Pass, and Camp Mystery (Shaw 2011).

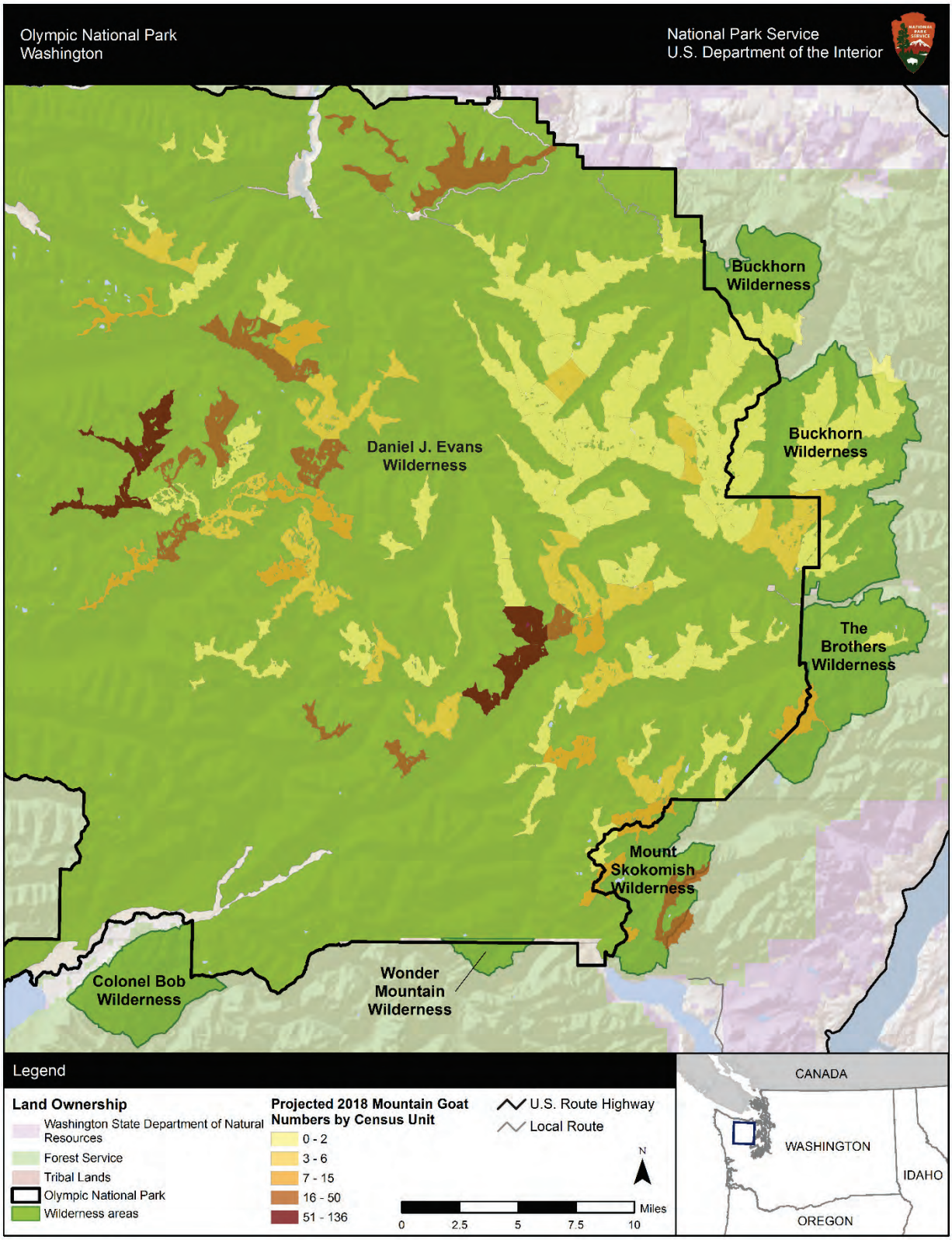


FIGURE 8. WILDERNESS IN OLYMPIC NATIONAL PARK AND OLYMPIC NATIONAL FOREST

WILDLIFE AND WILDLIFE HABITAT, INCLUDING SPECIAL-STATUS SPECIES

Wildlife in Olympic National Park and Olympic National Forest

Wildlife populations on the Olympic Peninsula have been largely shaped by geographic isolation of the peninsula. In addition to the mountain goat, the golden-mantled ground squirrel, wolverine, and pika are examples of species that were naturally excluded from the peninsula (Houston, Schreiner, and Moorhead 1994). From dense, mixed-conifer forests, to the subalpine meadows rock slopes, the park is home to a variety of fish, birds, and other wildlife throughout these diverse habitats (NPS 1995). It is estimated that there are approximately 300 avian, 65 mammalian, 13 amphibian, 29 freshwater fish, and 4 reptilian species on the Olympic Peninsula (NPS 2008a). Wildlife within park boundaries and on some adjacent Olympic National Forest lands benefit from the added protections associated with wilderness designations (as described in the "Wilderness Character" section of this chapter). These wilderness areas provide protection to ecological systems and their biological and physical components (NPS 2008a).

Although mountain goats occur primarily within subalpine and alpine terrestrial communities, all but two staging areas (Hurricane and Deer Park) would be located at lower elevations. As a result, this section focuses on those wildlife species that could occur in either the park or surrounding national forest, and could be affected by mountain goats and all associated activities necessary for mountain goat management.

Competition between mountain goats and other wildlife species most likely occurs, despite a lack of scientific data showing specific evidence. Houston, Schreiner, and Moorhead (1994) suggest that modification of vegetation communities by mountain goats on the Olympic Peninsula likely affects the distribution or abundance of other wildlife species, especially other ungulates and small mammals.

Endemic Wildlife Species

The diversity of wildlife within the project area includes several endemic (found nowhere else) species and subspecies (NPS 1995). Endemic species that occur in mountain goat habitat on the Olympic Peninsula include Olympic marmot (*Marmota olympus*), Olympic yellow-pine chipmunk (*Tamias amoenus caurinus*), Olympic snow mole (*Scapanus townsendii olympicus*), Olympic pocket gopher (*Thomomys mazama melanops*), and Olympic ermine (*Mustela ermine olympica*). The Olympic torrent salamander (*Rhyacotriton olymicus*) and Olympic grasshopper (*Nisquallia olympica*) have the potential to occur at lower elevations near staging areas (Houston, Schreiner, and Moorhead 1994, NPS 2008a; Piper pers. comm. 2016a). Further information about the Olympic marmot and Olympic pocket gopher can be found in the "Special-Status Wildlife Species" section.

Mammals

The diverse landscape of the Olympic Peninsula provides for a variety of life history strategies. Small mammals may spend their lives within an area of only a few hundred yards, whereas cougars (*Puma concolor*) and black bears (*Ursus americanus*) may travel hundreds of miles in search of mates, food, or new home ranges. Some species, such as the Roosevelt elk (*Cervus elaphus roosevelti*), migrate seasonally, descending from mountain meadows as snow accumulates. Other species, such as the snowshoe hare (*Lepus americanus*), can remain in their mountain habitat year-round (NPS 2015b).

There are 65 mammal species found within the park and neighboring lands, several of which occur in the project area, including Roosevelt elk, whose presence was a primary factor in the establishment of the park. Other native mammals that may occur in the project area include black-tailed deer (*Odocoileus hemionus columbianus*), black bear, cougar, bobcat (*Lynx rufus*), mountain beaver (*Aplodontia rufa*), and snowshoe hare. The Douglas squirrel (*Tamiasciurus douglasii*) is common in subalpine areas and could potentially be present in the project area. Mammals that are unlikely to occur in subalpine or alpine areas, but that may occur near staging areas, include raccoon (*Procyon lotor*), spotted skunk (*Spilogale gracilis*), and a variety of other small mammal species such as moles, bats, and voles (NPS 2008a, 2015b; Piper pers. comm. 2016a).

Columbia black-tailed deer are common in Olympic National Park

Interspecific resource competition between mountain goats and other ungulate species including Roosevelt elk and black-tailed deer may occur, although additional data is needed to verify this potential relationship. Competition among mountain goats, Roosevelt elk, and black-tailed deer only potentially occurs during summer months due to their overlapping high-elevation summer ranges. Although researchers have speculated that modification of plant communities by mountain goats might affect distribution of other small mammals including the Oregon vole (*Microtus oregoni*), deer mouse (*Peromyscus maniculatus*), and yellow-pine chipmunk (*Tamias amoenus*), the limited nature of surveys was acknowledged, and the results may only reflect habitat preferences of those small mammals (Houston, Schreiner, and Moorhead 1994).

Birds

There are approximately 300 bird species known to occur within the park and the adjoining lands. Common species with the potential to occur in the project area, particularly near staging areas, include American crow (*Corvus brachyrhynchos*), common raven (*Corvus corax*), varied thrush (*Ixoreus naevius*), American robin (*Turdus migratorius*), winter wren (*Troglodytes hiemalis*), Steller's jay (*Cyanocitta stelleri*), gray jay (*Perisoreus canadensis*), ruffed grouse (*Bonasa umbellus*), sooty grouse (*Dendragapus obscurus*), belted kingfisher (*Megaceryle alcyon*), and a variety of warblers, woodpeckers, kinglets, sparrows, and other neotropical migratory birds (NPS 2008a; Piper pers. comm. 2016a).

Common ravens are a widespread habitat generalist on the Olympic Peninsula

According to the *North Coast and Cascades Network Landbird Monitoring Report*, bird

populations in the Pacific Northwest are threatened by a variety of factors. Forest management practices discourage the development of old-growth conditions in conifer forests. Alpine and subalpine habitats are being threatened by visitor impacts and ecological changes resulting from alterations in natural fire regimes and climate change. When considering these threats to avian habitats in the Pacific Northwest, the diverse landscape of the Olympic Peninsula and the protection of its habitats is essential to preserving the region's bird diversity (Siegel, Wilkerson, and Kuntz 2008).

Reptiles and Amphibians

Reptiles that may be present within the project area, particularly near staging areas, include the northern alligator lizard (*Elgaria coerulea*), common garter snake (*Thamnophis sirtalis*), and northwestern garter snake (*Thamnophis ordinoides*), and rubber boa (*Charina bottae*). Amphibians that may be present within the project area include the tailed frog (*Ascaphus* spp.), red-legged frog (*Rana aurora*), cascade frog (*Rana cascadae*), northwestern salamander (*Ambystoma gracile*), western red-backed salamander (*Plethodon vehiculum*), and Van Dyke's salamander (*Plethodon vandykei*) (NPS 2008a; Piper pers. comm. 2016a).

Special-Status Wildlife Species

The Olympic Peninsula contains a variety of habitats suitable for special-status species. A discussion of species protected by the *Endangered Species Act* (ESA) can be found in the "Threatened or Endangered Species" section. NPS *Management Policies 2006* also require that potential effects of agency actions on state or local listed species be considered. Because NPS does not designate species with special conservation status, the following discussion covers wildlife species of concern that have been given special designation by the State of Washington or by the USDA Forest Service, and could be affected by interactions with mountain goats or activities associated with mountain goat management on the Olympic Peninsula. Vegetation species that have received a special designation are discussed in the section "Vegetation, Including Special-Status Plant Species."

Washington State Species of Concern

Wildlife species with the potential to occur within the project area on the Olympic Peninsula that are given special conservation status by Washington State are shown in table 6.

TABLE 6. STATE-LISTED WILDLIFE SPECIES IN OLYMPIC NATIONAL PARK

Common Name	Scientific Name	Federal Status	State Status
Bald eagle	*Haliaeetus leucocephalus*	Delisted	Sensitive
Olympic pocket gopher	*Thomomys mazama melanops*	No	Threatened
Olympic marmot	*Marmota olympus*	No	Candidate
Fisher	*Pekania pennanti*	No (proposal to list was withdrawn on April 18, 2016)	Endangered

Sources: USFWS 2015a, 2016a; WDFW 2015a; NatureServe 2015b; NPS 2007.

Bald Eagle (*Haliaeetus leucocephalus*). The bald eagle is listed as a sensitive species in the State of Washington. It was delisted from the ESA in 2007 due to species recovery (USFWS 2015b). Most eagles that breed in the northern United States migrate south for the winter. Feeding home ranges can be quite large, depending on proximity to food sources and abundance of food. Breeding habitat includes areas close to water bodies, which reflects the availability of primary food sources such as fish, waterfowl, or

seabirds. Nests are usually located in tall trees or on pinnacles or cliffs near water. In western Washington, most eagles begin to incubate their eggs by the third week in March, and young hatch by late April (Stinson, Watson, and McAllister 2001). Young typically fly at 10 to 12.5 weeks, remaining in the care of adults for several weeks after fledging (USFWS 2016a; NatureServe 2015b). Management activities associated with this plan/EIS that could impact this species might include staging areas in proximity to bald eagle habitat and associated helicopter overflights; however, primary bald eagle habitat is located along the coast and in the lower reaches of rivers downstream of staging areas (Happe pers. comm. 2015b).

Olympic Pocket Gopher (*Thomomys mazama melanops*). The Olympic pocket gopher is listed as threatened by the State of Washington. This subspecies of Mazama pocket gopher was reviewed for federal ESA listing in 2012 but was not federally listed because the US Fish and Wildlife Service (USFWS) determined that the primary threat, the encroachment of woody species into Olympic pocket gopher habitat, was not quantified by any data (USFWS 2013). However, because the subspecies range is entirely within the boundary of Olympic National Park and they are believed to be declining (USFWS 2013), the NPS began an inventory of this species in 2015, although results are not yet available (Happe pers. comm. 2015b). This small mammal burrows in the soils of alpine and subalpine meadows, openings in subalpine forest, and open subalpine areas with scattered trees (USFWS 2016a; NatureServe 2015a). Management activities associated with this plan/EIS might take place in Olympic pocket gopher habitat (Happe pers. comm. 2015b).

Olympic Marmot (*Marmota olympus*). The endemic Olympic marmot is listed as a candidate species by the State of Washington. Although its range is small and localized to the Olympic Mountains, and localized populations experienced declines and extirpations in the 1980s, overall populations have remained stable since 2007. The declines observed are likely due to predation by nonnative coyote (*Canis latrans*) and tree encroachment into meadow habitats (Griffin et al. 2008, NatureServe 2015a). This burrowing mammal is almost completely restricted to Olympic National Park and inhabits subalpine and alpine meadows and talus slopes near timberline. Many colonies are located on south-facing slopes, where food availability is greater due to earlier snowmelt. The Olympic marmot grazes on a wide variety of grasses and forbs, accumulating body fat for the winter (NatureServe 2015a). Olympic marmots are known to hibernate for seven to eight months annually, and occupy restricted home ranges during summer months while they are active.

The Olympic marmot is an endemic species on the Olympic Peninsula

Research has indicated that plants favored by mountain goats in the Klahhane Ridge area were also used by Olympic marmots (Houston, Schreiner, and Moorhead 1994). Effects of herbivory by Olympic marmots and mountain goats were shown to reduce the occurrence of palatable forb species and to increase the occurrence of unpalatable species. Research has suggested that high densities of mountain goats do not result in the competitive exclusion of Olympic marmots; however, Olympic marmots occur primarily on the periphery of areas that are most intensively used by mountain goat, which does not provide a good measure of interspecific relationships (Houston, Schreiner, and Moorhead 1994).

Although overall populations of Olympic marmot have remained stable, reports of declining populations in the park prompted research by the University of Montana beginning in 2002. This research showed that Olympic marmots had disappeared from many long-occupied sites and that there had been no colonization of new sites. Additional research showed that the population continued to decline by about 10% per year at still-occupied sites through 2006, when the total population of Olympic marmots was estimated to be fewer than 1,000 individuals. At this time, it was confirmed that the primary threat to the population was predation by coyotes. A monitoring program for the Olympic marmot population in the park was initiated in 2010 to assess the declining population more closely. The NPS will analyze data collected since 2010 in 2016 (NPS 2015c). Management activities associated with this plan/EIS might take place in Olympic marmot habitat.

Fisher (*Pekania pennanti*). The fisher is listed as endangered in the State of Washington; the proposal to list the West Coast Distinct Population at the federal level was recently withdrawn (USFWS 2016c). This mammal is a member of the weasel family and is active day and night and year-round. They inhabit forests of North America, relying on large trees with cavities, large snags, and downed logs to provide essential den and rest sites. They are a solitary species except during the breeding and denning season. Fishers give birth in late March and early April and give birth to kits in tree cavities. The primary fisher denning period (from birth to weaning) lasts about 10 weeks (NPS 2007; Fristrup, Joyce, and Lynch 2010; USFWS 2016a).

Surveys conducted in the 1990s failed to find any fishers in areas considered to be the best remaining habitat in the State of Washington. Additional surveys in national parks within Washington during the early 2000s failed to find any fishers. The fisher was listed as an endangered species in the State of Washington in 1998 by Washington Department of Fish & Wildlife (WDFW) and a recovery plan was released in 2006. A subsequent feasibility study by WDFW determined that the park and neighboring Olympic National Forest were the best locations for the first fisher reintroduction in Washington (Fristrup, Joyce, and Lynch 2010).

According to the 2014 *Annual Progress Report* for fisher reintroduction in the park, 90 fishers were translocated and released from British Columbia to the park from 2008 to 2010. In 2013, a new research project was initiated to determine the status of fishers on the Olympic Peninsula following release. Individuals observed included representatives from the founding population, as well as new recruits to the population. Data of fisher occurrence continues to be gathered for this effort (Happe et al. 2015). Management activities in staging areas might take place in or near fisher habitat (Happe pers. comm. 2015b).

USDA Forest Service Special-Status Wildlife Species

The USDA Forest Service lists Regional Forester Sensitive species, Olympic National Forest Management Indicator species (FS 1990), and Olympic National Forest Survey and Manage Species (USDA/DOI 2001). These species were evaluated and information about their occurrence and habitats is shown in appendix G.

Regional Forester Sensitive Species. The *National Forest Management Act* (16 USC 1600) requires the USDA Forest Service to maintain viable populations of existing native and desired nonnative wildlife in the planning area (36 CFR 219.19). Guidelines for each planning area must provide for a diversity of plant and animal communities based on the suitability of the specific land area. The USDA Forest Service established a Sensitive Species Program and a Biological Evaluation process (FSM 2672.4) to ensure species population viability. Regional foresters are responsible for identifying and maintaining a list of sensitive species occurring within their region. This list includes species for which there is a documented concern for viability within one or more administrative unit within the historic range of the species (FSM

2670.22, WO Amendment 2600-95-7). These species may require special management emphasis to ensure their viability and to preclude trends toward endangerment that would result in the need for federal listing. This regional list was last updated on January 31, 2008. The USDA Forest Service Manual (FS 2011, FSM 2672.4) requires a biological evaluation to determine potential effects of proposed ground-disturbing activities on sensitive species. This evaluation analyzes the alternatives and discusses the potential effects on the population or its habitat within the area and on the species as a whole, and makes recommendations for removing, avoiding, or compensating for adverse effects.

A list of Olympic National Forest Regional Forester Sensitive species is in appendix G. The Region 6 Sensitive Species List for the Olympic National Forest was evaluated for the occurrence of known populations or habitats capable of supporting these species within the area that could be affected by interactions with mountain goats or activities associated with mountain goat management. Regional Forester Sensitive species with known occurrence or the presence of suitable habitat in the area potentially affected by mountain goats or activities associated with mountain goat management are described in appendix G. Thirteen species have known occurrence or suitable habitat present in the project area, including the northern goshawk (*Accipiter gentilis*), peregrine falcon (*Falco peregrinus*), bald eagle, western bumble bee (*Bombus occidentalis*), several butterflies, Olympic grasshopper, Olympic marmot, and Olympic pocket gopher.

Olympic National Forest Management Indicator Species. The Olympic National Forest *Land and Resource Management Plan* (FS 1990) identifies species that are presumed to be indicators of the welfare of other species using the same habitat, and are species whose presence or abundance can be used to assess the impacts of management actions on a particular area. Management indicator species that are present or have the potential to occur within or near the project area include the Pacific marten, pileated woodpecker (*Dryocopus pileatus*), Roosevelt elk, and Columbia black-tailed deer (Piper pers. comm. 2016a). Habitat requirements for these species are described in appendix G. Each of these species has the potential to occur within the national forest in the project area.

Survey and Manage Species. "Survey and Manage" are a set of standards and guidelines associated with the 1994 *Record of Decision for Amendments to USDA Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl* (called the Northwest Forest Plan). They are documented in the January 2001 Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines. These standards and guidelines are applicable to USDA Forest Service and Bureau of Land Management lands in western Washington, western Oregon, and northwestern California and are intended to reduce or eliminate (mitigate) potential effects from agency actions to just over 300 flora and fauna species including mosses, liverworts, fungi, lichens, vascular plants, slugs, snails, salamanders, great gray owl, and red tree voles. These Survey and Manage species are assigned to one of six categories based upon the relative rarity of the species, the practicality to conduct pre-disturbance surveys, and the understanding of association with late-successional or old growth forests. The only Survey and Manage species identified by the USDA Forest Service were mollusks, which are not expected to occur in the project area or would not be disturbed by activities associated with mountain goat management.

VEGETATION, INCLUDING SPECIAL-STATUS PLANT SPECIES

Vegetation in Olympic National Park and Olympic National Forest

Vegetation on the Olympic Peninsula is extremely diverse due to its elevational and climatic variety. Terrestrial ecosystems include several forest types, generally classified by their elevation as coastal, temperate rain forest, lowland, montane, or subalpine forests. Alpine shrubland and grassland communities occupy higher elevations at or above tree line, which is approximately 5,250 feet on the more humid west side of the Olympic Peninsula and approximately 6,200 feet on the drier east and north sides. Within the summer range of mountain goats, vegetation communities range from subalpine meadows and herbaceous communities to scree and rock areas with little vegetation. In these areas, substrate stability and soil moisture are the primary factors in determining plant community distribution (NPS 1995).

Several plants found in the Olympic Mountains exhibit notably disjunct distributions. For example, western hedysarum (*Hedysarum occidentale*) occurs on the Olympic Peninsula, on Vancouver Island, British Columbia, and in the mountains of Idaho; least-bladdery milkvetch (*Astragalus microcystis*) occurs on the Olympic Peninsula and from northeastern Washington into Idaho, Montana, and British Columbia. The least-bladdery milkvetch occurs in only one or two locations in the subalpine and alpine zones in the dry northeastern Olympic Mountains (Houston, Schreiner, and Moorhead 1994).

Endemic Vegetation Species

As with wildlife, vegetation communities in the project area have been shaped by the geographic isolation of the Olympic Peninsula resulting in several known endemic species, including Cotton's milkvetch (*Astragalus australis var cottonii*), Olympic bellflower (*Campanula piperi*), Flett's fleabane (*Erigeron flettii*), Olympic rock mat (*Petrophyton hendersonii*), Olympic Mountain groundsel (*Senecio neowebsteri*), Olympic cutleaf synthyris kittentails (*Synthyris pinnatifida* var. *lanuginosa*), and Olympic violet (*Viola flettii*) (NPS 2008a). These species occur in mountain goat habitat and some are likely to occur near staging areas (Copass pers. comm. 2015).

Vegetation Zones on the Olympic Peninsula

Vegetation patterns on the Olympic Peninsula reflect environmental gradients of moisture and temperature. Moisture increases from east to west, and from lower elevations to higher elevations, and depends on the direction a particular slope faces. Most of the Olympic Peninsula below 4,900 feet is considered coniferous forest. The wide variety of plant communities are classified into six vegetation zones based on the dominant tree species of the potential climax forest. Additionally, there are subalpine and alpine zones that are not classified by dominant tree type. These zones are presented in table 7 and figure 9 (NPS 2008a). Mountain goats occur primarily within the subalpine and alpine terrestrial communities and also occur within the mountain hemlock (*Tsuga mertensiana*), or subalpine fir (*Abies lasiocarpa*) vegetation zones; therefore, management activities associated with the action alternatives would be concentrated in these vegetation zones. Staging areas are located in the subalpine fir zone and at lower elevations in the Douglas-fir (*Pseudotsuga menziesii*) zone and western hemlock (*Tsuga heterophylla*) zone. Vegetation zones of the Olympic Mountains are described in table 7.

TABLE 7. VEGETATION ZONES OF THE OLYMPIC PENINSULA

Vegetation Zone	Elevation	Description
Sitka spruce zone	Typically below 590 feet on the west side of the park.	Occurs in the wettest and most humid regions on the west side of the Olympic Peninsula. Common shrubs include salmonberry (*Rubus spectabilis*), salal (*Gaultheria shallon*), vine maple (*Acer circinatum*), red huckleberry (*Vaccinium parviflorium*) and Alaska huckleberry (*Vaccinium ovalifolium*) (NPS 2008a).
Western hemlock zone	Elevations extend from about 490 feet to 2,000 feet on the west side of the park and from sea level to 3,900 feet on the east side of the park.	Western hemlock is the climax dominant tree species; sub-climax Douglas-fir is widespread. Common shrubs include salal, vine maple, Oregon grape (*Mahonia nervosa*), red huckleberry, Alaska huckleberry, salmonberry, and rhododendron (*Rhododendron macrophyllum*) (NPS 2008a).
Pacific silver fir zone	Throughout the interior of the park, generally at middle elevations.	Pacific silver fir (*Abies amabilis*) dominates in this zone. Characterized by relatively cool and moist conditions. Common shrubs include Alaska huckleberry, red huckleberry, salmonberry, fool's huckleberry (*Menziesia ferruginea*), salal, and Oregon grape.
Mountain hemlock zone	Generally above 3,600 feet.	Occupies the snowier western slopes of the Olympic Mountains. Common tree species include mountain hemlock and subalpine fir. Pacific silver fir also present. Shrubs, forbs, and sedges dominate meadows (Houston, Schreiner, and Moorhead 1994). Common shrubs include Alaska huckleberry, oval-leaf huckleberry (*Vaccinium ovalifolium*), bog huckleberry (*Vaccinium uliaginosum*), white rhododendron (*Rhododendron albiflorum*), mountain ash (*Sorbus sitchensis*), fool's huckleberry, and red heather (*Phyllodoce empetriformis*) (NPS 2008a).
Douglas-fir zone	Middle elevations in the northeastern corner of the park.	Occupies the driest sites in the northeastern Olympic Mountains. Common shrubs include kinnikinnick (*Arctostaphylos uva-ursi*), Oregongrape, serviceberry (*Amelanchier alnifolia*), oceanspray (*Holodiscus discolor*), baldhip rose (*Rosa gymnocarpa*), creeping snowberry (*Symphoricarpos mollis*), and salal (NPS 2008a)
Subalpine fir zone	Generally above 3,900 feet.	Occupies the drier northeastern portion of the Olympic Mountains. Vegetation patterns characterized by tree clumps interspersed with park-like areas with low tree density and meadows (NPS 2008a). Dominated by subalpine fir with components of lodgepole pine (*Pinus contorta*), Pacific silver fir, mountain hemlock, or whitebark pine (*Pinus albicaulis*) (Houston, Schreiner, and Moorhead 1994).
Subalpine and alpine zones	Generally above 4,900 feet. Dominated by grasses, forbs, sedges, cushion or mat-forming dwarf shrubs.	Vegetation varies from sedge, grass, or forb dominated meadows with trees to rocky alpine areas where vascular plant cover is quite low (Crawford et al. 2009). Meadows often dominated by showy sedge (*Carex spectabilis*). Drier sites often contain spreading phlox (*Phlox diffusa*). Ericaceous heather meadows contain pink mountain heather (*Phyllodoce empetriformis*), Merten's mountain heather (*Cassiope mertensiana*), and blueberry (*Vaccinium deliciosum*). Communities found at higher elevations have the highest occurrence of endemic or species of concern in the park (Copass pers. comm. 2015).

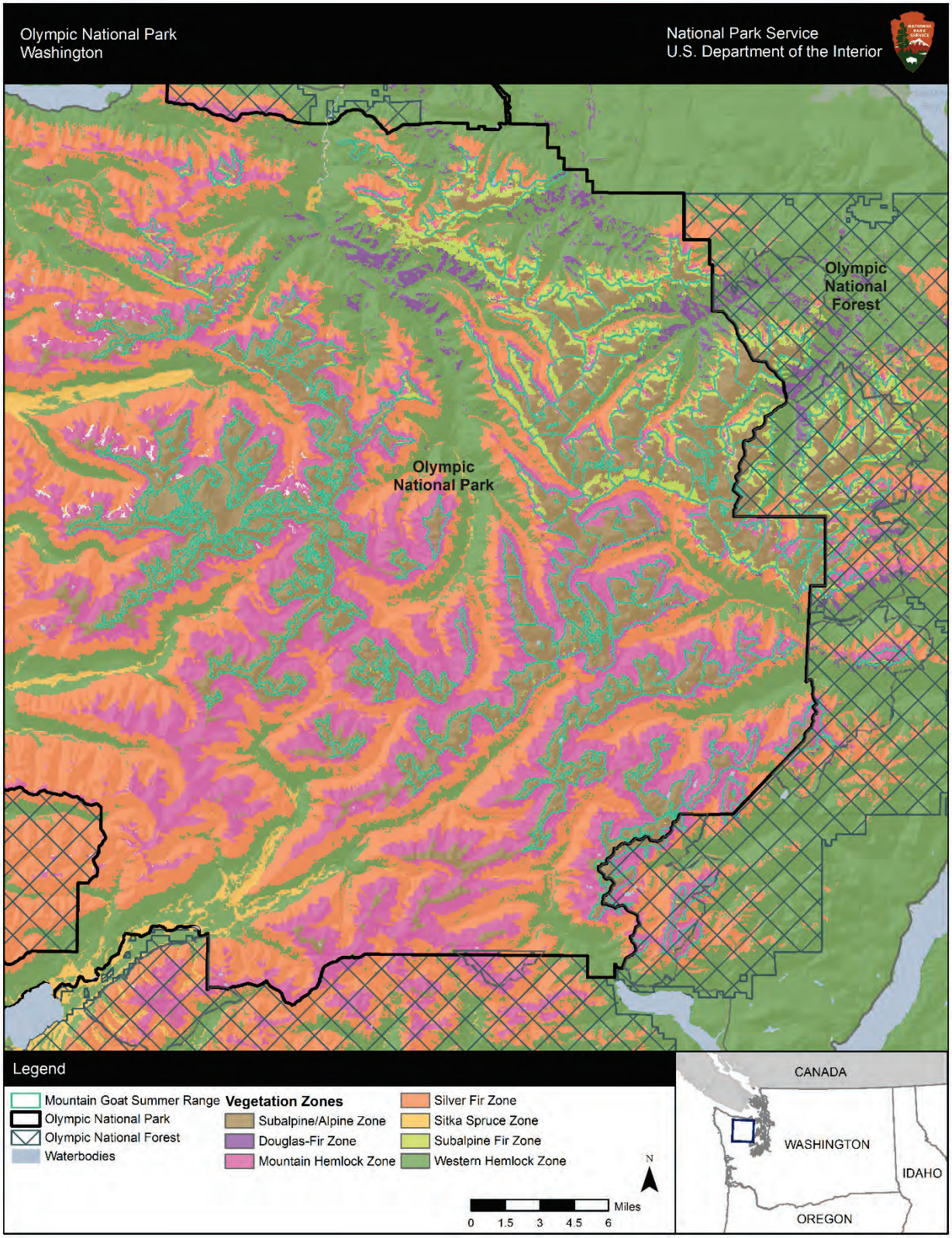


FIGURE 9. VEGETATION ZONES ON THE OLYMPIC PENINSULA

Herbivory of Vegetation at Olympic National Park

Research conducted in mountain goat summer range indicates considerable evidence of herbivory in subalpine and alpine vegetative communities. Primary herbivores include mountain goats, Roosevelt elk, deer, Olympic marmots, chipmunks, pocket gophers, voles, mountain beaver, and snowshoe hare. Studies conducted when mountain goat populations were at their peak levels found evidence of mountain goat presence on all study plots examined. Evidence of mountain goat herbivory was encountered twice as often as evidence of any other herbivores in almost all plant community types. Signs of elk, deer, and marmots were regularly noted around study plots. Evidence of other species was encountered infrequently when compared to evidence of ungulates (Houston, Schreiner, and Moorhead 1994).

Determining which herbivore consumes a specific plant species is difficult due to lack of direct observation. Evidence of herbivores (pellet groups, tracks, wallow or bedding sites, grazing, and trails) in the vicinity was used to infer the species likely responsible for grazing. Olympic marmots appear to extensively use mesic grassy communities and communities containing *Carex spectabilis*; deer grazed mainly in the mesic grassy, *Saussurea forb*, and tall sedge (*Carex-Lupinus*) communities; and elk were most often observed using the *Valeriana* forb (*Carex-Valeriana*) and tall sedge communities. Mountain goats seem to select rock outcrops and cliffs rather than specific plant species. This reinforces the interpretation that summer range selection by mountain goats is based more on physical habitat requirements than on plant communities (Houston, Schreiner, and Moorhead 1994).

Vegetation in Olympic National Forest

All of the vegetation types described for the park are also found in Olympic National Forest. Overall, the national forest occupies a lower-elevation area than the park; therefore, the preponderance of vegetated communities within the national forest are representative of those typically occupying relatively lower elevations, such as the western hemlock zone, Pacific silver fir zone, and Sitka spruce zone (figure 9). Staging areas in the Olympic National Forest proposed for mountain goats would be located in areas within the western hemlock zone and Douglas-fir zone. These areas would be likely to require clearing and grading in order to establish suitable sites for translocation activities.

The Olympic National Forest plan as amended by the Northwest Forest Plan sets forth vegetation management guidance for the forest, including management of old growth forest habitats as well as management for harvest of timber products (USDA/DOI 1994).

The Olympic National Forest plan incorporates the Record of Decision (ROD) for the Pacific Northwest Region Invasive Plant Program (FS 2005), which supplants the *Pacific Northwest Region Final EIS for Managing Competing and Unwanted Vegetation*, dated December, 1988. Management direction in the ROD includes invasive plant prevention and treatment/restoration standards intended to help achieve stated desired future conditions, goals, and objectives. The management direction is expected to result in decreased rates of spread of invasive plants, while protecting human health and the environment from the adverse effects of invasive plant treatment (FS 2005).

Special-Status Vegetation Species

The Olympic Peninsula contains a variety of habitats suitable for special-status plant species. A discussion of species protected by the ESA can be found in the “Threatened or Endangered Species” section. Because NPS does not designate species with special conservation status, the following discussion covers vegetation species of concern that have been given special designation by the State of

Washington or by the USDA Forest Service, and could be affected by interactions with mountain goats or activities associated with mountain goat management on the Olympic Peninsula.

Washington State Species of Concern

As of August 2015, plant species with the potential to occur within the project area that are of special concern to the state are outlined in table 8 (WDNR 2014; USFWS 2016a).

TABLE 8. STATE-LISTED PLANT SPECIES IN OLYMPIC NATIONAL PARK

Common Name	Scientific Name	Federal Status	State Status
Cotton's milkvetch	*Astragalus australis var cottonii*	No	Threatened
Triangular-lobed moonwort	*Botrychium ascendens*	No	Sensitive
Tall bugbane	*Cimicifuga elata*	No	Sensitive
Royal Jacob's ladder	*Polemonium carneum*	No	Threatened
Olympic cut-leaf synthyris	*Synthyris pinnatifida* var. *lanuginosa*	No	Threatened

Sources: NPS 2008a; WDNR 2015; NatureServe 2015c

Cotton's Milkvetch (*Astragalus* *australis var* *cottonii*). Cotton's milkvetch, also known as Olympic Mountain milkvetch, is an endemic species that is designated as threatened by the Washington Department of Natural Resources (WDNR 2015). Its conservation status is considered globally imperiled according to NatureServe (2015c). Cotton's milkvetch is a perennial herb that blooms in July and August and it occurs on dry talus slopes and open, rocky crests at approximately 4,600 to 5,600 feet. Because it grows within mountain goat habitat, it is believed to be threatened by exotic mountain goats, which trample the native vegetation (NatureServe 2015c). It is possible that management activities associated with this plan/EIS could take place within habitat for this species, which includes mountain goat habitat as well as Deer Park and Hurricane staging areas (Copass pers. comm. 2015).

Triangular-Lobed Moonwort (*Botrychium ascendens*). This species, also known as upward-lobed moonwort, is designated as sensitive by the State of Washington (WDNR 2014). Its conservation status is considered globally vulnerable and imperiled within Washington State according to NatureServe (2015c) and WDNR (2015). This is a small, perennial fern that generally occurs in lower montane coniferous forests (NatureServe 2015c). It is possible that management activities associated with this plan/EIS could take place in proximity to habitat for this species (Copass pers. comm. 2015).

Tall Bugbane (*Cimicifuga elata*). Tall bugbane is designated as sensitive by the State of Washington (WDNR 2015). Its conservation status is considered globally secure, but vulnerable within Washington State according to NatureServe (2015c) and WDNR (2015). This species is a coarse perennial herb that is found in moist, shady woods primarily at lower elevations; particularly, north-facing slopes in mature Douglas fir (*Pseudotsuga menziesii*) and bigleaf maple (*Acer macrophyllum*) forests (NatureServe 2015c). It is possible, but unlikely, that management activities associated with this plan/EIS could take place in proximity to habitat for this species (Copass pers. comm. 2015).

Royal Jacob's Ladder (*Polemonium carneum*). Royal Jacob's ladder, also known as great polemonium, is designated as threatened by the State of Washington (WDNR 2015). Its conservation status is considered globally vulnerable, and imperiled within Washington State according to NatureServe (2015c) and WDNR (2015). This species is a perennial herb that occurs in woody thickets, open and moist forests, prairie edges, and roadsides from northern Washington to the San Francisco Bay Area of California

(NRCS 2015). It is possible that management activities associated with this plan/EIS could take place within habitat for this species (Copass pers. comm. 2015).

Olympic Cut-Leaf Synthyris (*Synthyris pinnatifida var. lanuginosa*). Olympic cut-leaf synthyris, also known as featherleaf kittentails, is designated as threatened by the State of Washington (WDNR 2015). Its conservation status is considered globally secure, but critically imperiled within Washington State according to NatureServe (2015c) and WDNR (2015). It is endemic to the Olympic Peninsula with known occurrence in the Hood Canal and Dungeness-Elwha watersheds. This species typically occurs in dry, rocky areas in cushion-plant communities of high elevations (NatureServe 2015d). It is possible that management activities associated with this plan/EIS could take place within habitat for this species, which includes mountain goat habitat as well as Deer Park and Hurricane staging areas (Copass pers. comm. 2015).

USDA Forest Service Special-Status Vegetation Species

Olympic National Forest also lists plant species under their special-status species program. Species identified by this program were evaluated and are identified in appendix G. Appendix G includes a general habitat description and notes about whether the species or its habitat is present in the project area. Species and their habitats identified as occurring in areas where mountain goats or mountain goat management activities could occur include Regional Forester sensitive plant species. No management indicator or survey and manage designated plant species were identified.

THREATENED OR ENDANGERED SPECIES

Threatened or Endangered Wildlife

Table 9 shows the federally listed wildlife species with the potential to occur within the project area on the Olympic Peninsula (WDFW 2015a; USFWS 2016a) and to be affected by actions taken under the alternatives considered.

TABLE 9. FEDERALLY LISTED WILDLIFE SPECIES IN THE OLYMPIC PENINSULA PROJECT AREA

Common Name	Scientific Name	Federal Status	State Status
Birds			
Northern spotted owl	*Strix occidentalis caurina*	Threatened	Endangered
Marbled murrelet	*Brachyramphus marmoratus*	Threatened	Threatened

Sources: USFWS 2015a, 2016a, 2016c; WDFW 2015a; NatureServe 2015a; NPS 2007

Northern Spotted Owl (*Strix occidentalis caurina*). The northern spotted owl is listed as threatened under the ESA and as endangered in the State of Washington. The USFWS has indicated that it will be assessing whether to change the ESA status from threatened to endangered (Buchanan 2016). Northern spotted owl home ranges contain extensive acreage of old-growth forest, which is required to meet habitat needs. The project area includes critical habitat and potential habitat for northern spotted owl, primarily in lower elevations of major drainages (figure 10). Characteristics of northern spotted owl habitat include moderate to high canopy closure, a multilayered, multispecies canopy dominated by large overstory trees; a high incidence of large trees with large cavities, broken tops, and other indications of decadence; numerous large snags; heavy accumulations of logs and other woody debris on the forest floor; and considerable open space within and beneath the canopy. For the purpose of analysis, northern spotted owl breeding season in Washington is broken into two periods: early breeding season is March 1 through

July 15, and late breeding season is July 16 through September 30. Most pairs do not nest every year, nor are nesting pairs successful every year. Incubation lasts about 30 days and young leave the nest at about 5 weeks. After leaving the nest, young depend on their parents until they are able to fly and hunt on their own. During the first few weeks, the adults often roost with young during the night (NPS 2008a; USFWS 2016a; NatureServe 2015a; Buchanan 2016).

Over 80 northern spotted owl territories in the NPS and USDA Forest Service portion of the project area have been studied for approximately 22 years. A 2014 workshop analyzed data collected from several demography studies conducted from 1990 to 2013. This analysis estimated a range-wide rate of population decline of 3.8% per year and a 3.9% annual decline for the Olympic Peninsula. NPS monitoring sites detected northern spotted owl pairs at three sites and single northern spotted owls at three sites, which represents the lowest number of sites with detections for any year of the study. Competition with the barred owl (*Strix varia*) appears to be the primary threat to the conservation of northern spotted owls in protected areas (Gremel 2014; Dugger et al. 2016).

The interior of the park has approximately 494,000 acres of forested areas considered potential northern spotted owl habitat. This represents the largest contiguous block of suitable nesting habitat remaining within the listed range of northern spotted owls. However, lower elevations of this habitat are being invaded and almost exclusively used by nonnative barred owl, which displace northern spotted owls because they are slightly larger and more aggressive (NPS 2008a). Management activities associated with this plan/EIS include one staging area (Sweets) that is very close to potential habitat for the northern spotted owl (Happe pers. comm. 2015b). The two southern staging areas proposed in Olympic National Forest, Mt. Ellinor and Hamma Hamma, occur within areas mapped as critical habitat for the northern spotted owl (Piper pers. comm. 2016c).

However, all potential staging areas in the national forest were evaluated by wildlife biologists with USDA Forest Service, NPS, and WDFW to ensure that they would not occur adjacent to suitable habitat for northern spotted owl. The field review found that the characteristics and configuration of the forest surrounding the Hamma Hamma and Mt. Ellinor staging areas do not provide habitat that is suitable for northern spotted owl (Piper pers. comm. 2016b).

Marbled Murrelet (*Brachyramphus marmoratus*). The marbled murrelet is listed as threatened, both federally and at the state level in Washington. This small seabird lives primarily in the near-shore marine environment, but nests in old-growth forests 50 or more miles inland. Suitable nesting habitat for murrelet consists of old-growth coniferous stands that are multilayered with moderate to high canopy closure. Potential habitat of this type occurs along the major drainages in lower elevations of the project area, overlapping the potential habitat for northern spotted owls (figure 10). Marbled murrelet will occasionally nest in younger stands if remnant large trees or deformities provide large enough limbs. For the purpose of analysis, the nesting season is broken into two periods: early nesting season from April 1 through August 5, and late breeding season from August 6 through September 23. Nestlings fledge in 27 to 40 days (NPS 2008a; USFWS 2016a; NatureServe 2015a).

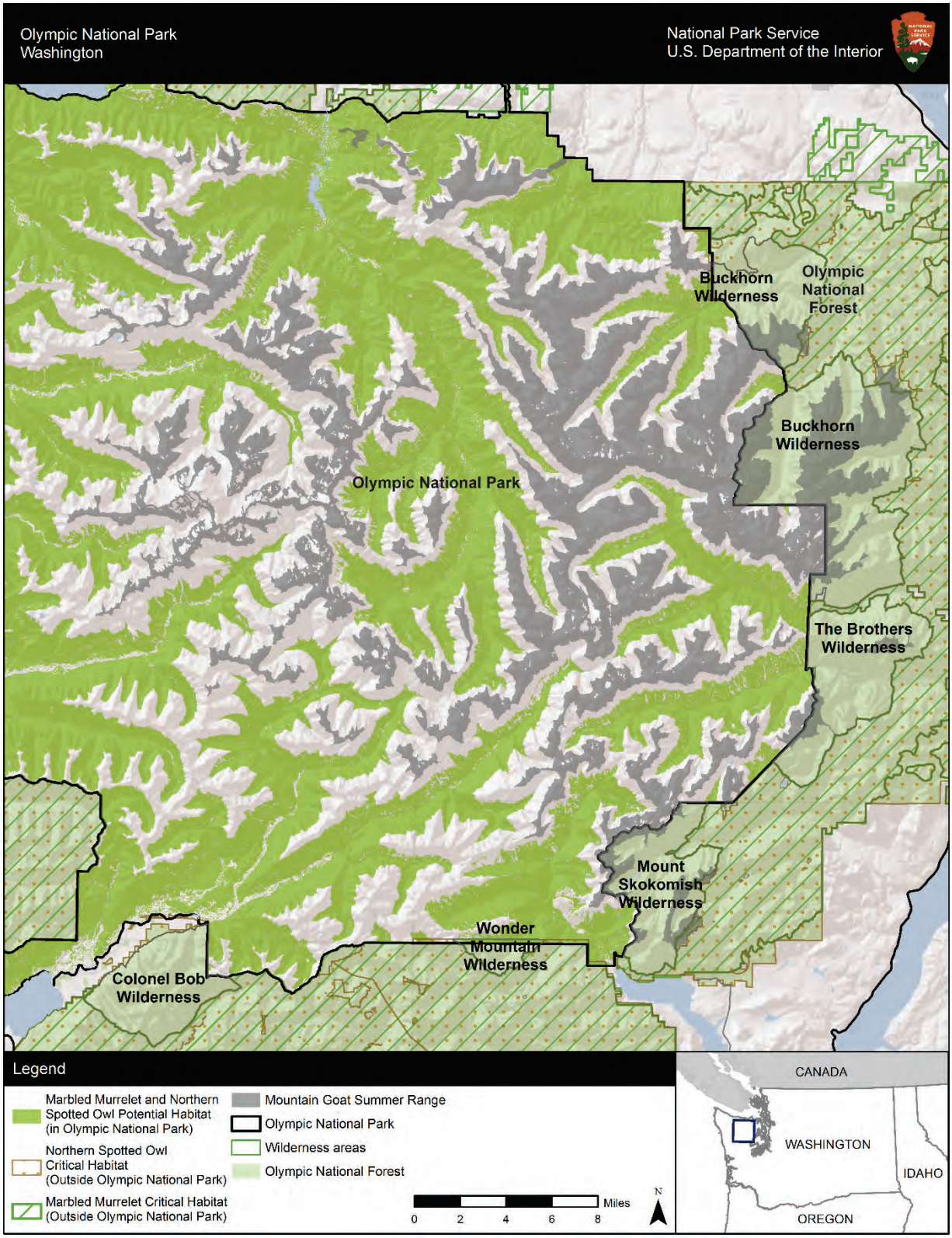


FIGURE 10. CRITICAL HABITAT AND POTENTIAL HABITAT FOR NORTHERN SPOTTED OWL AND MARBLED MURRELET ON THE OLYMPIC PENINSULA

Within the project area, marbled murrelet occur within all major drainages below approximately 4,000 feet. Audio-visual survey efforts for nesting marbled murrelets have found occupied stands up to approximately 3,800 feet on the east side of the Olympic Peninsula and up to approximately 3,500 feet on its west side (USFWS 2009). Approximately 453,000 acres of forested area within the park are considered suitable nesting habitat, representing the largest contiguous block of suitable nesting habitat remaining within the listed range of marbled murrelet in the lower 48 states. The park is located in two different marbled murrelet recovery zones (Zone 1: Puget Sound, and Zone 2: Western Washington Coast Range) with the line between the two zones bisecting the park from northwest to southeast (NPS 2008a). Currently, no research on the marbled murrelet is being conducted in the park. Management activities associated with this plan/EIS might include use of the Sweets staging area, which is close to potential habitat for the marbled murrelet (Happe pers. comm. 2015b).

Marbled murrelet nesting habitat in the Olympic National Forest is 259,731 acres. Similar to the national park, marbled murrelets in the forest are within Conservation Zones 1 and 2. Management activities associated with this plan/EIS include use of staging areas in the forests that are within habitat for the marbled murrelet (Piper pers. comm. 2016c).

Critical Habitat. Areas of habitat that are necessary for the survival of threatened and endangered species are designated by USFWS, to prevent activities that may "destroy or adversely modify" critical habitat for a listed species (USFWS 2016d). Because the park is 95% designated wilderness, which inherently provides protection to northern spotted owl and marbled murrelet, no critical habitat for these two threatened species has been defined within the park (Happe pers. comm. 2015a). However, potential habitat within the park has been determined by NPS and partner-agency researchers (i.e., USFWS and USGS) as forested areas below 3,000 feet on the west side of the park and below 4,000 feet on the east side. Critical habitat is designated by USFWS for northern spotted owl and marbled murrelet in the Olympic National Forest outside of wilderness areas. Figure 10 shows critical habitat for northern spotted owl and marbled murrelet on the Olympic Peninsula, which occurs outside of the park, and potential habitat is also shown within the boundaries of Olympic National Park.

The Olympic National Forest contains 386,901 acres of designated critical habitat for the northern spotted owl, of which approximately half are considered suitable habitat. The Olympic National Forest also contains 411,964 acres of designated critical habitat for the marbled murrelet, of which approximately half are considered nesting habitat (Piper pers. comm. 2016c). The Mt. Ellinor staging area and Hamma Hamma staging area are both within Critical Habitat Unit NC02 for northern spotted owl and Critical Habitat Unit WA-06-b for marbled murrelet. However, to ensure that proposed management activities would not occur adjacent to occupied northern spotted owl or marbled murrelet habitat, or suitable nesting habitat for marbled murrelet, these potential staging areas were evaluated by wildlife biologists with USDA Forest Service, NPS, USFWS, and WDFW (Happe et al. 2016). The evaluation resulted in the determination that the habitat surrounding the Mt. Ellinor and Hamma Hamma staging areas is not suitable habitat for northern spotted owls or marbled murrelets (Happe et al. 2016).

Threatened or Endangered Plant Species

As noted in chapter 1, no plant species within the project area on the Olympic Peninsula are federally protected under the ESA. Whitebark pine is the only plant species considered for listing (candidate) that has potential to occur in the project area, but has been dismissed from further analysis due to the lack of potential impacts on it from proposed management activities (USFWS 2016a).

ACOUSTIC ENVIRONMENT

The acoustical environment is the combination of all the acoustic resources within a given area. This includes natural sounds and cultural sounds, as well as non-natural human-caused sounds.

Acoustic resources are physical sound sources, including both natural sounds (e.g., wind, water, wildlife, vegetation) and cultural and historic sounds (e.g., battle reenactments, tribal ceremonies). The acoustical environment is the combination of all the acoustic resources within a given area. This includes natural sounds and cultural sounds, as well as non-natural human-caused sounds. NPS *Management Policies 2006* require NPS to restore and manage park acoustical environments and soundscapes (NPS 2016b). According to the NPS, a soundscape is defined as the "total acoustic environment of an area," which includes both natural and human sounds (Fristrup, Joyce, and Lynch 2009). According to section 4.9 of NPS *Management Policies 2006*, the natural soundscape of a park refers to the combination of all of the natural sounds occurring in the park, absent the human-induced sounds, as well as the physical capacity for transmitting those natural sounds (NPS 2006a).

Natural sounds include sounds that are both within and beyond the range that humans can perceive, and can be transmitted through air, water, or solid materials. Some natural sounds in the natural soundscape are also part of the biological or other physical resource components of the park. Natural sounds are an important park resource and a critical component of the ecological communities that parks seek to preserve. Common natural sounds at Olympic National Park and Olympic National Forest range from bird calls and insect chirps to sounds produced by physical processes, such as wind rushing through leaves on trees, thunder, pouring rain, rivers and waterfalls. Natural sound and the opportunity to experience solitude are valued components of the visitor experience within the park and the national forest. The wilderness qualities of a backcountry experience in particular include the ability of visitors to enjoy uninterrupted solitude and natural sounds.

Noise is generally defined as unwanted or intrusive sound. Noise can adversely affect park resources or values, including but not limited to natural soundscapes, wildlife, wilderness, and visitor experience. Primary sources of human-caused noise in national parks can include cars, buses, and other motorized vehicles, including recreational vehicles and their generators; airplanes and helicopters; and park operations, such as the use of maintenance equipment. Human activities in Olympic National Park and Olympic National Forest generate intermittent noise, including the use of mechanical or motorized equipment, such as chainsaws, during management and maintenance activities; construction activities; overflights conducted as part of wildlife surveys; and visitor use activities (use of motor vehicles, recreational vehicles, people in campgrounds, etc.). In addition to these noise sources, traffic on Highway 101 and military and commercial overflights introduce noise that is carried from outside into the park and the national forest.

The magnitude of noise is usually described by its sound pressure. The A-weighted decibel (dBA) scale is commonly used to describe noise levels because it reflects the frequency range to which the human ear is most sensitive. Throughout this section and the analysis of impacts on soundscapes in chapter 4, all noise levels are expressed in dBA. Sound levels in national parks can vary greatly, depending on location, topography, vegetation, biological activity, weather conditions, and other factors. For example, background sound levels within a typical suburban area fluctuate between 50 and 60 dBA, while the crater of Haleakala National Park is intensely quiet, with levels around 10 dBA (NPS 2015d). Several examples of sound pressure levels measured in national parks using the A-weighted scale are listed in table 10.

TABLE 10. COMMON NOISE LEVELS AND THEIR EFFECTS ON THE HUMAN EAR

Decibel level (dBA)	Sound Source	Noise Level
10	Volcano crater (Haleakala National Park)	Very low
20	Leaves rustling (Canyonlands National Park)	Very low
40	Crickets at 5 meters (Zion National Park)	Low
60	Conversational speech at 5 meters (Whitman Mission National Historic Site)	Medium
80	Snowcoach at 30 meters (Yellowstone National Park)	High
100	Thunder (Arches National Park)	High
120	Military jet, 100 meters above ground level (AGL) (Yukon-Charley Rivers National Park)	High
126	Cannon fire at 150 meters (Vicksburg National Military Park)	High

Impacts on soundscapes are typically analyzed in terms of natural ambient sound levels and existing ambient sound levels. Natural ambient sound levels are defined as natural sound conditions found in a project area, including all sounds of nature (i.e., wind, water, wildlife, etc.), and excluding all human and mechanical sounds. Existing ambient sound levels are defined as the composite, all-inclusive sound associated with a given environment, including human and mechanical sounds. Existing ambient sound levels for areas that are in or near the project area are shown in table 11. Sound-level data for existing ambient sound conditions were analyzed in terms of the following metrics (Lee and MacDonald 2016):

- **LA_{eq}**: The equivalent sound level determined by the logarithmic average of sound levels of a specific time period.
- **L_{50}**: A statistical descriptor describing the sound level exceeded 50% of a specific time period (i.e., the median sound level).
- **L_{90}**: A statistical descriptor describing the sound level exceeded 90% of a specific time period and only the quietest 10% of the sample can be found below this point.

The data in table 11 represent existing ambient sound conditions for two locations in the park during wintertime, and may not be completely representative of overall ambient sound conditions for the park. For example, ambient sound levels at Hurricane Ridge may be naturally lowered during winter due to the muffling effects of snow cover, and are likely lower due to a reduced visitor presence. Soundscape monitoring data collected for the summer season has not yet been analyzed.

TABLE 11. EXISTING AMBIENT SOUND CONDITIONS IN OLYMPIC NATIONAL PARK, JANUARY–MARCH, 2010

Site Name	Total Days	Existing Ambient					
		Daytime (7 a.m. to 7 p.m.)			Nighttime (7 p.m. to 7 a.m.)		
		LA_{eq} (dBA)	L_{50} (dBA)	L_{90} (dBA)	LA_{eq} (dBA)	L_{50} (dBA)	L_{90} (dBA)
Hurricane Ridge	38	38.0	24.4	15.4	38.4	21.8	14.7
Lake Crescent	26	44.8	35.1	31.5	45.1	32.4	28.6

Overall, based on a geospatial model constructed by the NPS Natural Sounds and Night Skies Division, the mean existing ambient daytime sound level at Olympic National Park during mid-summer is estimated to be 33.3 dBA (Wood 2015). At this sound level, the soundscape of the park would be considered relatively intact, although some areas along the coast and around popular visitor areas have higher ambient sound levels. In other words, the project area receives relatively little influence from human-caused sounds and the model predicts that the influence of human-caused sounds averages only 0.8 dBA, ranging from 0 to 13.8 dBA, above natural conditions (Wood 2015). This demonstrates that natural sounds intrinsic to the park are an important component of the park's environment needing protection.

SOILS

Soil development in the Olympic Mountains is predominately driven by the amount of moisture in the soil. Sufficient water is present over most of the Olympic Peninsula to cause both rapid weathering and leaching of nutrients; therefore, the soils tend to be relatively infertile (NPS 2008a). The amount and type of organic matter in the soil is important to soil structure and fertility. Organic matter contains many organically bound nutrients such as nitrogen, phosphorus, and sulfur, which are released slowly in the rooting zone where they are most available. Soil organic matter is also the food base for many animals, and organic matter is important in soil mixing and aeration. In the park, the tendency is for organic material to accumulate on the surface of the soil (NPS 2008a).

Alpine and subalpine soils in the Olympic Mountains are young and poorly developed, making them sensitive to disturbance.

Mountain goats primarily reside in fragile alpine soil areas of the park. Alpine and subalpine soils in the Olympic Mountains are young and poorly developed, making them sensitive to disturbance. Alpine and subalpine soils on the Olympic Peninsula are generally acidic with pH values ranging from 4.5 to 5.7 for most soils (NPS 2008a). Soils in the southern and western portions of the park consist of fine-grained volcanic soils, while sedimentary soils from deposition dominate the northern and eastern portions. Metamorphosed and volcanic sediments are often found at higher elevations and in the interior of the park. At lower elevations, soils derived from glacial drift are common (NPS 1995).

Mountain goat wallowing in Olympic National Park

Mountain goats are known to wallow in these soils (NPS 1995; Houston, Schreiner, and Moorhead 1994; Schreiner and Woodward 1994). The typical wallow is flat with exposed mineral soil where surface rocks and vegetation have been removed or eliminated (Houston, Schreiner, and Moorhead 1994). These wallows can range from 32 to 700 square feet in size. Because wallowing removes soil surface layers, the soil has reduced organic matter and associated water-holding capacity, reduced nutrients available for vegetation, increased soil aeration, and increased surface temperature. The soil resulting from mountain goat wallows provides less stability for plant regeneration. These changes to the soil can cause major shifts in plant community composition around wallow edges (NPS 1995).

Soils in Olympic National Forest

Soils in Olympic National Forest are similar to those found in Olympic National Park (NRCS 2016). However, a few generalizations can be made about the soils in the forest. Surface soils typically vary between gravel, silt loams, and silty clay loams. These soils generally have low bulk densities. The properties of these soils are indicative of the presence of amorphous (structureless) clays, with exception of soils formed from the continental glacial drift, which tend to be gravel to gravel sand loams (FS 1990).

The upland soils in the national forest are well drained and have a thin surface. Subsoils strongly resemble original bedrock materials, with depth and gravel contents varying widely. Glacial and alluvial bottomland soils are generally thicker, with high water retention capacities. Surface infiltration rates are also high. Soils in the national forest remain moist up to 4 months in summer, except in the northeastern corner where the soil moisture regime is mostly xeric (FS 1990).

Sensitive soils are scattered throughout the national forest. These are generally correlated with (1) steep slopes, (2) incised stream channels, (3) unstable bedrock, and (4) water seepage areas. Soils erode primarily via mass movement (landslide) mechanisms (FS 1990).

ARCHEOLOGICAL RESOURCES

The NPS categorizes cultural resources as archeological resources, cultural landscapes, historic structures (which include districts), museum objects, and ethnographic resources. As indicated in "Chapter 1: Purpose of and Need for Action," the project has been evaluated as having no potential impact on cultural landscapes, historic structures, museum objects, and ethnographic resources. Therefore, these impact topics have been dismissed, leaving only archeological resources. Approximately 1% of the park and 3% of the national forest has been surveyed for archeological resources. Although limited, these surveys indicate that the project area contains both known and unknown archeological resources (Conca pers. comm. 2015a, 2015b). The 2002 NPS Site Estimation Project for Olympic, North Cascades, and Mount Rainier National Parks supports the potential for thousands of additional archeological resources in the sub-alpine areas of the park (NPS 1998).

The subalpine and alpine areas of the Olympic Mountains were used extensively prehistorically and historically by Native Americans (NPS 1995). It is thought that the peopling of the Olympic Peninsula began approximately 14,000 B.P (Matson and Coupland 1995; Schalk 1988; Waters et al. 2011). There are no known sites attributed to the paleoindian occupation of the park or Olympic National Forest. Native Americans living on the Olympic Peninsula today explain that they have been here since time immemorial. Archeological survey and excavation within the park and forest have documented sites dating back nearly 9,000 years (Kwarsick 2011). These sites are generally lithic scatters characterized by shallowly buried stone tools, flakes, and debitage (the remnants of stone tool production). In Olympic National Forest, these sites tend to be located near high mountain lakes, meadows, and along ridge lines (FS 1998). While documented archeological sites from this early period are rare, it is likely that additional early sites are present within the project area.

Middle period sites (6,000–3,000 BP) are less common in the park and forest, but several sites have been documented and investigated that date to this period (Gallison 1994; Samuels 1991; Schalk, Speulda and Conca 1996; Conca 2000). Sites from this period in the park and forest are dominated by lithic scatters, while there are several shell midden sites along the coast that date to this period. Later period archeological sites are well represented across the Olympic Peninsula (Kwarsick 2011). Sites from this period tend to consist entirely of lithic materials and are difficult to date, it is assumed that they date to this period (Kwarsick 2011). These sites are commonly found in the subalpine region of the park; a trend that is likely the same within Olympic National Forest.

The late period (ca. <3,000BP) has been well researched on the Olympic Peninsula (Schalk 1988; Ames and Maschner 1999). While people were focused on maritime resources during this period, the interior of the park including the high country remained important and was used extensively. Archeological sites representing this time period include large coastal villages and towns, resource procurement sites, rock art sites and a large number of flaked stone tool scatters located primarily in the subalpine zone.

Contact between Europeans and Native Americans occurred in 1792 when Captain George Vancouver came through the Hood Canal and noted coastal villages. The Euro-American settlers arrived in the 1860s with a major influx occurring between 1890 and 1895 (FS 1998). These settlers not only set up homesteads but looked inland for timber and mining. Evidence of this use is still present in many parts of Olympic National Forest and these types of historic archeological sites are recorded as cultural resources (FS 1998). Ethnographic accounts document the use of the high country by Native Americans for a variety of reasons, including resource procurement and travel between villages. It is likely that travel in these mountains was limited to the snow-free months (FS 1998).

The presence of early archeological sites and ethnographic documentation indicate the potential for additional archeological sites to be identified within the subalpine and alpine areas of the park. Given the nature of archeological sites in general, and their likelihood of being shallowly buried within the alpine areas of the park, these resources are easily impacted by ground disturbing activities. These activities include trampling or wallowing by mountain goats as well as management activities aimed at managing these animals.

Olympic National Park

There are over 250 archeological sites recorded within Olympic National Park. These represent over 8,000 years of human use and are spread across the entire park from sea level to nearly 7,000 feet in elevation. They include coastal village sites, rock art sites, lithic scatters, historic period sites, and landscape features. Of these, 97 archeological sites are located in the subalpine and alpine vegetation zones used by mountain goats, or above 4,900 feet above sea level. Of these sites 92 are prehistoric, three are historic and two are multi-component sites that consist of both historic and prehistoric cultural materials. Of the prehistoric archeological sites, three are rock shelters, one of which is a pit feature, and the remaining 88 are lithic scatters. While most of these sites have yet to be evaluated for eligibility to the National Register of Historic Places, the majority of them are likely eligible and will be treated as such until an evaluation has been completed.

Olympic National Forest

There are 205 known archeological resources within the Olympic National Forest. There has been minimal archeological inventory specifically within the wilderness areas of Olympic National Forest (Hauge pers. comm. 2016). Only ten archeological resources have been documented within the project area, eight of which are within the Buckhorn Wilderness and two which are outside of wilderness but within alpine and subalpine vegetation zones used by mountain goats, or above 4,900 feet above sea level. These resources include three trails, one trail shelter, one historic site associated within mining and five prehistoric lithic scatters. Only two of these sites, both trails, have been evaluated for eligibility to the National Register of Historic Places; the remaining sites are considered unevaluated.

VISITOR USE AND EXPERIENCE

Because many of the areas that mountain goats inhabit are also popular destinations for recreational visitors in the project area, both in the frontcountry (e.g., Hurricane Ridge) and backcountry (e.g., Glacier Meadows) (see figure 11 for a map of the project area showing visitor use areas), there is a high potential for mountain goat-human interactions (appendix A). Responses to the possibility of seeing mountain goats vary. Some visitors, interested in viewing all wildlife, welcome the opportunity to see the mountain goats, while others ask how to avoid them (Burger pers. comm. 2015).

Visitor Use and Experience in Olympic National Park

Park Visitation and Use

As seen in table 12, in 2015, the park received 3,263,761 recreation visitors and 43,325 backcountry campers. In 2016, visitor numbers are slightly higher, numbering approximately 50,000 more visitors during 2016 than 2015 by the end of November, as numbers for December are not yet available (NPS 2017a). Most people visit the park in the summer months. Recreational visits were highest from June through September with the greatest number in August, which has exceeded 700,000 visitors that month for the past 3 years. The park receives the greatest number of backcountry campers from July through September, with the greatest number in August during 2015 (23,514). In December, the park received the fewest recreation visitors in 2015 (68,935) and the fewest backcountry campers (201) (NPS 2017a).

Annual recreational visitation has remained above 2.5 million people over the past 30 years (1984–2015). The total number of recreational visitors to the park exceeded 3 million annually for the first time in 1992 and that number of visitors has been maintained during most years since then. In 15 of the past 20 years (1996–2015), more than 3 million people visited the park annually. The park received the most visitors in 1997 (3,846,709) (NPS 2017a).

TABLE 12. 2015 MONTHLY VISITATION IN OLYMPIC NATIONAL PARK

Month	Recreation Visitors	Backcountry Campers
January	79,877	254
February	102,766	726
March	110,453	1,153
April	163,263	1,732
May	280,726	4,743
June	550,337	12,606
July	568,820	21,705
August	702,159	23,514
September	391,825	18,981
October	139,783	2,381
November	104,817	591
December	68,935	201
Total	3,263,761	88,587

Source: NPS 2017a

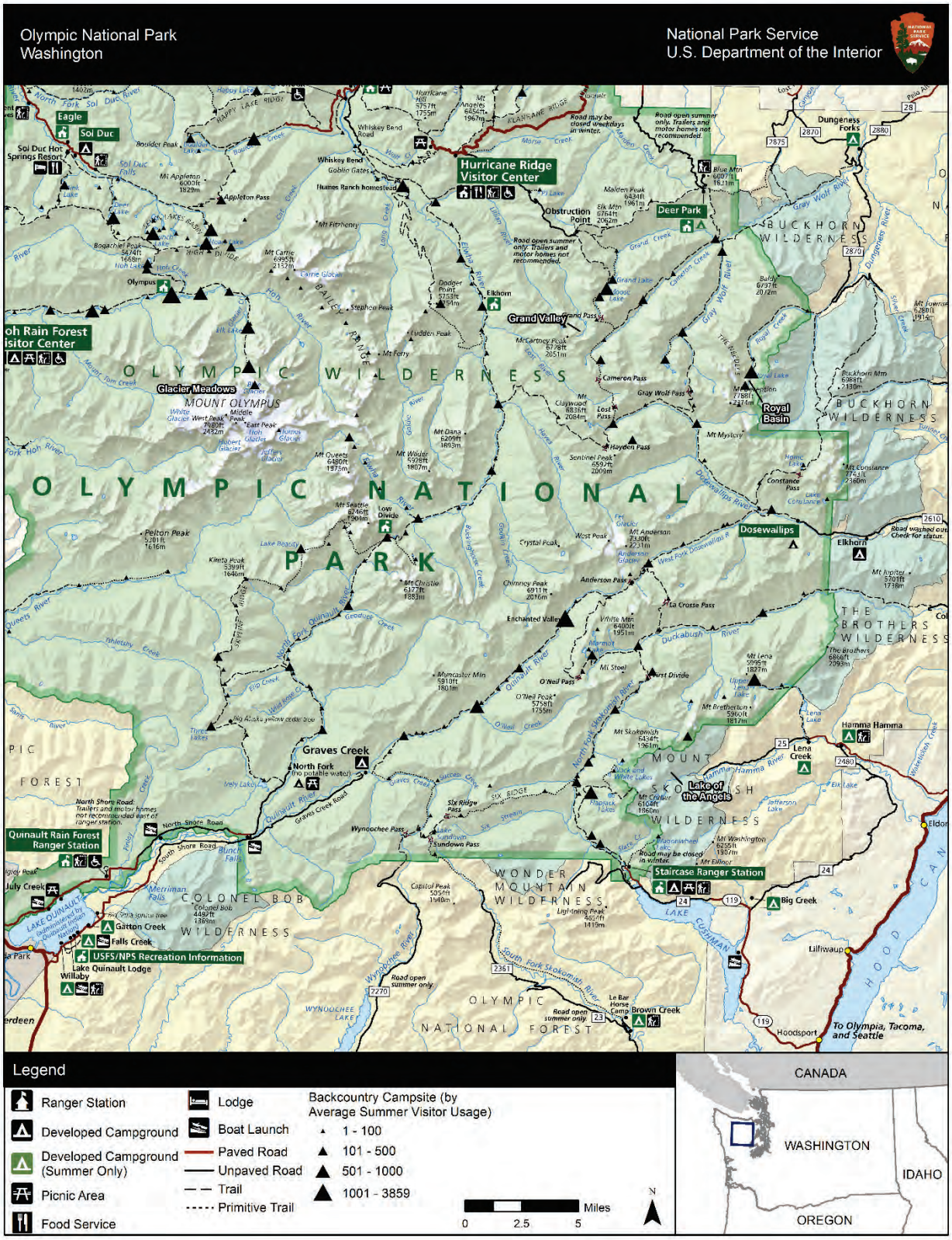


FIGURE 11. MAP OF PROJECT AREA ON THE OLYMPIC PENINSULA SHOWING VISITOR USE AREAS AND FACILITIES

Table 13 shows park visitation at specific locations that occur within proximity to the project area. Lake Crescent is the most popular area for visitors in the park, attracting a total of 1,938,121 people in 2015. The greatest number of people visited Lake Crescent during August (342,627). Another popular area is Hurricane Ridge, which is the location of one staging area, attracting 427,681 visitors in 2015. The greatest monthly visitation (90,078) at Hurricane Ridge occurred during August. Within the project area, the least popular visitor area is referred to as Hoodsport, which is used to access the Staircase entrance near the Mt. Ellinor staging area, attracting only 93,087 visitors in 2015. The greatest number of people visited the Hoodsport area in August (18,257) (NPS 2017a).

TABLE 13. 2015 MONTHLY VISITATION IN OLYMPIC NATIONAL PARK BY AREA

Month	Area			
	Elwha River Valley	Hoodsport	Hurricane Ridge	Lake Crescent
January	1,773	488	6,791	86,130
February	2,516	4,037	10,888	98,629
March	6,497	2,589	10,673	92,869
April	12,620	8,733	13,611	141,310
May	15,121	10,888	36,789	145,886
June	30,066	10,233	67,663	356,486
July	40,630	18,132	88,878	256,664
August	7,890	18,257	90,078	342,627
September	11,660	12,318	59,387	161,199
October	1,812	2,488	24,233	94,400
November	200	2,618	7,631	100,774
December	200	2,306	11,059	61,147
Total	130,985	93,087	427,681	1,938,121

Source: NPS 2017a

A comprehensive visitor survey was conducted at the park from July 7 through 16, 2000, by the Park Studies Unit of the University of Idaho, which found that the most common visitor activities at Olympic National Park were sightseeing/scenic driving (88%); walking on nature trails (77%); enjoying wilderness, solitude, quiet (73%); viewing wildlife (72%); and hiking (71%). Other activities included camping in developed campgrounds, attending ranger-led programs, visiting cultural sites, stargazing, overnight backpacking, fishing, and bicycling. A number of visitors participate in wilderness mountaineering and alpine scrambling. Nontechnical scrambling, glacier travel, and off-trail high-elevation traverses are popular activities. Several concessions and businesses under permit provide recreational services in and around the park, including river rafting, boat rentals, guided wilderness trips, horseback riding, and pack stock and guided trips (NPS 2008a; Van Ormer, Littlejohn, and Gramann 2001). Approximately 23% of visitors indicated they had visited the park more than one time during the 12 months when this survey was conducted in 2000. Approximately 69% spent one day or more at the park. Of those visitors who spent less than one day at the park, 77% spent 1 to 6 hours in the park. Over half of the visitors (62%) said that they spent one or two nights in the park (Van Ormer, Littlejohn, and Gramann 2001). In 2006, there were 82,739 visitor use nights recorded for overnight wilderness use. Favorite areas of the park included Hurricane Ridge, Hoh Rain Forest, Sol Duc, Quinault, Lake Quinault, Lake Crescent, and Rialto Beach (figure 11). Visitors listed these areas as “favorite” because of scenery,

trails, wildlife, natural beauty, a unique experience, and old-growth forest among others (NPS 2008a; Van Ormer, Littlejohn, and Gramann 2001).

Park Facilities and Trails

Recreational visitors enjoy the numerous hiking trails in Olympic National Park

The park is open 24 hours a day year-round, although some roads, campgrounds, and facilities are open seasonally. There are more than 140 miles of paved and unpaved visitor use roads in the park and approximately 1,500 visitor parking spaces. The main visitor center in Port Angeles is open daily in the summer with reduced hours from fall to spring. It offers information, an orientation movie, nature trails, a children's discovery room, exhibits, and handicap-accessible exhibits. There are additional visitor centers at Hurricane Ridge and Hoh Rain Forest, and ranger stations at Quinault, Storm King, and Staircase (NPS 2008a). With the exception of Hurricane Ridge Visitor Center, located 1.3 miles from the Hurricane staging area, the majority of these facilities are located outside of areas where mountain goat management activities associated with the action alternatives would take place. The Staircase Ranger Station is located within approximately 4 miles of the Mt. Ellinor staging area (see figure 11 for a map of park facilities and trails).

The park has 13 developed campgrounds and more than 2,000 campsites (figure 11). Of these, 883 are classified as non-wilderness, road-accessible, while 1,300 are classified as wilderness. Some non-wilderness, road-accessible campsites are open year-round, while others close or become primitive with pit toilets and no water during winter months. Wilderness campsites include small designated camps for hikers, group camps for 7 to 12 people, and stock camps. Permits are required for all overnight stays in the wilderness (NPS 2008a).

As described in the "Wilderness Character" section of this chapter, the park wilderness protects opportunities for solitude and for primitive and unconfined recreation. Visitors to the park have the opportunity to connect with the natural world, to practice traditional skills, and to have transformative personal experiences (NPS 2008a). According to the 2008 park *General Management Plan* (NPS 2008a), overnight wilderness use peaked in 1995 with 123,840 visitor use nights (one visitor use night = one visitor for one night) in the Daniel J. Evans Wilderness. In the late 1990s, overnight use decreased by about 30% and by 2003, there were 94,567 visitor use nights. In 2006, there were 83,420 visitor use nights recorded for overnight wilderness use (NPS 2008a).

Numerous diverse trails within the park vary in both length and remoteness, which can be divided into five separate geographic areas:

- Staircase/Dosewallips Trails and Hurricane Ridge/Elwha Trails, which traverse areas where mountain goat management activities would be likely to take place under the action alternatives;
- Quinault/Queets Trails and Hoh/Bogachiel/Sol Duc Trails, portions of which may traverse areas where mountain goat management activities could be detectable;

- Royal Basin, accessed by the Dungeness River Trail, which traverses areas where mountain goat management activities would be likely to take place under the action alternatives;
- Deer Park, where mountain goat management activities would be likely to take place nearby under the action alternatives; and
- Coastal Routes, which are outside of areas where mountain goat management activities would be likely to take place.

About 32 miles of wider paved or gravel nature trails may include educational signs and appeal to more inexperienced hikers or those who may want a short self-guided interpretive hike. There are 611 miles of maintained trails in designated wilderness. The Pacific Northwest National Scenic Trail traverses 140 miles through the park, passing east to west through the heart of its remote wilderness. About 60% of park wilderness trails (approximately 365 miles) are open to stock use (NPS 2008a; NPS 2015a).

Visitor Use and Experience in Olympic National Forest

Olympic National Forest occupies 632,324 acres of land, including approximately 88,265 acres of wilderness areas adjoining the park (NPS 1995). The forest plays an important role in providing developed and undeveloped recreational opportunities on the Olympic Peninsula.

Visitor activities in Olympic National Forest are similar to those described for the park. Common recreational activities for national forest visitors include hiking, backpacking camping, fishing, bicycling, wildlife viewing, auto touring, horseback riding, and hunting. Unique activities such as clam digging, oyster picking, and scuba diving are also available. Recreational opportunities in the national forest also include facilities and areas that have national and regional significance, such as Lake Quinault Lodge (FS 1990, 2016b). During the summer, the USDA Forest Service provides educational interpretive services to the public two to three times per week at Mt. Ellinor and Marmot Pass, which involve speaking with 100 or more visitors per day (FS 2016d).

Habitat used by mountain goats exists in upper elevations on the eastern side of Olympic National Forest, largely within designated wilderness areas adjacent to the park, and projected mountain goat population growth and habitat use are expected to remain concentrated in these areas (see figure 5 in chapter 2). In addition, the Mt. Ellinor and Hamma Hamma staging areas are each located at lower elevations in Olympic National Forest, near trailheads and frontcountry campgrounds. Camping, day hiking, climbing, backpacking, and hunting in these portions of the national forest, on the northeastern and southeastern flanks of the Olympic Mountains, are therefore the most likely visitor uses that could be affected by management activities associated with this plan/EIS.

Wilderness areas in Olympic National Forest receive heavy use from hikers and backpackers. The Buckhorn Wilderness receives the highest visitation of all five wilderness areas, while the smaller Mount Skokomish Wilderness contains the Mt. Ellinor Trail, one of the most popular trails in the national forest (Shaw 2011). Trail counter data for the Mt. Ellinor Trail recorded 10,718 visitors in 2015. The three next most popular wilderness trails, the Mount Townsend Trail, the Tubal Cain Trail, and the Upper Big Quilcene Trail, are all located in the Buckhorn Wilderness. In 2015, these trails received 6,625; 3,689; and 5,135 visitors, respectively (Weinberg pers. comm. 2016). Mountain goat presence is greatest in the Buckhorn Wilderness and Mount Skokomish Wilderness areas (see figure 8). On the Mt. Ellinor Trail in particular, a number of mountain goat-human encounters have taken place and measures such as trail closure, hazing patrols, and other types of interventions have been implemented. These are discussed in further detail below in the “Visitor and Employee Safety” section of this chapter.

Hunting mountain goats, which is prohibited within the park, is permitted in Olympic National Forest. Hunting activities include sport hunting as well as hunting by local tribal members. While the mountain goat population crosses jurisdictional boundaries of the park and the forest, the majority of mountain goats reside in more extensive habitat within the park, where hunting is not permitted.

WDFW manages and regulates hunting on NFS lands and provides information to the public regarding hunting in visitor use areas (FS 2016d). The WDFW 2015–2016 *Big Game Hunting Seasons and Regulations* (WDFW 2015c) provide information on designated hunting areas, hunter responsibilities, and permit requirements. Harvest of mountain goats throughout Washington is subject to a "once-in-a-lifetime" restriction, wherein a hunter is permitted to take only one mountain goat over the course of a lifetime. Hunters may harvest any adult mountain goat with horns greater than 4 inches long (WDFW 2015c). In areas outside of the Olympic Mountains, WDFW discourages hunters from harvesting nannies; however, in the Olympic Mountains, the harvesting of all mountain goats is encouraged because the hunt in the Olympic Mountains is intended to reduce the mountain goat population and reduce instances of conflicts between mountain goats and humans (WDFW 2015c; Harris pers. comm. 2015b).

In 2014, WDFW offered six hunting permits for the Olympic Mountains, two of which were filled. Hunting season dates for 2014 were September 15–25 (for an early season) and September 26–October 6 (late season). In 2015, WDFW again offered six permits, split into two similar season lengths, but encouraged a higher harvest rate by (1) combining two formerly adjacent units (Mount Washington in the south and The Brothers in the north) into a single East Olympic Mountains unit; and (2) making this hunt into a separate hunt type within the WDFW system. The first change was made to allow hunters more choice in where they decided to hunt (because of a relatively smaller number of mountain goats and difficult access in the northern area). The second change was to encourage hunter participation, by removing the loss of preference points hunters may otherwise have for other Washington mountain goat hunting areas should they draw an Olympic Peninsula mountain goat permit but fail to harvest. In spite of these changes, only two mountain goats were harvested in 2015. During the 2016 hunting season, six permits were issued and five of the permit holders were successful in harvesting a mountain goat. It is anticipated that the hunt will continue under the current regulations for the 2017 hunting seasons (Harris 2015b).

VISITOR AND EMPLOYEE SAFETY

Hazards to visitors and employees in the park and the national forest include hazards typical of backcountry recreation, such as injuries from falls and exposure to inclement weather. However, for the purposes of this plan/EIS, this section focuses only on those hazards associated with mountain goat-human interactions and with current and proposed mountain goat management activities.

Hazards Associated with Mountain Goat-Human Interactions

Mountain goats pose a nuisance when they persistently seek salt and minerals from human urine, packs, and sweat on clothing.

Because many of the areas that mountain goats inhabit are also popular destinations for park visitors, there is a high potential for mountain goat-human interactions on the Olympic Peninsula. These interactions are most likely to occur in areas where mountain goats are habituated to human presence and have become conditioned to seeking salts from humans. The nature of mountain goat-human interactions can vary widely, ranging from benign to fatal. Benign interactions may include casual observation of mountain goats from a distance of several hundred feet, while fatal interactions may occur when mountain goats are in close proximity to visitors. Mountain goats pose a nuisance when they persistently seek salt and minerals from

human urine, packs, and sweat on clothing. They have been known to paw and dig areas on the ground where hikers have urinated or disposed of cooking wastewater and chew unattended clothing (appendix A).

Reports of human injuries caused by mountain goats are extremely rare in the Olympic Mountains. In all reported instances, the encounters were with large, mature male mountain goats in areas where there was a history of both habituation and salt conditioning. Two injurious mountain goat attacks have been reported, in 1999 in the Olympic National Forest and 2010 in the park. The 2010 incident in Olympic National Park involved a mountain goat killing a man by gouging his lower thigh/knee area, severing a major artery. This attack occurred after the mountain goat had followed the man for 3/4 of a mile on a trail, in an area with high visitor use and year-round mountain goat occupancy. The mountain goat was later euthanized by park staff (appendix A).

Table 14 summarizes reports of mountain goat-human interactions by area (see figure 11 for a map of visitor use areas). Table 15 summarizes mountain goat-human interaction type and frequency for 2011 through 2013. There were 157 mountain goat-human interactions reported in 2011, 169 in 2012, and 149 in 2013. From 2011 through 2013, there were the most mountain goat-human interactions (189) in the area called High Divide, and 158 at Hurricane Ridge. Only one mountain goat-human interaction was reported in North Fork Quinault from 2011 through 2013. The majority of mountain goat-human interactions (39.3%) in this 3-year period can be classified as "mountain goat observation," where mountain goats are generally more than 330 feet away. In a high percentage of mountain goat-human interactions (33.6%) from 2011 through 2013, mountain goats can be classified as "habituated," where mountain goats allow people within 100 feet but not closer than 20 feet. In these instances, the goats are easily shooed away. While none of the mountain goat-human interactions in this period were classified as "aggressive," there was one incident with a "conditioned/aggressive" mountain goat in 2011 that resulted in lethal removal of the offending animal. In instances classified as aggressive, the mountain goats make contact with a person or corner a person, making egress impossible. Similarly, a small percentage (0.2%) of interactions from 2011 through 2013 can be classified as "conditioned/aggressive," where mountain goats aggressively seek salts. In these instances, the mountain goats may exhibit threat postures when encountered on trails, and they will not respond unless aggressively hazed (NPS 2013b).

Safety Considerations Associated with Current Mountain Goat Management at Olympic National Park

Several management actions that are currently used for managing mountain goats, including aversive conditioning, animal marking, and lethal removal of hazardous mountain goats, present certain safety concerns related to mountain goat behavior during these operations and potential for injuries. Management operations associated with mountain goat management could involve the use of helicopters in uneven, high-elevation terrain as well as the use of firearms in backcountry areas. These management methods could result in impacts on visitor and employee safety.

Aversive Conditioning

When animals are openly frequenting an area where a number of people are present, an attempt may be made to scare or frighten the animal with aversive conditioning or hazing techniques. Hazing techniques include noise stimuli (sirens, compressed air horns, cracker shells) and contact stimuli (thrown rocks, use of a slingshot, paintballs, or rubber projectiles or bean bags fired from specialty shotgun ammunition). If hazing is used, park personnel must take into account the safety of uninvolved bystanders and employees during hazing actions (appendix A).

TABLE 14. REPORTS OF MOUNTAIN GOAT-HUMAN INTERACTIONS IN OLYMPIC NATIONAL PARK BY AREA

Area	Number of Reports		
	2011	2012	2013
Bailey Range	0	7	0
Dosewallips	2	4	0
Duckabush	1	0	4
East Fork Quinault	2	1	1
Elwha River Valley	5	2	3
Grand Valley	12	11	0
High Divide	60	65	54
Hoh	6	2	4
Hurricane Ridge	48	55	55
North Fork Quinault	1	0	0
O'Neil Pass Area	2	1	2
Royal Basin	7	0	1
Staircase/Skokomish	11	21	25
Total	157	169	149

Source: NPS 2013b.

TABLE 15. FREQUENCY AND TYPE OF MOUNTAIN GOAT-HUMAN INTERACTION IN OLYMPIC NATIONAL PARK

Observation Type	Reported Mountain Goat-Human Interactions by Year			
	2011	2012	2013	Average
Mountain Goat Observation. The mountain goat is generally greater than 330 feet away.	39.5%	40.8%	37.6%	39.3%
Habituated. The mountain goat lets people get within 330 feet, but not less than 20 feet. It is easily shooed away.	38.2%	23.7%	38.9%	33.6%
Habituated and Starting To Be Conditioned. The mountain goat occasionally follows people on trails and visits campsites while people are present. It is not easily shooed away. There are no aggressive postures in males.	12.7%	33.6%	19.5%	21.9%
Conditioned. The mountain goat is persistent in following people and seeking salts. It repeatedly visits campsites. The mountain goat is hard to haze. There are some aggressive postures in males.	8.9%	1.8%	4.0%	4.9%
Conditioned/Aggressive. The mountain goat aggressively seeks salts. It exhibits threat postures when encountered on trails. It will not respond unless aggressively hazed.	0.6%	0.0%	0.0%	0.2%
Aggressive: The mountain goat attacks a person. It makes contact or corners people, making egress impossible.	0.0%	0.0%	0.0%	0.0%
Total Number of Reports	157	169	149	158

Source: NPS 2013b.

Animal Marking

If a mountain goat (or a group of mountain goats is frequenting an area) is a candidate for hazing, or if there has been a series of incidents in an area and there is uncertainty as to which mountain goat is involved, the NPS attempts to mark each animal. There are three levels of animal marking that are available for use in mountain goats: paintballs, ear tags, and radio collars (appendix A). Capture and handling of mountain goats to apply ear tags and attach radio collars presents risks of employee injury from mountain goats that are resisting capture (kicks, bites, injuries from horns); therefore, these activities must be undertaken in a manner to minimize injuries to staff.

Lethal Removal of Hazardous Mountain Goats

Conditioned and aggressive mountain goats may be lethally removed from the park using firearms or other means of humane euthanasia, according to the management continuum presented in appendix B. This has been necessary two times, once during 2010 and again in 2011. Aerial shooting involves the tracking of mountain goats via a small airplane or helicopter. Aerial shooting from helicopters is among the least expensive and the safest management option (as compared to live capture) for park personnel (Houston, Schreiner, and Moorhead 1994). However, helicopter use includes the risk of accidents that could be catastrophic and firearm use can be extremely hazardous, although all personnel will be trained and experienced in this type of operation (Caudell et al. 2009).

Safety Considerations Associated with Mountain Goat Management at Olympic National Forest

Similar to the park, the potential exists for mountain goat-human interactions within Olympic National Forest where mountain goats have become habituated to human presence and have become conditioned to seeking salts from humans. Hazards associated with mountain goat-human interactions in Olympic National Forest are similar to those described for the park. In one instance in the national forest, a man was gored in the thigh after a mountain goat jumped from a rock about 15 feet away. Minutes earlier, the mountain goat had been licking members of the man's group and their packs while they were eating lunch. Mountain goats in Olympic National Forest are concentrated in higher-elevation areas on the eastern portions of the forest and in designated wilderness adjacent to the park boundary (see figure 8). The potential for interactions between humans and mountain goats is therefore greatest in these areas.

Olympic National Forest provides mountain goat-human interaction safety information on its public website and places signs and mountain goat safety information at trailheads (Noble pers. comm. 2016). Olympic National Forest, Olympic National Park, and WDFW collaborated to develop a safety video intended to reduce mountain goat-human conflicts, and WDFW provides a phone hotline and website where visitors can report dangerous wildlife.

Olympic National Forest also encourages visitors to report mountain goat incidents to USDA Forest Service staff and provides a detailed incident report form to record reported mountain goat encounters. Types of encounters to be reported include a mountain goat not moving off trail, acting aggressively, or other events that seem potentially dangerous (Weinberg pers. comm. 2016). A voluntary mountain goat registry is maintained at the Mt. Ellinor Trail, where visitors who have encountered mountain goats can provide information on the nature of the interaction at a self-reporting registration box located at the Upper Mt. Ellinor Trailhead. In 2015, a total of 88 mountain goat-human interactions were reported. In most of these instances, reports indicate that neither the mountain goats nor the humans reacted (i.e., humans watched, took pictures, etc., and the mountain goats did not react). In the 13 circumstances where the visitors made a move (made noise or threw rocks), six of these situations ended in no mountain goat

response, while seven ended in the mountain goat moving away. No threatening responses by mountain goats were reported (FS 2016e).

Since 2012, a number of more active intervention tactics have been implemented to manage mountain goat behavior and minimize negative mountain goat-human interactions. From July, 2012, until September 30, 2012, the Mt. Ellinor Trail was closed to the public due to a reported incident between a hiker and a mountain goat, along with increasingly higher reporting by visitors of unacceptable mountain goat behavior. The closure period provided Olympic National Forest officials time to discuss mountain goat management options with WDFW and to have discussions with park staff concerning how the park works to address mountain goat-human interactions. In addition to ensuring public safety, the closure limited mountain goat exposure to human influence during this period. When the trail was re-opened to the public, USDA Forest Service staff presence on the trail was increased for public education. Small mineral blocks (less than 5 pounds) were placed on three occasions on Mt. Ellinor, outside of wilderness, to draw mountain goats away from trails during peak salt demand. USDA Forest Service staff were provided safety training for the use of bear spray and aversive conditioning, with assistance from national forest biologists and input from WDFW staff. Forest staff conducted over 30 patrols of the Mt. Ellinor Trail in 2012 to monitor mountain goat behavior and to haze mountain goats that approached or remained close to humans. In 2013, Olympic National Forest began recruiting and training mountain goat-human interactions educational interns to patrol high-use trails with mountain goats, such as the Mt. Ellinor Trail, to monitor mountain goat behavior and apply low-level hazing techniques such as yelling and throwing rocks. When necessary, specialized staff have been brought in to apply higher-level hazing (with paintball guns, slingshots, etc.) and attempt to mark animals. Forest staff have continued to conduct hazing patrols on Mt. Ellinor and in The Brothers Wilderness. Additionally, to attract mountain goats away from high human use areas and deter them from approaching visitors to seek salt, small salt blocks have been placed on Mt. Ellinor between 2012 and 2014, but not in 2015 or 2016 (Weinberg pers. comm. 2016).

Mountain goat hunting activities, as described in the "Visitor Use and Experience" section of this chapter, present additional visitor and employee safety risks in Olympic National Forest. These safety risks are largely attributable to the use of firearms during hunting activities. Both the USDA Forest Service and WDFW have regulations governing the use of firearms that are intended to minimize human safety risks. Olympic National Forest regulations prohibit discharging a firearm:

- in or within 150 yards of a residence, building, campsite, developed recreation campsite, or occupied area;
- across or on roads or bodies of water, or where people or property are exposed to injury or damage;
- into a cave; or
- into areas that cause resource damage – e.g., shooting rocks, stumps, or non-game animals.

Areas of the Olympic National Forest are closed to recreational shooting year-round due to proximity to local communities. Violation of these prohibitions is punishable by fine or imprisonment (16 USC 551, 18 USC 3559 and 3571) (FS 2016c). In addition to USDA Forest Service restrictions on firearm use, WDFW requires firearms safety training as part of its hunter safety education requirements. All people born after January 1, 1972, are required to pass a hunter education course to obtain their first Washington hunting license. To receive a Basic Hunter Education certification, students must pass a written test and—in most cases—a field skills test. Washington's hunter education curriculum includes a required firearms safety component (WDFW 2015d).

PART TWO – NORTH CASCADES NATIONAL FORESTS AREA

PROJECT SETTING

Mt. Baker-Snoqualmie National Forest

The Mt. Baker-Snoqualmie National Forest is one of the most visited national forests in the country. Located on the west side of the North Cascades Mountains, the forest encompasses over 1.7 million acres between the Canadian border and Mt. Rainier National Park (see figure 2 in chapter 1). There are glacier-covered peaks, spectacular mountain meadows and old-growth forests rich in history, and outdoor opportunities. Elevations range from below 500 feet to just under 11,000 feet.

Okanogan-Wenatchee National Forest

The Okanogan-Wenatchee National Forest encompasses more than 4 million acres in Washington State and stretches north to south from the Canadian border to the Goat Rocks Wilderness - a distance of about 180 miles. The forest lies east of the crest of the North Cascades Range, which defines its western boundary. The eastern edge of the forest extends into the Okanogan highlands, then south along the Okanogan and Columbia Rivers, and then to the Yakima River Valley. Because of this wide geographic range, the forest is very diverse - from the high, glaciated alpine peaks along the crest of the North Cascades Range and the numerous mountain ranges extending eastward from the crest, through deep, lush valleys of old growth forest, to the dry and rugged shrub-steppe country at its eastern edge (see figure 2 in chapter 1). Elevations range from below 1,000 feet to over 9,000 feet. Precipitation varies widely, from more than 70 inches along the crest to less than 10 inches at its eastern edge. This greatly affects the forest and vegetation types across the area.

WILDERNESS CHARACTER

The project area for the North Cascades national forests, where mountain goats could be released, includes three designated wilderness areas: Glacier Peak Wilderness, Alpine Lakes Wilderness, and Henry M. Jackson Wilderness. Numerous potential sites for releasing mountain goats in the North Cascades national forests were evaluated by USDA Forest Service and WDFW, with efforts to identify as many non-wilderness sites as possible. However, the abundance of suitable mountain goat habitat within wilderness areas and other site criteria led there to be seven of 12 release sites proposed within wilderness.

As described for the Olympic Peninsula, the *Wilderness Act* requires the USDA Forest Service to preserve the wilderness character of these areas.

Glacier Peak Wilderness (*Wilderness Act* of 1964, Public Law 88-577, September 3, 1964)

The 566,057-acre Glacier Peak Wilderness is located on the Mt. Baker-Snoqualmie and Okanogan-Wenatchee National Forests, and borders the Stephen Mather Wilderness to the north and Henry M. Jackson Wilderness to the south. The *Wilderness Act* of 1964 designated the Glacier Peak Wilderness, and the wilderness was increased in size (10,000 acres) by Public Law 90-544 (October 2, 1968). Glacier Peak Wilderness was expanded by an additional 112,000 acres as a result of Public Law 98-399 (July 3, 1984). It contains a 450-mile trail system including the Pacific Crest National Scenic Trail, which traverses its west and north sides.

Glacier Peak Wilderness is characterized by heavily forested streams, steep-sided valleys, and rugged glacier-covered peaks. Various species of wildlife inhabit the area and include deer, bear, and mountain goat. Numerous creeks cut through the valleys from their sharp drainages. This wilderness area also includes more than 200 lakes, many of which are unnamed and difficult to access.

Alpine Lakes Wilderness (*Alpine Lakes Management Act* of 1976, Public Law 93-367)

The Alpine Lakes Wilderness was designated in 1976. A 22,000-acre addition to the wilderness was approved by congress as part of the *National Defense Authorization Act* for Fiscal Year 2015 (Public Law 113-291, December 19, 2014), expanding the wilderness to a total area of 414,701 acres on the Mt. Baker-Snoqualmie and Okanogan-Wenatchee National Forests. The wilderness is located between Snoqualmie and Stevens Passes in the North Cascades Range, including the sub-range called the Wenatchee Mountains. The Alpine Lakes Wilderness is characterized by sawtooth ridges, sharp summit spires, glacial valleys, and hundreds of glacially excavated lake basins. Small glaciers persist in the Stuart Range and along the high crest between Chikamin Peak and Mount Daniel.

Because of the unique position of the Alpine Lakes Wilderness, straddling the crest of the North Cascades Range and the resulting variation in elevation and precipitation, a range of vegetation communities are represented from west to east. Numerous hiking trails provide access to the wilderness, including a portion of the Pacific Crest National Scenic Trail. Given its proximity to the Seattle metropolitan area and scenic qualities, the area receives high visitor use, especially where there is easy access from Interstate 90 and Highway 2.

Henry M. Jackson Wilderness (*Washington State Wilderness Act* of 1984, Public Law 98-339, July 3, 1984)

The United States Congress designated the Henry M. Jackson Wilderness in 1984 and it now has a total of 102,910 acres on the Mt. Baker-Snoqualmie and Okanogan-Wenatchee National Forests. The Henry M. Jackson Wilderness is bordered by the Glacier Peak Wilderness to the north and the Wild Sky Wilderness to the southwest. Extending for more than 20 miles along the north-south trending crest of the North Cascades Mountains, this wilderness area is characterized by deep glacial valleys spreading out east and west from the crest. Snow often accumulates to a depth of 20 feet at higher elevations, and remains well into summer, eventually melting into the more than 60 lakes scattered throughout the area. Henry M. Jackson Wilderness shares its northeast border with the much larger Glacier Peak Wilderness. Thirty-two miles of the Pacific Crest National Scenic Trail bisect the wilderness.

WILDLIFE, INCLUDING SENSITIVE AND MANAGEMENT INDICATOR SPECIES

Wildlife in the North Cascades National Forests

The areas of the North Cascades national forests where mountain goats from the Olympic Peninsula may be released are home to an abundant and diverse assemblage of native fauna. This section provides an overview of the North Cascades national forests wildlife.

Mammals

There are approximately 75 mammal species found in the North Cascades national forests. Large carnivores that are common include black bear, cougar, coyote, and bobcat. Wolves are recolonizing suitable habitat across the region, from which they were extirpated in the early 20th century. Wolverine (*Gulo gulo luscus*) are also present, but at very low abundance. Large herbivores include the black-tailed deer on the west slope of the North Cascades Range and mule deer (*Odocoileus hemionus*) and white-tailed deer (*Odocoileus virginianus*) on the east slope. Both species of deer are the most common ungulates where they occur in the North Cascades forests. Large herds of elk (*Cervus elaphus*) are also present across the southern third of the North Cascades national forests and moose (*Alces alces*) numbers are on the rise, particularly in the northeastern portion of the ecosystem. Small bodied carnivores include red fox (*Vulpus vulpus*), pine marten (*Martes americana*), river otter (*Lutra canadensis*), mink (*Neovison vison*), long-tailed weasel (*Mustela frenata*), and ermine (*Mustela erminea*). Several dozen species of small mammals, including rabbits, ground and arboreal squirrels, mice, shrews, and other rodents are also present, as well as 12 bat species.

At subalpine and alpine habitats used by mountain goat, pika (*Ochotona princeps*) and hoary marmot (*Marmota caligata*) are found among talus slopes or scree fields and foraging in adjacent meadows (NPS 2016c). During summer, after the snow has melted, elk and deer also forage in the same high elevation meadow habitats that are utilized by mountain goats, although they seek security and thermal cover in the adjacent forested habitat rather than the rocky escape terrain favored by mountain goats. Columbian ground squirrels are locally abundant in mid- to upper-elevation open meadows in the northeast portion of the North Cascades ecosystem (Fitkin pers. comm. 2016).

Birds

Over 200 species of birds in 38 families are estimated to occur within North Cascades national forests, with habitats ranging from low elevation forests and wetlands to alpine meadows. In addition to the ESA-listed marbled murrelet and northern spotted owl, there are bald eagle (*Haliaeetus leucocephalus*), northern goshawk, sharp-tailed grouse (*Tympanuchus phasianellus*), common loon (*Gavia immer*), flammulated owl (*Psiloscops flammeolus*), Vaux's swift (*Chaetura vauxi*), Lewis' woodpecker (*Melanerpes lewis*), white-headed woodpecker (*Leuconotopicus albolarvatus*), black-backed woodpecker (*Picoides arcticus*), and pileated woodpecker (*Dryocopus pileatus*). Many migrating, breeding, and wintering species of birds are attracted to the rivers, lakes, and streams in the North Cascades ecosystem. One of the largest wintering populations of bald eagles in the continental United States is within the Skagit River watershed. Clear, fast-flowing rivers and streams host breeding populations of Harlequin ducks (*Histrionicus histrionicus*) (NPS 2015f). The North Cascades ecosystem is directly within the Pacific Flyway Corridor and many migratory species, including raptors, pass through the area during their spring and fall migrations (USFWS 2016a). Over half of the species breeding in the area are migratory species. However, the species potentially impacted would be those nesting close to mountain goat staging areas or release sites. Due to the lack of the project's impacts on trees or other landscape vegetation, there is no change expected in the habitat components from the action alternatives. Therefore, potential impacts on bird species that are not included as management indicator species, Regional Forester sensitive species, or ESA-listed will not be further discussed in this plan/EIS.

Fish

Fish present in the North Cascades national forests include peamouth (*Mylocheilus caurinus*), northern pikeminnow (*Ptychocheilus oregonensis*), coastal and westslope cutthroat trout (*Oncorhynchus clarkii*), chum salmon (*Oncorhynchus keta*), coho salmon (*Oncorhynchus kisutch*), rainbow trout (*Oncorhynchus mykiss*), sockeye salmon or kokanee (*Oncorhynchus nerka*), mountain whitefish (*Prosopium williamsoni*),

and Dolly Varden (*Salvelinus malma*) (NPS 2015g). In addition, the Okanogan-Wenatchee National Forest supports runs of Middle Columbia River steelhead (*Oncorhynchus mykiss*) and Upper Columbia River spring-run Chinook (*Oncorhynchus tshawytscha*), and the Mt. Baker-Snoqualmie National Forest supports runs of Puget Sound steelhead and Puget Sound Chinook salmon (*Oncorhynchus mykiss*) (FS 2015). This project is expected to have no adverse impact on aquatic resources and there is no change expected to aquatic habitat components from the action alternatives. Therefore, potential impacts on fish will not be further discussed in this plan/EIS.

Amphibians and Reptiles

The North Cascades national forests has a variety of reptile and amphibian species, including snakes, turtles, lizards, frogs, and salamanders. This project is expected to have minimal impact on aquatic or terrestrial resources used by these groups of species and there is no change expected to the habitat components from the action alternatives. Therefore, potential impacts on amphibians and reptiles will not be further discussed in this plan/EIS.

Regional Forester Sensitive Species

The *National Forest Management Act* (16 USC 1600) requires the USDA Forest Service to maintain viable populations of existing native and desired nonnative wildlife in the planning area (36 CFR 219.19). Guidelines for each planning area must provide for a diversity of plant and animal communities based on the suitability of the specific land area. The USDA Forest Service established a Sensitive Species Program and a biological evaluation process (FSM 2672.4) to ensure species population viability. Regional foresters are responsible for identifying and maintaining a list of sensitive species occurring on NFS lands within their region. This list includes species for which there is a documented concern for viability within one or more administrative unit within the historic range of the species (FSM 2670.22, WO Amendment 2600-95-7). These species may require special management emphasis to ensure their viability and to preclude trends toward endangerment that would result in the need for federal listing. This regional list was last updated on January 31, 2008. The USDA Forest Service Manual (FS 2011, FSM 2672.4) requires a biological evaluation to determine potential effects of proposed ground-disturbing activities on sensitive species. This evaluation analyzes the alternatives and discusses the potential effects on the population or its habitat within the area and on the species as a whole, and makes recommendations for removing, avoiding, or compensating for adverse effects as needed.

A list of Regional Forester Sensitive species for the Mt. Baker-Snoqualmie and Okanogan-Wenatchee Forest is in appendix H. Only those species that could be impacted by mountain goat management activities are discussed below.

Mountain Goat. The mountain goat is identified by both the Mt. Baker-Snoqualmie and Okanogan-Wenatchee National Forests as a sensitive species due to the Washington Department of Natural Resources ranking as an Imperiled species (S2) with a high risk of extirpation in the State due to concern of restricted range and few populations. The mountain goat is also a forest management indicator species for winter and summer habitat that includes the alpine and subalpine areas of the North Cascades national forests. Habitat includes cliffs, crags or other extremely rocky areas of mountainous terrain and open alpine meadow areas down to conifer forest habitats.

Mountain goats, a native species to the North Cascades national forests, are considered to have experienced substantial declines in most of the North Cascades forests (Rice and Gay 2010; Rice 2012), although the precise magnitude of the decline is uncertain (WDFW 2015a, 2015b). Mountain goat populations have recovered in some portions of the North Cascades forests, and in 2016, 21 permits for recreational harvest were offered within 9 hunting units. Recreational goat harvesting was restricted to

areas with a recent series of population surveys (Rice, Jenkins, and Chang 2009), and in which the number of goats (excluding kids) averaged more than 100 animals. WDFW policy was to constrain harvest levels to ensure that female mountain goats removed were less than 1.2% of the estimated total of goats of yearling age and above in the hunting area over the most recent 3-year period (WDFW 2015b).

Many mountain goat populations in the North Cascades forests remain small and isolated (WDFW 2015b), and appear unlikely to recover for many decades without reintroduction and/or augmentation. Without recovery in these areas, long-term genetic and demographic health of mountain goats in the North Cascades national forests cannot be ensured.

Harlequin Duck. The harlequin duck is found in swift, moving streams (rivers and creeks), with adequate pool habitat for foraging and brooding. The duck can be found along such river ecosystems throughout the Mt. Baker-Snoqualmie and Okanogan-Wenatchee National Forests. Mountain goat management activities at staging areas could disturb nearby nesting ducks.

Wolverine. In Washington, wolverines occur in alpine areas down through forested zones to the lower edge of forests. Generally, they are most common in alpine and subalpine zones of the Cascade Range, but will sometimes descend into valleys, particularly in winter where large game may be available (Aubry, McKelvey, and Copeland 2007). Reproductive den sites (sites where kits are born and raised prior to weaning) typically consist of long, complex snow tunnels that may be associated with large structures, such as fallen trees or boulders (Aubry, McKelvey, and Copeland 2007). Wolverines forage on carrion but are capable of killing their own prey, and in many areas are believed to be dependent on ungulates as a major food source. Due to their low abundance and preference for high-elevation habitat that is being affected by climate change, the wolverine has been proposed for ESA-listing for many years and has been determined as “warranted, but precluded” for listing by the USFWS. The status of the wolverine with regard to the ESA is currently under review by the USFWS, and thus wolverine will be discussed further in the “Threatened or Endangered Species” section (USFWS 2016b).

Management Indicator Species

These species are those selected under the Mt. Baker-Snoqualmie, Okanogan, and Wenatchee Forest Plans (USDA 1989, 1990a, 1990b), as amended, which are presumed to be an indicator of the welfare of other species using the same habitat, and is a species whose condition can be used to assess the impacts of management actions on a particular area. A list of these species can be found in appendix H. Only those species potentially impacted by mountain goat management activities are discussed in this section.

Mule Deer (*Odocoileus hemionus*). Mule deer are an indicator of big game winter range conditions. They are associated with coniferous and hardwood forests with an interspersion of early seral habitat consisting of shrub vegetation for foraging. Mule deer are an edge species and require areas where there is a juxtaposition of cover to escape predators and human disturbance, and open areas for foraging. Mountain goat management activities at staging and release areas, helicopter use, and human presence could disturb nearby mule deer.

Elk (*Cervus elaphus*). Elk are an indicator of big game winter range conditions. They require a juxtaposition of open- and closed-canopy habitats to provide them with foraging areas in proximity to security cover. Roads and trails and the associated human disturbance have adverse effects on elk, which include loss of habitat, increased energy loss, and vulnerability to mortality (Rowland et al. 2005; Wisdom et al. 2004; Wisdom et al. 2005). The negative impacts of roads and trails increase with the level of human use, and elk will often avoid roads particularly in open habitats and shift their use to areas of low human activity. Mountain goat management activities at staging and release areas, helicopter use, and human presence could disturb nearby elk.

Survey and Manage Species

"Survey and Manage" are a set of standards and guidelines associated with the 1994 *Record of Decision for Amendments to USDA Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl*. They are documented in the January 2001 Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines. These standards and guidelines are applicable to USDA Forest Service and Bureau of Land Management lands in western Washington, western Oregon, and northwestern California and are intended to reduce or eliminate (mitigate) potential effects from agency actions on just over 300 flora and fauna species including mosses, liverworts, fungi, lichens, vascular plants, slugs, snails, salamanders, great gray owl, and red tree voles. These Survey and Manage species are assigned to one of six categories based upon the relative rarity of the species, the practicality to conduct pre-disturbance surveys, and the understanding of association with late-successional or old growth forests. No Survey and Manage species are expected to occur in the project area or would not be disturbed by activities associated with mountain goat management, and therefore, are not discussed further.

VEGETATION

Dominant vegetation zones include the western hemlock, Pacific silver fir, mountain hemlock and subalpine fir zones. Under alternatives B and D, mountain goats could be translocated to their preferred habitat at subalpine and alpine elevations in the North Cascades national forests area, and staging areas might be located at lower elevations. Vegetation at mountain goat staging and release sites in the North Cascades national forests could potentially be impacted by mountain goat management activities.

A list of Regional Forester Sensitive plant species with potential to occur in the North Cascades national forests can be found in appendix H. These species are not expected to occur in the project area, because the staging areas are in disturbed areas, and no sensitive plants occur in the alpine areas at proposed release sites. Therefore, these plant species are not discussed further.

THREATENED OR ENDANGERED SPECIES

Threatened or Endangered Wildlife Species

Table 16 shows the federally listed wildlife species with the potential to occur within the project area and to be potentially affected by mountain goat management actions in the North Cascades national forests (WDFW 2015a; USFWS 2016a). The project would not affect ESA-listed fish in the North Cascades forests. No staging or release activities are proposed in or around suitable habitat for fish species, and staging and release activities would not affect aquatic or riparian habitat. These species are not discussed further in this analysis.

TABLE 16. FEDERALLY LISTED AND CANDIDATE WILDLIFE SPECIES IN THE NORTH CASCADES NATIONAL FORESTS

Common Name	Scientific Name	Federal Status	State Status
Birds			
Northern spotted owl	*Strix occidentalis caurina*	Threatened	Endangered
Marbled murrelet	*Brachyramphus marmoratus*	Threatened	Threatened
Mammals			
Grizzly bear	*Ursus arctos*	Threatened	Endangered
Gray wolf	*Canis lupus irremotus*	Endangered	Endangered
Canada lynx	*Lynx canadensis*	Threatened	Threatened
Wolverine	*Gulo gulo luscus*	Candidate (Proposed Threatened)	Candidate

Sources: USFWS 2015a, 2016a; WDFW 2015a

Northern Spotted Owl (*Strix occidentalis caurina*). The northern spotted owl is known to occur in the states of Washington, Oregon, and California, and is listed as federally threatened over the entirety of its range. Although the breeding season varies with geographic location and elevation, northern spotted owls generally nest from February to June (USFWS 2016a).

Northern spotted owls live in forests characterized by dense canopy closure of mature and old-growth trees, abundant logs, standing snags, and live trees with broken tops. Although they are known to nest, roost, and feed in a wide variety of habitat types, northern spotted owls prefer older forest stands characterized by multi-layered canopies of several tree species of varying size and age, both standing and fallen dead trees, and open space among the lower branches to allow flight under the canopy. Typically, forests do not attain these characteristics until they are at least 150 to 200 years old. Loss and modification of nesting, roosting, and foraging habitat due to timber harvesting, land conversions, natural disturbances such as fire and windstorms, and competition with invading barred owl (*Strix varia*), a species native to eastern North America, have led to a decline of northern spotted owls throughout much of their historic range (table 15) (USFWS 2016a).

There is approximately 9,577,969 acres of designated critical habitat in 11 units for the spotted owl in the States of Washington, Oregon, and California. The project area occurs in three spotted owl designated critical habitat units: East Cascades North, West Cascades Central, and West Cascades North (USFWS 2012). Many of the staging areas occur within northern spotted owl designated critical habitat units (USFWS 2012). However, the staging areas are previously disturbed areas and do not contain primary constituent elements of spotted owl critical habitat. Release sites are open areas and do not contain primary constituent elements of spotted owl critical habitat.

Surveys for northern spotted owls in the project area have not been conducted to protocol in recent years. Therefore, any current activity centers near staging areas are unknown. There is no suitable nesting habitat near release sites, but mountain goat management activities at staging areas such as preparation, helicopter use and human presence could disturb spotted owls that may be nesting near the staging areas.

Marbled Murrelet (*Brachyramphus marmoratus*). The marbled murrelet is a small seabird that nests in the canopy of mature, old-growth forests up to 50 miles or more inland. In Washington State, marbled murrelet nesting habitat is located in the Mt. Baker-Snoqualmie National Forest as well as in North Cascades National Park west of the crest of the North Cascades Range (USFWS 2016a). Marbled

murrelet nest from mid-April to late September and have a naturally low reproductive rate, laying only one egg per nest and not all adults nest every year.

The primary cause of marbled murrelet population decline is the loss and modification of nesting habitat in old growth and mature forests through commercial timber harvests, human-induced fires, and land conversions. In the marbled murrelet's marine habitat, oil spills and gill-net fishing also threaten the population. Current estimates indicate that the Washington population continues to decline at a rate of about 5% per year. It is unlikely that population numbers will increase rapidly due to the naturally low reproductive rate and the continued loss of nesting habitat.

There are approximately 3,887,800 acres of designated critical habitat in 101 subunits for the marbled murrelet in the States of Washington, Oregon, and California (USFWS 2016a). The project area within the North Cascades national forests occurs within seven marbled murrelet designated critical habitat subunits: WA-07-d, WA-08-b, WA-09-b, WA-09-c, WA-09-e, WA-10-a, and WA-10-c. While this species has the potential to occur near staging areas, habitat requirements suggest that it is not likely to be a common occurrence. The staging areas are previously disturbed areas and do not contain primary constituent elements of marbled murrelet critical habitat, but surveys for the marbled murrelet have not been completed adjacent to these sites. Release sites are open areas and do not contain primary constituent elements of marbled murrelet critical habitat.

Surveys for marbled murrelet in the project area are limited and have not been conducted according to protocol in recent years. Therefore, any current nests near staging areas are unknown. There is no suitable nesting habitat near release sites, however mountain goat management activities at staging areas such as preparation, helicopter use and human presence could disturb marbled murrelets nesting near the staging areas.

Grizzly Bear (*Ursus arctos*). The grizzly bear is an apex carnivore that was brought to such low levels in the last century that it was listed as a federally threatened species in 1975. The most recent confirmed observation within the US portion of the North Cascades grizzly bear recovery zone was in 1996, when a grizzly bear was observed south of Glacier Peak. The only direct evidence of reproduction during the past 25 years was a confirmed observation of a female and cub on upper Lake Chelan in 1991 (Almack et al. 1993). Several hair sampling efforts throughout the recovery zone detected one female grizzly bear in British Columbia, a single male grizzly was detected by a remote camera and (also confirmed with a hair sample).

The current number of grizzly bears in the North Cascades Range is unknown. There have been four confirmed detections of grizzly bears in the greater North Cascades region in the past 10 years, all of which occurred in British Columbia. Given the low documented number of grizzly bears, very slow reproductive rate, and other recovery constraints, the grizzly bear in the North Cascades Range was found by the FWS to be warranted for uplisting to endangered status, but the listing was precluded, which means that this recommendation was not carried forward because listings of other species were considered to be higher-priority. Although a very small number of grizzly bears still inhabit the North Cascades Range, the number does not meet the accepted definition for a population (two adult females with cubs or one adult female tracked through two litters). As a result, it is highly unlikely that a viable grizzly bear population exists in the North Cascades Range (NPS 2017b).

While few sightings, historic or present, have been reported for this area, the project area is within the North Cascades grizzly bear recovery zone. The recovery zone was defined in a recovery plan for grizzly bears that was completed in 1982. This plan recommended that the North Cascades ecosystem, which includes portions of the North Cascades national forests area, be evaluated for its potential to support grizzly bears. Results of that evaluation (Almack et al. 1993) determined there to be ample secure habitat

to support a recovered grizzly bear population, and the Interagency Grizzly Bear Recovery Committee formalized the inclusion of the North Cascades ecosystem as a grizzly bear recovery zone (Servheen 1997). Core habitat for grizzly bears is typically 0.3 mile from open roads or high use trails since they naturally tend to avoid areas with roads and associated human activity (Servheen 1997). Because grizzly bears could occur in the North Cascades national forests near staging and release sites, mountain goat management activities such as preparation, helicopter use and human presence could disturb nearby grizzly bears.

Canada Lynx (*Lynx canadensis*). Canada lynx live in mid- to high-elevation boreal forests extending into Washington from Canada and Idaho. Their distribution extends northward throughout most of Canada and Alaska, and eastward across the northern tier of the contiguous United States (WDFW 1993; Lewis 2016). The largest block of suitable habitat within the project area is found along the east slope of the North Cascades mountains in the "Okanogan" lynx management zone (WDFW 1993; Lewis 2016). In 2000, the Canada lynx was federally listed as threatened, but had been protected in the State of Washington since 1993. This feline is highly adapted to prey on snowshoe hares and the presence of adequate numbers of hares is a key characteristic that defines lynx habitat. In Washington, Canada lynx are primarily found in high-elevation forests in the north-central and northeast part of Washington, including subalpine and high-elevation mixed conifer zones in the Cascades mountains generally above 1,220 meters. The lynx population in Washington now appears to be largely restricted to western Okanogan and northern Chelan Counties, as well as the eastern edges of Whatcom and Skagit Counties, which largely coincides with the Okanogan lynx management zone (Lewis 2016). The area of Washington State currently occupied by lynx is designated as critical habitat (USFWS 2014). There is no lynx critical habitat in the affected environment of the North Cascades national forests area, but there is the potential for lynx to occur in the project area. Mountain goat management activities at staging and release areas such as preparation, helicopter use and human presence could disturb nearby lynx.

Gray Wolf (*Canis lupus irremotus*). The northern Rocky Mountain gray wolf is a habitat generalist and historically occupied most of the western half of the United States. In 2011, wolves in the eastern third of the State of Washington were removed from federal protections under the ESA; however, within the planning area, they remain listed as federally endangered. The North Cascades national forests are included within one of three gray wolf recovery areas in Washington (WDFW 2015d). As of 2015, the minimum known number of wolves in Washington increased by approximately 32% over the 2014 minimum estimate and was composed of at least 90 wolves in 18 known packs (WDFW 2016f; 2015d). Reproduction was documented in 11 packs during 2015 and, as of 31 December 2015, 8 of those packs were considered successful breeding pairs (WDFW 2015d). Wolves inhabit a mix of both public and private lands from eastern Washington to the east slopes of the Cascade mountains, with an estimated mean home range size of approximately 349 mi^2 (WDFW 2015d).

Three packs are known from the North Cascades national forests, in the vicinity of the mountain goat translocation areas. As of 2015 the pack numbers were Lookout (3 individuals), Loup Loup (6 individuals), and Teanaway (3 individuals). The Teanaway pack territory is just north of I-90, to the east of Snoqualmie summit. Mountain goats could potentially be prey items for wolves. Mountain goat management activities at staging and release areas such as preparation, helicopter use and human presence could disturb nearby wolves.

Wolverine (*Gulo gulo luscus*). The wolverine is not federally listed as threatened or endangered, but is currently a candidate for listing under ESA. In 2014, the USFWS concluded that the factors affecting wolverine were not sufficient for federal protections, but that assessment is currently under review again as a result of legal challenges. Washington State has also classified wolverine as a candidate species for listing, and they are considered a Regional Forester Sensitive species in both the Okanogan-Wenatchee National Forest and the Mt. Baker-Snoqualmie National Forest.

Trapping pressure in the United States and Canada is believed to be responsible for wolverine population declines during the early part of the 1900s and habitat fragmentation and climate change are the primary threats today (Ruggiero et al. 1994). The wolverine still occupies areas in the North Cascades national forests, with limited sightings and historical records, but some recent evidence suggests that their populations could be expanding. In 2015, biologists found signs of the species just a few miles north of I-90, the farthest south that wolverines have been detected since the early 20th century. Wolverines naturally occur at low densities, with individuals ranging over large areas (Johnson and Cassidy 1997) and are sensitive to human activity, particularly near den sites. Wolverine require large areas of high-elevation mountainous terrain, which receive high snowfall that persists into the summer. In fact, persistent spring snow cover (April 15 to May 14) is the best overall predictor of wolverine occurrence in the contiguous United States (Copeland et al. 2010).

In the North Cascades national forests area, wolverine occur in alpine areas down through forested zones to the lower edge of forests. Generally, they are most common in alpine and subalpine zones, but will sometimes descend into valleys, particularly in winter where large game may be available (Aubry, McKelvey, and Copeland 2007). Reproductive den sites (sites where kits are born and raised prior to weaning) typically consist of long, complex snow tunnels that may be associated with large structures, such as fallen trees or boulders (Aubry, McKelvey, and Copeland 2007). Wolverine forage on carrion but are capable of killing their own prey, and in many areas are believed to be dependent on ungulates as a major food source.

The abundance of food and presence of human activity are thought to be more influential on wolverine habitat selection than plant associations or topography (Ruggiero et al. 1994). Since the alpine habitat required by wolverines overlaps with that of mountain goats, it is possible that management activities at staging areas or mountain goat translocation areas could impact this species. Mountain goat management activities at staging and release areas, helicopter use, and human presence could disturb nearby wolverines.

Threatened or Endangered Plant Species

As noted in chapter 1, no federally listed, or proposed threatened or endangered plant species are known to occur within the vicinity of where mountain goats could be translocated in the North Cascades national forests area, and therefore, are not discussed further. However, a list of threatened or endangered plant species found in the Mt. Baker-Snoqualmie and Okanogan-Wenatchee National Forests that was reviewed as part of the biological evaluation process can be found in appendix H.

VISITOR USE AND EXPERIENCE

Lands within the North Cascades national forests area provide a diverse array of recreational opportunities including hiking, backpacking, climbing, horseback riding, boating, backcountry camping, winter sports, and wildlife viewing. Opportunities for hunting, fishing, mountain biking and off-road vehicle use are also available in the national forests. Recreational use of NFS lands in the North Cascades national forests is estimated to be 8 million recreation visitor days per year, mostly dispersed recreation. It is estimated that almost l million recreation visitor days occur annually in wilderness; however, these are not equally distributed, and some areas receive much higher recreational use than others. The majority of recreational visits to the North Cascades national forests occur during July through September, during any day of the week, although visitor use is highest on weekend days and holidays.

Because of the close proximity to the Seattle metropolitan area, trails across the North Cascades national forests area receive high visitor use. Popular hiking and backpacking destinations include mountain summits, alpine lakes, and historic fire lookouts. The Green Mountain Lookout near the Buckindy release

site in the Glacier Peak Wilderness is used as an administrative site and not available for public use. Hikers and backpackers access the site from the Green Mountain Trailhead using the 4.25-mile Green Mountain Trail 782. There are campsites along the trail but no other system trails connect to the Green Mountain Trail. Goat Lake, 2,000 feet below the Cadet Lake Ridge release site is a 5-mile hike from the Elliott Creek/Goat Lake Trailhead in the Henry M. Jackson Wilderness. The trail is popular for hiking and backpacking. No trails access the Cadet Lake Ridge release site which is 3/4 to one mile from the lake. No trails directly lead to the Mount Stillaguamish release site, although Stillaguamish Peak is a popular recreation destination nearby. The Perry Creek Trail runs through the Perry Creek Research Natural Area ending at Forgotten Peak. An unmarked user-created trail leaves the Perry Creek Trail and winds toward Stillaguamish Peak.

Release sites proposed under this project are in high-elevation areas with suitable mountain goat habitat. These areas tend to receive relatively low visitor use because of the difficult terrain. However, backpacking and climbing into remote portions of the wilderness does occur and a few sites such as Snowy Lakes, Whitechuck, Kaleetan Peak, and Vesper Peak, are high use. The North Cascades Mountains are often referred to as the "American Alps" by professional climbers because of the rugged approaches, exceptional alpine terrain, and unrivaled scenery. There may also be opportunities to view wildlife in the more remote, higher elevations of the North Cascades national forests, especially given that human activity may be lower and alpine vegetation provides greater visibility than in more forested areas at lower elevations. WDFW identifies Ptarmigan Ridge (between Mt. Shuksan and Mt. Baker in the Mt. Baker Wilderness) and The Enchantments (Alpine Lakes Wilderness) as the most rewarding areas to view mountain goats in the Mt. Baker-Snoqualmie and Okanogan-Wenatchee National Forests, although neither of those locations are within the project area nor included in the release sites proposed under this project (WDFW 2016b).

The 12 staging areas where mountain goats are proposed to be received from the Olympic Peninsula are located near roads or trailheads where visitor use may be high. These areas may also have high scenic value but also experience traffic noise from vehicles or large group gatherings.

VISITOR AND EMPLOYEE SAFETY

Hazards to visitors and employees in the North Cascades national forests include hazards typical of backcountry recreation, such as injuries from falls and exposure to inclement weather. However, for the purposes of this plan/EIS, this section focuses only on those hazards associated with potential mountain goat-human interactions and with current and proposed mountain goat management actions.

Some of the areas that mountain goats inhabit are also popular destinations for visitors to North Cascades national forests. In such areas, there is a potential for mountain goat-human interactions. However, as on the Olympic Peninsula, these interactions are most likely to occur in areas where mountain goats are habituated to human presence and have become conditioned to seeking salts from humans. The nature of mountain goat-human interactions can vary widely. In general, mountain goats pose a nuisance when they persistently seek salt and minerals from human urine, packs, and sweat on clothing.

There are occasional reports of aggressive or nuisance mountain goats in the North Cascades national forests. Within the Okanogan-Wenatchee National Forest, conditioned and habituated mountain goats have been documented as problematic in the highly visited sections of The Enchantment Permit Area within the Alpine Lakes Wilderness (in the Okanogan-Wenatchee National Forest) (e.g., Landers 2013). Users of the Ptarmigan Traverse (Glacier Peak Wilderness) have also reported mountain goats in close proximity to camps, seeking out urination sites (Reed pers. comm. 2016). However, the majority of encounters reported to USDA Forest Service staff indicate that mountain goats in the North Cascades national forests generally retreat when humans are present, likely due to past hunting pressure (Reed pers.

comm. 2016). In the Mt. Baker Wilderness, northwest of the project area in the Mt. Baker-Snoqualmie National Forest, there is a relatively large population of mountain goats, but they are not typically observed on the trail and keep to the escape habitat of slopes and ledges off-trail (Richey pers. comm. 2016). In areas of the North Cascades national forests where existing mountain goat populations overlap with sections of the Pacific Crest National Scenic Trail, or highly used visitor areas (e.g., Artist Point Trailhead), mountain goats maintain their distance from humans and negative interactions have largely been avoided.

Chapter 4:

Environmental Consequences

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

INTRODUCTION

This "Environmental Consequences" chapter analyzes both beneficial and adverse impacts that would result from implementing any of the alternatives considered in this Mountain Goat Management Plan / Environmental Impact Statement (plan/EIS), including the actions taking place on US Department of Agriculture (USDA) Forest Service lands related to translocation of mountain goats to the Mt. Baker-Snoqualmie National Forest and Okanogan-Wenatchee National Forest (North Cascades national forests). The resources presented in this chapter correspond to the resource discussions in "Chapter 3: Affected Environment." Impacts of actions on the Olympic Peninsula on resources of Olympic National Park and Olympic National Forest are discussed first in Part One, followed by a separate discussion of the impacts of actions in the North Cascades national forests in Part Two.

GENERAL METHODOLOGY FOR ASSESSING IMPACTS

This chapter evaluates impacts on the human environment (i.e., physical, natural, cultural, and socioeconomic resources) from proposed mountain goat management alternatives. The approach includes the following elements:

- Focusing the analysis, to the greatest extent possible, on management changes and associated issues that could have meaningful impacts on the resources or values being evaluated.
- Using general analysis methods and assumptions that follow the Council on Environmental Quality (CEQ); US Department of the Interior regulations and guidance found in the 2015 National Park Service (NPS) *National Environmental Policy Act* (NEPA) Handbook; and the USDA Forest Service National Environmental Policy Act Handbook (FS 2014).
- Evaluating cumulative impacts for each impact topic.
- The importance and severity of impacts from management activities are assessed and described in each resource topic as applicable. If impacts are not likely to be significant, no determination on significance is provided.

GENERAL ANALYSIS METHODOLOGY AND ASSUMPTIONS

In coordination with USDA Forest Service and Washington Department of Fish & Wildlife (WDFW), the NPS interdisciplinary planning team reviewed a substantial body of scientific literature and studies applicable to the project areas and the associated resources. This information augmented site-specific observations and documentation gathered by team personnel to support the qualitative and quantitative statements presented for each analyzed resource. When available, the methodology notes other resource-specific data, observations, or studies for each impact topic. The impact analysis focuses on perceived or expected environmental issues from the implementation of mountain goat management and their likelihood of being significant.

Assessing Impacts Using CEQ Criteria

According to the CEQ NEPA regulations (40 CFR 1500–1508), the term "significantly" is based on the criteria of context and intensity (40 CFR 1508.27).

Context. This means that the significance of an action must be analyzed in several contexts such as society as a whole (human, national), the affected region, the affected interests, and the locality. Significance varies with the setting of the proposed action. For instance, in the case of a site-specific action, significance would usually depend upon the effects within the locale rather than in the world as a whole. Both short- and long-term effects are relevant.

Intensity. This refers to the severity or magnitude of an impact. The CEQ identifies 10 factors that should be considered in evaluating the intensity of an impact. For more information, see 40 CFR 1508.27(b).

Assumptions

The following guiding assumptions were used to provide context for this analysis.

Analysis Period. This plan/EIS establishes goals, objectives, and specific implementation actions needed to manage mountain goats into the future. The majority of initial management actions would likely occur within 5 years of implementation. However, this plan would guide park managers into the future, as additional management actions are needed. To understand the potential long-term impacts associated with mountain goat management, the plan considers actions over a 20-year period. However, management activities may continue without additional NEPA analysis so long as there are no "substantial changes in the proposed action that are relevant to environmental concerns; or significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts" (40 CFR 1502.9(c)).

Analysis Area. The geographic area analyzed by this plan/EIS is separated into two locations: the Olympic Peninsula area and the North Cascades national forests area. The Olympic Peninsula area consists of Olympic National Park and portions of the Olympic National Forest to the east and southeast of the park. The North Cascades national forests area consists of the Mt. Baker-Snoqualmie and Okanogan-Wenatchee National Forests. Impacts are considered separately for each area. In all cases, impacts may be characterized as either localized (i.e., occurring in limited areas) or widespread (i.e., occurring over the analysis area).

Duration and Type of Impacts. For the analysis provided in this plan/EIS, the following assumptions are used for all resources analyzed.

Duration describes the length of time over which an effect may occur. For example, impacts could occur over minutes, days, months, or years. The analysis includes a description of the expected time frame over which impacts are expected. Short-term impacts would be short in duration and would not persist long after implementation. Short-term impacts would generally occur only during capture and translocation or lethal removal activities. For activities requiring helicopter use, short-term impacts would occur annually over two 2-week periods for up to 5 years. For ground-based lethal removal activities, short-term impacts could occur sporadically across the entire initial management period, but would likely be short in duration and potentially high in intensity (i.e., a gunshot). Long-term impacts would occur over a longer period of time, generally more than one year, and would be permanent or continuous. Because the majority of the initial management actions would have short-term impacts that would occur within 5 years of implementation, long-term impacts associated with the action alternatives would generally occur or continue after the 5-year initial management period. An example of a long-term impact would be the beneficial effect of soil and vegetation recovery resulting from the removal of mountain goats from the Olympic Peninsula. Long-term impacts could also result from the implementation of the no-action alternative, including continued damage to archeological resources from mountain goat wallowing and potential safety concerns for visitors.

Type describes the classification of the impact as beneficial or adverse:

- **Beneficial.** A change in the condition or appearance of the resource that moves the resource toward a desired condition.
- **Adverse.** A change that moves the resource away from a desired condition or detracts from its appearance or condition.

PART ONE – IMPACTS ON RESOURCES AND VALUES OF THE OLYMPIC PENINSULA

CUMULATIVE IMPACTS

The CEQ regulations for implementing NEPA require the assessment of cumulative impacts in the decision-making process for federal projects. Cumulative impacts are defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions" (40 CFR 1508.7). All alternatives, including the no-action alternative, consider cumulative impacts.

Cumulative impacts were determined by combining the impacts of other past, present, and reasonably foreseeable future actions and considering the contribution of the alternatives to the overall cumulative impacts. Therefore, it was necessary to identify other ongoing or reasonably foreseeable future projects and plans at the park and, if applicable, the surrounding region. Past actions are those that have been occurring since the establishment of the park and reasonably foreseeable future projects are those that would occur within the life of the plan. Following CEQ guidance, past actions were included, "to the extent that they are relevant and useful in analyzing whether the reasonably foreseeable effects of the agency proposal for the actions and its alternatives may have a continuing, additive, and significant relationship to those effects" (CEQ 2005).

Cumulative Impact Scenario

Past projects or plans with ongoing effects and reasonably foreseeable future projects or plans at the park and, if applicable, the surrounding region were identified to provide the cumulative impact scenario. The geographic area of analysis for cumulative impacts varies slightly by affected resource, and includes elements within park boundaries, as well as actions outside the park on adjacent National Forest System (NFS) lands, and within the surrounding region as they apply to specific impact topics.

Past, Present, and Reasonably Foreseeable Future Actions in Olympic National Park

For the purposes of conducting the cumulative effects analysis, NPS and USDA Forest Service identified the following projects, plans, or actions described according to the resource potentially affected. Table 17 identifies the resources or values that may be affected by these actions.

TABLE 17. PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIONS AND POTENTIAL RESOURCES AFFECTED IN THE OLYMPIC PENINSULA AREA

Past, Present, and Reasonably Foreseeable Action	Impact Topic									
	Mountain Goats	Wilderness Character	Wildlife, Wildlife Habitat, and Special-Status Species	Vegetation and Special-Status Plant Species	Threatened or Endangered Species	Soils	Archeological Resources	Visitor Use and Experience	Visitor and Employee Safety	Acoustic Env
Actions in Olympic National Park										
Olympic Marmot Monitoring	x	x	x	x		x		x		
Soil Survey		x	x	x	x	x		x	x	
Vital Signs Monitoring (including Landbird Monitoring, Mountain Lakes Monitoring, Glacier Monitoring, Alpine/Subalpine Monitoring, Elk Monitoring)	x	x	x	x	x			x		x
Scientific Research Activities	x	x	x	x	x			x		
Ongoing Operations and Maintenance Activities (including Wilderness Waste Management, Radio Repeater Maintenance, Search and Rescue Operations, Trail Maintenance)	x	x	x	x	x	x		x	x	x
Actions in Olympic National Forest										
Ongoing Operations and Maintenance Activities (including Trail Maintenance, Road Maintenance)		x	x	x	x	x		x	x	x
Hunting	x		x		x			x	x	x
Other Actions on the Olympic Peninsula										
Military, Commercial, and Private Overflights	x	x	x		x			x		x
Fire Management Operations		x	x		x			x	x	x

Olympic Marmot Monitoring. Because the endemic Olympic marmot is experiencing population declines, an Olympic marmot monitoring program will be running from approximately 2017 to 2022. This program will involve monitoring surveys by 80 to 100 volunteers in high elevation areas of the park. Surveys will last for 3 to 8 days over a staggered period from the beginning of August through mid-September each summer. Volunteers will survey on and off trail, including areas within mountain goat habitat (Jenkins et al. 2016). Conflicts may exist with mountain goat management activities.

Soil Survey. Because soils in the park have not been surveyed according to National Cooperative Soil Survey standards, the Natural Resources Conservation Service is conducting a soil survey of the park through an interagency agreement with the NPS. Surveys involve investigators collecting soil and ecological data to produce a Soil Survey and Ecological Site Descriptions for the park. Methods and activities adhere to National Cooperative Soil Survey standards and involve removal of topsoil and vegetation and excavation of soils using shovels and/or augers. Following removal, soil descriptions and photographs are taken, soils are backfilled and topsoil and vegetation are replaced. Surveys will provide data necessary to plan and manage land for protection and restoration of natural resources, protection of cultural resources, scenic values, facilities management, recreation restoration, and watershed planning. Surveys began in 2014 and are anticipated to take at least 5 years to complete. Conflicts may exist with mountain goat management activities where soil surveys overlap with mountain goat habitat in the higher elevations in the park (Johnson pers. comm. 2016b).

Vital Signs Monitoring. Vital Signs monitoring was authorized by congress in 1998 and is now coordinated in all parks nationwide, through ecologically based "Networks." Olympic National Park is a member of the "North Coast and Cascades Network" and the monitoring program is coordinated with six other national parks in the northwest. The goal of the monitoring program is to discover the characteristics of an ecosystem that can provide information about the status and trend of the system's overall health. Parks within the "North Coast and Cascades Network" have selected the following topics to monitor: climate; water quality; glaciers; intertidal communities; landbirds; mountain lakes; landscape change; fish communities; elk; and forest, prairie and alpine/subalpine vegetation. In Olympic National Park, the vital signs monitoring activities that overlap with mountain goat habitat and potential mountain goat management activities are landbirds, mountain lakes, glaciers, alpine/subalpine vegetation, and elk (Johnson pers. comm. 2016b). All vital signs monitoring would be conducted over the long term and would continue as long as funding continues to support the program.

Landbird Monitoring—National parks in Washington fulfill a vital role as both refuges for bird species dependent on late-successional forest conditions, and as reference sites for assessing the effects of land-use and land-cover changes on bird populations throughout the larger Pacific Northwest region. Monitoring population trends at control sites in national parks is especially important because the parks are among the few sites in the United States where population trends due to large-scale regional or global change patterns are relatively unconfounded with local changes in land use. Monitoring activities associated with the landbird vital sign are low impact and utilize a point count transect survey method. A two-person crew accesses each monitoring transect on foot, traveling on trails and off trails, carrying all their survey equipment on their backs. Conflicts may exist with mountain goat management activities where monitoring transects overlap mountain goat habitat in the higher elevations in the park (Johnson pers. comm. 2016b).

Mountain Lakes Monitoring—Mountain lakes and ponds are essential ecosystems in Olympic National Park and these waters are enormously popular visitor destinations due to their aesthetic and natural characteristics. These highly sensitive ecosystems have in-lake physical, chemical, and biological processes that are being monitored. Eight high elevation lakes are monitored at Olympic National Park each year by park field crew consisting of four or five members. Crews access each lake on foot, traveling on trails and off trails, carrying all their equipment and supplies for multiple days at a time in the

backcountry. Conflicts may exist with mountain goat management activities (Johnson pers. comm. 2016b).

Glacier Monitoring—Glaciers are important resources and sensitive indicators of climate change. Glacier loss in the Olympics is much higher than the loss observed in other regions of the Pacific Northwest. Glacier monitoring occurs at two glaciers in the park, Blue Glacier (Mount Olympus) and Eel Glacier (Mt. Anderson). Park staff fly to the two glaciers in April, measure snow depth and place ablation stakes. During the summer the crews hike to each glacier to take mass balance measurements and then make final measurements in late fall. Conflicts may exist with mountain goat management activities (mainly helicopter flights) (Johnson pers. comm. 2016b).

Alpine/Subalpine Monitoring—The alpine and subalpine areas are ecologically important zones that provide popular recreational opportunities for visitors to Olympic National Park. Collectively, the subalpine and alpine zones comprise the alpine treeline ecotone—a transition between the closed canopy forests below and bare rock or ice covering the mountain or ridge tops. The alpine/subalpine vital signs monitoring goal is to provide accurate information regarding the status and trends of vegetation in the alpine treeline ecotone in order to inform management decisions affecting these areas. Monitoring plots are located on relatively gentle slopes within a mile of trails and roads. The two- to three-person crew accesses each monitoring plot on foot, traveling on trails and off trails, carrying all their survey equipment on their backs. Conflicts exist between vegetation monitoring staff and aggressive or conditioned mountain goats (Johnson pers. comm. 2016b).

Elk Monitoring—Current monitoring protocol consists of conducting aerial surveys of Roosevelt elk in high elevation habitat during the morning and evening hours for 2 to 3 consecutive days between August 15 and September 15 every year or every other year (Jenkins et al. 2016). Because high elevation elk habitat overlaps substantially with mountain goat habitat, elk monitoring may not be able to occur during mountain goat management efforts. However, if mountain goat management efforts take place in July, elk monitoring could still be conducted in August.

Scientific Research Activities. Each year Olympic National Park issues between 50 and 70 research permits for a variety of scientific activities. An example of some of the scientific research topics include: amphibian research, structural geology and tectonism, biodiversity and physiological constraints of cold-specialized insects, study of growth-climate relationships of mountain hemlock trees at treeline, water quality assessments, study of adaptation across latitude and altitude of montane bumble bees, and arctic-alpine plant studies. Many of the scientific research activities are short-term in nature, occurring one or two seasons at the most, however, a small number could occur for multiple years. Conflicts may exist with mountain goat management activities where scientific research activities overlap with mountain goat habitat in the higher elevations in the park (Johnson pers. comm. 2016b).

Ongoing Operations and Maintenance Activities

Wilderness Waste Management—Activities associated with wilderness waste management include management of human waste at wilderness camp areas and on Mt. Olympus and removal of administrative materials, formerly used for wilderness management activities that are no longer needed. Pit toilets, vault toilets, and composting toilets have been placed in many areas of the wilderness where visitor use is moderate to high. At season's end, or once human waste toilets reach capacity, human waste is flown out by helicopter. Toilet structures that have deteriorated or have been damaged are generally replaced in-kind by hand digging in the same vicinity (in locations approved by cultural resource staff) and in minimal impact sites on open, non-vegetated ground when possible. Old toilet structures may be transported off-site by pack stock or by helicopter. Transportation of extraneous administrative materials are accomplished utilizing the minimum tool under minimum requirement guidelines: first choice, by

park staff/volunteers where and when possible; second, utilize stock to pack out materials where and when possible; lastly, utilize helicopters where the size/weight of materials precludes implementation of the former alternatives or where a scheduled sewage-related flight has available capacity for additional items. Flights are combined to remove unnecessary materials with already scheduled flights (e.g., wildlife flights, sewage-related flights) where possible. The number of flights varies by year depending on the need and generally occurs over the course of 5 to 7 days in late September, or as needed. Because high elevation privies are located near mountain goat habitat, wilderness waste management flights would not be able to occur during mountain goat management efforts (Miller pers. comm. 2016c).

Radio Repeater Maintenance—The majority of Olympic National Park is wilderness (95%), and radio communication is critical for response to public and employee emergencies and important for facilitating park wilderness stewardship. Preventative maintenance checks are completed annually in the spring through fall (June through September); however lightning strikes throughout the year may require regrounding of radio systems. There are generally 1 to 3 radio repeater maintenance flights per year, which could conflict with mountain goat management activities (Miller pers. comm. 2016c).

Search and Rescue Operations—Search and rescue operations occur randomly within the park and adjacent national forest and in no particular location or time frame. These extraction operations can include anything from lost or stranded hikers, injured, or deceased visitors. In 2015, there were 12 to 13 days of flights for search and rescue-related operations in the park. High elevation search and rescue operations may be necessary near mountain goat habitat or identified staging areas may be needed for search and rescue operations, and therefore, mountain goat management efforts may be delayed during those instances (Miller pers. comm. 2016c).

Trail Maintenance—Olympic National Park provides over 600 miles of trail throughout the park. Approximately 90% of the trails are located within the park's designated Daniel J. Evans Wilderness, which covers approximately 95% of the park. There are approximately 250 trail bridges and 12 miles of boardwalk/puncheon. Ongoing maintenance is required to provide access to park visitors and employees while avoiding or minimizing the potential for adverse impacts on park wilderness resources and values. Trail maintenance sometimes requires the use of helicopters to transport materials that are either too heavy for transport by pack stock or to areas that are inaccessible to pack stock. Helicopter use for trail maintenance generally occurs over 5 to 6 days a year during September through March. Because many trails are in or near mountain goat habitat, or near staging areas, flights for trail maintenance would not be able to occur during mountain goat management efforts (Miller pers. comm. 2016c).

Past, Present, and Reasonably Foreseeable Actions in Olympic National Forest

Ongoing Operations and Maintenance Activities

Trail Maintenance—Ongoing maintenance is required to provide access to national forest visitors and employees while avoiding or minimizing the potential for adverse impacts on forest resources adjacent to the trail. Trail maintenance activities include logout, tread, and drainage structure maintenance on the existing trail systems throughout the national forest. Because many trails are in or near mountain goat habitat, or near staging areas, flights for trail maintenance would not be able to occur during mountain goat management efforts

Road Maintenance—Ongoing maintenance is required to provide access to accommodate light and commercial road traffic while maintaining the integrity of the road facility and minimizing the potential for adverse impacts on forest resources adjacent to the road. Road maintenance activities occur on existing roads throughout the national forest and include repair of minor erosion damage and maintenance of road surface and drainage structures. Road maintenance includes use of rock quarries and water

sources, roadside brushing, grading, ditching on native surface roads and other activities needed to maintain the road in good condition. Maintenance work is usually performed commensurate with the use of the road and the condition of the road. Conflicts could occur if road maintenance is needed in areas where staging areas are located or along roads that are being used for goat management activities.

Hunting. Decisions on hunting seasons in Washington are made by the Washington Fish and Wildlife Commission, with big game seasons set annually. The WDFW can make recommendations for change as needed. As of the 2016 hunting season, there are six permits available for mountain goats in the "East Olympic Mountains" hunting area (three during an early season of September 15 through 25, and three during a late season of September 26 through October 6). These are labeled "Conflict Reduction" hunts, to differentiate them from the other 21 permits available statewide (in nine hunting areas). Once a hunter successfully harvests a mountain goat they are ineligible to apply for a second permit in a future year. There are currently no plans to increase the number of permits for mountain goat hunts on the Olympic Peninsula. Hunter safety and the quality of the experience suggest that, in these limited areas, hunter numbers should be limited. If hunter success returns to the low rates observed in 2014 and 2015, future options available to WDFW to increase hunter enthusiasm and/or success (assuming population reduction continues to be the goal) would be to (1) increase the season length; and (2) waive the "once-in-a-lifetime" restriction (Harris pers. comm. 2015b).

Other Past, Present, and Reasonably Foreseeable Actions on the Olympic Peninsula

Military, Commercial, and Private Overflights. Overflights of the project area by military, commercial, and private aircraft would occur for the duration of management activities. Most military, commercial, and private overflights are not low-level events, generally occurring between 10,000 feet and 35,000 feet above mean sea level (Wahl pers. comm. 2016). These flights would be likely to increase in number and frequency, and sound associated with overflights of new aircraft would likely be louder in the future (Happe pers. comm. 2016). Commercial overflights would likely occur daily and at high levels (above 30,000 feet), where they could affect the acoustic environment over large distances but likely not at levels that would be highly disruptive to humans or wildlife. Private overflights would occur less frequently and at the lower range of the above-referenced elevations (closer to 10,000 feet), but would be expected to have roughly similar impacts on commercial flights. Military overflights would occur less frequently than commercial flights and would occur over the very northern portion of the project area as military planes are en route from Naval Air Station Whidbey Island to their Military Operating Areas as established by the Federal Aviation Administration, which are located over the Washington coast and the lower-elevation western portions of Olympic National Park and Olympic National Forest, and not over mountain goat habitat (Miller pers. comm. 2016c). Military jets are considerably louder than commercial jets (NRAC 2009) and could thus be audible to visitors and wildlife over most of the project area, with the possible exception of the southeastern portion of the Olympic Mountains. These flights increase audible noise within the project area.

Fire Management Operations. Fire management operations are required to utilize the benefits of fire to achieve desired natural resource conditions while protecting park resources and surrounding lands from fire. Fire management may include fire suppression, fires for resource benefit, manual or mechanical treatment, or prescribed fire/debris burning. Fire management actions may involve limited use of helicopters, chainsaws, water pumps, hose lays, bucket drops, and construction of fireline. Stock may be utilized to transport fire crew and equipment to locations in wilderness when applicable. The time it takes to complete fire management actions may vary depending on fire behavior, fire management objectives and fire progression. Minimum Impact Strategies and Tactics are emphasized to limit long-term effects on wilderness. Fire suppression or fires for resource benefit operations could occur near mountain goat habitat or identified staging areas, in which case mountain goat management efforts may be delayed.

While wildfires in the Olympic Mountains are not normal occurrences due to the mesic forest types, there were approximately 250 and 100 hours of flight time for fire-related activities in 2015 and 2016, respectively. Given changing climate conditions, it is uncertain what to anticipate for fire management operations over the next several years. If fire suppression is needed during mountain goat management activities, goat management activities would be postponed (Miller pers. comm. 2017).

MOUNTAIN GOATS

NPS *Management Policies 2006* (NPS 2006) presents specific requirements relating to native species, exotic species, and the removal of exotic species. These policies place a high priority on managing exotic species that have, or potentially could have, an impact on park resources, and that can reasonably be expected to be successfully controlled. If exotic species cannot be successfully eliminated, NPS policy directs that managers seek to contain these species to prevent further spread or resource damage (NPS 2006).

Additionally, the Secretary of the Interior maintains discretion to provide "for destruction of such animal and of such plant life as may be detrimental to the use of any of said parks, monuments, or reservations" (16 USC 3), and the NPS *Management Policies 2006* gives the NPS discretion to allow negative impacts when necessary (NPS 2006).

Methods and Assumptions

Potential impacts on mountain goats were evaluated based on resource expert knowledge and professional judgment, review of literature, anticipated locations for management activities, and the resource-specific issues identified in chapter 1. General assumptions for impacts on mountain goats are described below. Each alternative provides additional assumptions as appropriate.

Analysis Period. For the analysis of impacts of the action alternatives to mountain goats, it is expected that the majority of impacts would occur within the first 5 years of project implementation because most active management activities would be expected to occur within this time frame. However, there could be substantial long-term impacts on the mountain goat population on the Olympic Peninsula as a result of the action alternatives.

Analysis Area. The area of analysis for impacts of alternatives on mountain goats is habitat for mountain goats within the project area. The degree to which mountain goats in these areas would be affected varies by alternative as described in the following sections.

Duration and Type of Impacts. The analysis of the duration and type of impacts on mountain goats under each alternative is based on the following issue statement:

- **Issue Statement.** Any action to manage exotic mountain goats in the park and adjacent Olympic National Forest will have a clear and direct impact on the Olympic Peninsula mountain goat population.

Analysis of Impacts on Mountain Goats in Olympic National Forest. For the analysis of impacts on mountain goats, it is assumed that the types of impacts would be the same for management activities occurring both on NPS and adjacent Olympic National Forest lands within the project area. However, because approximately 90% of mountain goat habitat is in the park, the majority of impacts associated with managing mountains goats would occur within park boundaries.

Alternative A: No Action

Impacts

Implementation of alternative A would result in the same effects to mountain goats as impacts currently occurring within the project area on the Olympic Peninsula. Park staff would continue to manage the mountain goat population in accordance with the 2011 *Mountain Goat Action Plan* (appendix A) and the mountain goat population would continue to grow (Jenkins et al. 2016). Nuisance control activities by park staff, ranging from hazing of habituated mountain goats to lethal removal of hazardous mountain goats with firearms, would continue indefinitely into the future. While these limited management activities would continue, and individual mountain goats would be adversely affected by nuisance control actions, these actions are not expected to affect mountain goats at the population level on the Olympic Peninsula. Therefore, management activities under alternative A would be isolated events and geographically limited, resulting in minimal adverse impacts on mountain goats in the project area.

Cumulative Impacts

Past, present, and reasonably foreseeable future actions in the park with the potential to have cumulative impacts on mountain goats under alternative A include ongoing park operations and maintenance activities, vital signs monitoring, Olympic marmot monitoring, and other scientific research. These activities could adversely affect mountain goats in alpine and subalpine areas of the park by causing general disturbance to individuals. Outside of the park on adjoining Olympic National Forest lands, hunting would result in the removal of individuals; however, the overall population would not be affected over the long term because the population would continue to grow at a higher rate than the number of mountain goats harvested. Other past, present, and reasonably foreseeable actions in the surrounding Olympic Peninsula region that could impact mountain goats include the occurrence of military, commercial, private, and fire management overflights, whereby noise may cause mountain goats stress or flight reactions. However, mountain goats on the Olympic Peninsula are highly habituated to human activities and these past, present, and reasonably foreseeable actions would not be likely to have any adverse impacts on the mountain goat population. Therefore, when the minimal adverse impacts from alternative A are combined with the effects of past, present, and reasonably foreseeable future actions, an overall adverse cumulative impact is expected. Alternative A would contribute a minimal adverse increment to the overall cumulative impact.

Conclusion

Adverse impacts on individual mountain goats under alternative A would occur from nuisance control activities including potential hazing and lethal removal actions. However, because management actions associated with alternative A would not result in impacts on the overall mountain goat population on the Olympic Peninsula, impacts on mountain goats under alternative A would be minimal. Impacts on mountain goats under alternative A would be considerably less than impacts associated with any of the action alternatives because their population would continue to increase and the goal of all the action alternatives is to substantially reduce or eliminate mountain goats on the Olympic Peninsula. There would be adverse cumulative impacts on mountain goats, and the contribution of alternative A would be adverse but minimal.

Alternative B: Capture and Translocation

Impacts

Several management activities in mountain goat habitat under alternative B would cause direct impacts on mountain goats in the project area. Helicopter-based capture operations would involve the use of drugs or net guns to immobilize mountain goats. Ground-based capture operations could involve drop nets and darting. Once captured, mountain goats would be subdued by animal handlers, at which point they may or may not be sedated for transport. While capture and translocation efforts would strive to minimize stress and to protect the welfare of individual animals (including attempts to keep nannies and kids together), there is potential for injury and death of animals from accidents and stress resulting from these capture efforts.

Alternative B would cause long-term, direct, adverse impacts on the mountain goat population by reducing it approximately 50%. As a result, it is anticipated that reduced numbers and disruption to mountain goat social structure would keep the population suppressed for several years, and maintenance activities would maintain this reduced population level. Based on previous experience with mountain goat control in the park, the population would recover to its current abundance after 10 to 15 years if maintenance activities were not performed. With maintenance, it is expected that the mountain goat population could remain at or below 50% of its original size of approximately 325 to 375 animals.

Cumulative Impacts

As described for alternative A, other past, present, and reasonably foreseeable actions in the park, national forest, or surrounding landscape would result in adverse effects on mountain goats by causing general disturbance to individuals. The contribution of adverse impacts under alternative B to the cumulative impacts would be adverse because capture and translocation efforts would reduce the mountain goat population by approximately 50% within the project area, and maintenance actions would be scheduled to keep the population size at a reduced level. When the adverse impacts from alternative B are combined with the effects of past, present, and reasonably foreseeable future actions, an overall adverse cumulative impact is expected. Alternative B would contribute a substantial adverse increment to the overall cumulative impact, because of the reduction of the population.

Conclusion

Adverse impacts on the Olympic Peninsula mountain goat population would occur under alternative B because capture and translocation efforts would reduce the mountain goat population within the project area by approximately 50%, which is substantially greater than impacts on mountain goats under alternative A. Also, capture and processing of mountain goats could result in injury or death of individual mountain goats in the project area from accidents or stress associated with management actions. However, adverse impacts on mountain goats under alternative B would be less than impacts under alternative C and D, which could reduce the mountain goat population by at least 90% through the inclusion of lethal removal as a management option. Overall, there would be adverse cumulative impacts on mountain goats on the Olympic Peninsula under alternative B, primarily driven by the substantial adverse contribution of alternative B to the cumulative impacts.

Alternative C: Lethal Removal

Impacts

Management activities in mountain goat habitat under alternative C would seek to eliminate the mountain goat population through the lethal removal of mountain goats using firearms from the ground or helicopter. These actions would directly reduce the mountain goat population within the project area by at least 90% of its current level. If this anticipated reduction level is met, then the impact on mountain goats would be long term and persist for several decades due to reduced survival or reproductive success, genetic bottlenecks, and/or social disruption to the remaining mountain goats. It is expected that this large of a reduction in mountain goat numbers could extirpate the population. Therefore, impacts on mountain goats under alternative C would be adverse and significant to the mountain goat population on the Olympic Peninsula.

Cumulative Impacts

As described for alternative A, other past, present, and reasonably foreseeable actions in the park, national forest, or surrounding landscape would result in adverse effects on mountain goats by causing general disturbance to individuals. When the adverse impacts from alternative C are combined with the effects of past, present, and reasonably foreseeable future actions, an overall significant adverse cumulative impact is expected. Alternative C would contribute a significant adverse increment to the overall cumulative impact.

Conclusion

Significant adverse impacts on the Olympic Peninsula mountain goat population would occur under alternative C because the mountain goat population would be substantially reduced by at least 90% within the project area. Overall, the adverse impacts on mountain goats under alternative C would be substantially greater than impacts on them under alternatives B and D because lethal removal would affect a greater number of mountain goats than other alternatives. An overall significant, long-term, adverse cumulative impact on mountain goats would be expected under alternative C, primarily driven by the contribution of alternative C to the cumulative impacts.

Alternative D: Combination of Capture and Translocation and Lethal Removal (Preferred Alternative)

Impacts

Impacts associated with management of mountain goats under alternative D would include a combination of the impacts described under alternatives B and C. Similar to alternative B, alternative D would focus primarily on capture and translocation efforts during the first few years of management. During this time, impacts on individual mountain goats would be adverse because of potential injury and death associated with accidents and stress, as described for alternative B. Similar to alternative C, alternative D would involve lethal removal of mountain goats in the project area, resulting in adverse impacts on mountain goats on the Olympic Peninsula. These adverse impacts on mountain goats on the Olympic Peninsula would be permanent and significant because the goal would be to eliminate the population and it is expected that management activities could reduce it by at least 90% of its current level. When combined with future maintenance activities, this level of mountain goat removal is expected to extirpate the population from the Olympic Peninsula.

Cumulative Impacts

As described for alternative A, there would be adverse cumulative impacts on mountain goats from past, present, and reasonably foreseeable actions in the park, national forest, or surrounding landscape. When the adverse impacts from alternative D are combined with the effects of past, present, and reasonably foreseeable future actions, an overall significant adverse cumulative impact is expected. Alternative D would contribute a significant adverse increment to the overall cumulative impact.

Conclusion

Significant adverse impacts on the Olympic Peninsula mountain goat population would occur under alternative D because the combination of capture and translocation efforts and lethal removal would substantially reduce the mountain goat population by at least 90% in the project area. Additionally, similar to alternative B, capture and processing of mountain goats could result in injury or death of individual mountain goats in the project area from accidents or stress associated with management actions. Overall, impacts on mountain goats under alternative D would be substantially more than impacts associated with alternative A and alternative B. Alternative D would result in fewer impacts on mountain goats than alternative C, which would reduce at least 90% of the mountain goat population on the Olympic Peninsula exclusively through lethal removal. There would be adverse cumulative impacts on mountain goats from other past, present and reasonably foreseeable future actions. However, as with alternative C, an overall adverse and significant cumulative impact would be expected under alternative D, primarily driven by the significant contribution of alternative D to the cumulative impacts.

WILDERNESS CHARACTER

Methods and Assumptions

Potential impacts on designated wilderness were evaluated based on four of the five qualities of wilderness character described in the affected environment. While not analyzed as a core element of wilderness character, mountain goats also affect scientific and ecological features of value. Potential changes to scientific value or ecological elements are unmeasurable since environmental conditions prior to mountain goat introductions can only be inferred. Impacts on untrammeled, natural, undeveloped, and opportunities for solitude or primitive and unconfined recreation are, however, analyzed for specific and measurable results. Analyses only apply to the actions taken within Olympic National Park and Olympic National Forest under each alternative.

Analysis Period. For the analysis of impacts on wilderness character, it is expected that the majority of impacts would occur within the first 1 to 4 years of project implementation, during which activities associated with initial reduction would probably occur. However, it is assumed that maintenance activities would extend these impacts beyond 3 to 5 years, but with less frequency, in order to ensure that the success of initial reduction persists through time.

Analysis Area. The area of analysis for impacts of alternatives on wilderness character includes wilderness areas of Olympic National Park and Olympic National Forest currently or potentially used as habitat by mountain goats. Additionally, the area of analysis for the action alternatives includes five identified staging areas used to conduct mountain goat management activities. Although these staging areas are located outside of designated wilderness, they are directly adjacent to wilderness areas which could be affected by activities conducted in and around staging areas.

Duration and Type of Impacts. The analysis of the duration and type of impacts on wilderness character under each alternative is based on the following issue statements:

- **Issue Statement.** The presence of mountain goats, an exotic species, in wilderness, and the impacts on sensitive alpine and subalpine plant communities from grazing and wallowing disturbance result in adverse impacts on the natural quality of designated wilderness in Olympic National Park and Olympic National Forest.
- **Issue Statement.** Proposed activities associated with the management of mountain goats within the park and adjacent national forest, such as the use of aircraft, firearms, and area closures to remove mountain goats, could result in impacts on the untrammeled, natural, undeveloped, and solitude or primitive and unconfined recreational qualities of wilderness character.

Analysis of Impacts on Wilderness in Olympic National Forest. For the analysis of impacts on wilderness in Olympic National Forest, staging areas on both park and forest land would be located in previously disturbed areas and outside of designated wilderness. Because mountain goat habitat on both park land and national forest land is similar, it is assumed that the types of impacts on wilderness character would be similar for management activities occurring on NPS and adjacent Olympic National Forest lands. However, because approximately 90% of mountain goat habitat is in the park, the majority of impacts associated with management would occur within the park's designated wilderness.

Alternative A: No Action

Impacts

Untrammeled. Under alternative A, options for the management of mountain goats in wilderness would be limited to those actions outlined in the *Mountain Goat Action Plan*. The goal of the action plan is "that [mountain] goats in the park exhibit natural behaviors consistent with other portions of their range, to not have those natural behaviors altered by human use of their habitats (i.e., become habituated or conditioned), and to minimize the potential for hazardous mountain goat human encounters." (appendix A). Mountain goat management under this alternative would involve nuisance control and very limited lethal removal of conditioned mountain goats that have displayed aggressive behavior. Although the objective of these management activities would not be to reduce the mountain goat population, they would periodically restrict, manipulate, or attempt to control mountain goats, resulting in long-term adverse impacts on the untrammeled quality of wilderness character.

Natural. Under alternative A, the continued presence and increasing numbers of exotic mountain goats in wilderness would be a long-term, adverse impact on the natural quality of wilderness character. Also, the continued browsing, grazing, wallowing, trailing, and trampling by mountain goats would create long-term impacts on the natural quality of wilderness character by adversely affecting the condition of soils and plants, including endemic species. Furthermore, mountain goats extensively use some areas of Olympic National Park for bedding. Continual use of these sites results in plant mortality and subsequent soil loss due to wind and water erosion.

Undeveloped. Under alternative A, research and monitoring activities would continue in wilderness according to the current operations of the park and the national forest. Park and USDA Forest Service staff would continue to collect information on mountain goat population levels, visitor interactions, and sensitive park resources via helicopter or fixed-wing airplane as necessary. There would also be infrequent helicopter use from lethal removal operations in line with protocols found in the *Mountain Goat Action Plan* (appendix A). These activities would result in minimal, long-term, adverse impacts, of short duration to the undeveloped quality of wilderness character because motorized equipment and the

presence of facilities are prohibited under the *Wilderness Act* unless they meet the minimum requirements for administration of the area for the purpose of wilderness.

Opportunities for Solitude or Primitive and Unconfined Recreation. Under alternative A, it is expected that the mountain goat population would grow. As a result of this growth, visitors may encounter mountain goats more frequently, leading to harassment by goats and potentially unsafe interactions. If unsafe interactions increase, temporary closures in wilderness would likely occur in order for park management to deal with conditioned or aggressive mountain goats. Furthermore, noise generating aircraft may occasionally be used to haze or lethally remove problematic mountains goats and perform periodic surveys to assess mountain goat population abundance. Therefore, closures and noise disturbance would infrequently limit opportunities for solitude or a primitive and unconfined type of recreation, resulting in long-term, adverse impacts on this quality of wilderness character.

Cumulative Impacts

Under alternative A, past, present, and reasonably foreseeable future actions with the potential to impact wilderness character include: ongoing operations and maintenance activities in the park and national forest; and vital signs monitoring, Olympic marmot monitoring, and other scientific research in the park. Other past, present, and reasonably foreseeable future actions in the surrounding Olympic Peninsula region that could impact wilderness character include increasing occurrence of military, commercial, and private overflights, as well as fire management operations, depending on the specific quality of wilderness character.

Untrammeled. The implementation of ongoing operations and maintenance actions and monitoring, in both the park and national forest, would have short-term, adverse impacts on the untrammeled wilderness character due to the periodic presence of NPS and USDA forest service staff.

Natural. Park and national forest maintenance activities, such as trail maintenance, would contribute short-term, adverse impacts on the natural quality of wilderness character by disturbing soils, vegetation, and wildlife along the trail corridors. However, proactive trail rehabilitation efforts would lead to long-term, beneficial impacts in areas receiving high levels of use.

Undeveloped. The maintenance of trails in the park's wilderness areas would have short-term, adverse impacts through the use of motorized equipment (e.g., chainsaws) and other improvements. Facilities such as ranger stations, historic structures, bridges, radio repeaters, toilets, and signs would remain in the wilderness on a short- or long-term basis. The presence of these facilities would result in direct, adverse impacts on the undeveloped quality of wilderness character from ongoing use and maintenance. Helicopters or fixed-wing airplanes would continue to be used for administrative use above park and national forest wilderness, in particular for fire management or search and rescue operations, which would result in short-term, adverse impacts.

Opportunities for Solitude or Primitive and Unconfined Recreation. Noise produced by, and visual encounters with, crews and equipment used for trail and facility maintenance would have short-term, adverse impacts on wilderness visitors' solitude or primitive and unconfined recreation experience. However, once individual maintenance projects are complete and these areas are improved, wilderness visitors would experience long-term, beneficial impacts as a result of improved access in areas that provide solitude and unconfined recreational experiences. Park or other personnel conducting scientific research would contribute to short-term, adverse impacts by introducing human sounds, thereby reducing opportunities for solitude. Continued or increased administrative, military, or commercial overflights, as well as flights associated with fire management operations, would impact the solitude that wilderness provides, resulting in short-term, adverse impacts on this quality of wilderness character. For more

information on impacts associated with noise from past, present, and reasonably foreseeable future actions, please refer to the "Acoustic Environment" section in this chapter.

The impacts on the qualities of wilderness character of the Olympic Peninsula would be both short and long term, and primarily adverse. Under alternative A, the use of motorized equipment, human presence, and temporary area closures within wilderness areas would contribute direct, adverse impacts, but on an infrequent and geographically localized basis because management activities would only occur as needed to address conditioned or aggressive mountain goats. The continued presence and expected increase in mountain goats would result in adverse effects on the natural quality of wilderness, and more closures and noise disturbance would result in long-term, adverse impacts on opportunities for solitude. When the impacts of alternative A are added to the past, present, and reasonably foreseeable future impacts, the overall cumulative impact on wilderness character would result in mostly adverse impacts because natural conditions in wilderness would continue to be impacted by exotic mountain goats, which alternative A would not address. Alternative A would contribute a noticeable adverse increment to the overall cumulative impact because of the continued presence and likely increase in population of an exotic species in wilderness.

Conclusion

Under alternative A, the continued presence and projected population increase of mountain goats on the Olympic Peninsula would result in long-term, adverse impacts on the natural quality of wilderness. These impacts include the loss of soils and plants, including endemic species, due to browsing, grazing, wallowing, trailing, and trampling by mountain goats. Management tools under this alternative would involve nuisance control, the sporadic lethal removal of mountain goats, and periodic helicopter surveys to assess mountain goat population abundance, resulting in long-term, adverse impacts on the untrammeled and undeveloped qualities of wilderness character. Research and monitoring activities would also adversely affect the undeveloped quality of wilderness character in the long term because some of these activities require the use of a helicopter or fixed-wing airplane. Current opportunities for solitude or a primitive and unconfined type of recreation would continue, but occasional adverse effects would result from area closures and noise disturbance that could periodically impact wilderness character. These impacts on wilderness character from management activities would be infrequent and of short duration, so they would be less under alternative A than under the action alternatives. However, impacts on wilderness character from a large exotic mountain goat population would be far greater than that of the action alternatives, which would decrease the population. Thus, the impacts of alternative A, combined with the impacts of other past, present, and reasonably foreseeable future actions, would result in overall adverse cumulative impacts, with alternative A contributing a noticeable adverse increment.

Alternative B: Capture and Translocation

Impacts Associated with Staging Areas

Under alternative B, efforts to capture and translocate mountain goats would take place. Staging areas would not be located in designated wilderness; however, direct, adverse impacts on adjacent wilderness areas could result from noise produced from motorized vehicles and equipment. Because the distance of the staging areas to designated wilderness ranges from 100 feet to more than 1 mile, the noise from staging areas would likely elevate sound levels to over 45 A-weighted decibel (dBA), a level at which noise would be audible to all visitors and wildlife up to 1 mile from the staging area (table 18). When helicopters are landing or taking off from staging areas, sound levels and attenuation distances would temporarily elevate to levels similar to those described in the "Acoustic Environment" section, reaching 102 dB directly below a helicopter at 30 feet above ground level (AGL). This would be of very severe intensity but would be temporary and intermittent, only occurring during landings and take offs over the

course of two 2-week management periods: one in mid- to late July and one in late August to mid-September. Furthermore, staging areas that are not closed for other reasons, would be closed prior to operations.

TABLE 18. DISTANCE OF STAGING AREAS TO DESIGNATED WILDERNESS

Staging Area	Distance (feet)	Wilderness Ownership
Sweets	600	NPS
Hurricane	200	NPS
Deer Park	100	NPS
Hamma Hamma	6,500	USDA Forest Service (The Brothers Wilderness)
Mt. Ellinor	2,900	USDA Forest Service (Mount Skokomish Wilderness)

Impacts Associated with Capture and Translocation Activities in Mountain Goat Habitat

Untrammeled. Under alternative B, park staff would access wilderness areas in the park and national forest on foot and via helicopter in order to bait and trap mountain goats. From the air, mountain goats would be captured through either the use of immobilizing drugs or net guns, delivered from a helicopter over four 12-day periods in years 1 and 2. Ground-based capture methods would include drop nets and darting. Baiting, trapping, netting, snaring, darting, and capturing mountain goats for translocation would have short-term, direct, adverse impacts on the untrammeled quality of wilderness character, as this would be considered direct human intervention of wildlife in wilderness areas.

Natural. Helicopter landings and ground-based operations associated with management activities would not permanently damage or alter soils and plants because the anticipated rotor wash, landing skids, and foot traffic would only temporarily compact soils and flatten vegetation. The capture and translocation of 50% of the mountain goat population would reduce adverse impacts on soils, plants and animals, because browsing, grazing, wallowing, trailing, and trampling by mountain goats would be reduced, resulting in minimal, indirect, beneficial impacts. These beneficial impacts would be realized while the population is reduced. If maintenance activities cannot be performed in the long term (5 to 15 years after initial management) the mountain goat population would likely recover creating impacts described under alternative A. Therefore, long-term, adverse impacts could occur to the natural conditions in wilderness areas if the mountain goat population rebounds.

Undeveloped. Under alternative B, the lack of suitable roads and terrain for stock animals in wilderness necessitates the use of helicopters for mountain goat management activities. The use of motorized equipment, such as helicopters, would cause intermittent, direct, adverse impacts on the undeveloped quality of wilderness character over several weeks during pursuit and capture operations. Actions could result in a maximum of 8 hours of flight time over wilderness per day over the two separate 2-week management periods each year, or for a maximum of 96 hours for each 2-week period. Additionally, helicopters would land briefly in wilderness up to three times during each mountain goat capture operation, to pick-up and drop-off capture crews and sling mountain goats. A supplementary aircraft may be used to spot mountain goats and assist in capture operations. Setting ground traps, drop nets, and placement of salt blocks would cause short-term, direct, adverse impacts on the undeveloped quality of wilderness character because these installations would not promote the primeval character and influence of wilderness. Furthermore, direct, adverse impacts on the undeveloped wilderness character would result from periodic helicopter surveys for mountain goats approximately every 5 years in order to monitor

population abundance, which includes approximately 30 hours of flight time distributed over 6 to 7 days in July or August.

Opportunities for Solitude or Primitive and Unconfined Recreation. Under alternative B, noise would be produced in wilderness from helicopter or fixed-wing airplane, reaching high decibel levels during operations. Temporary area closures within the vicinity of capture operations would be required during periods of high visitor use in July, August, and September. With time needed to mobilize and demobilize, and issues associated with weather conditions, operations would occur over the course of two separate 2-week periods per year, up to 8 flight hours per day. Areas with a high density of mountain goats, such as High Divide, Lena Lakes, Hurricane Ridge, Lake of the Angels, and Mount Ellinor, would likely be closed to public visitation for more efficient management and for operator safety. Most capture operations, including maintenance activities, would take place from sunrise to mid-morning (around 11 a.m.). Similar to the impacts associated with the staging areas, intermittent, short-term, adverse impacts on solitude and unconfined recreation would occur due to the noise produced from motorized equipment and the closures to various areas of the wilderness, and effects to particular areas used by wilderness recreationists would depend on the flight path taken (see figure 5 in chapter 2). These impacts would be realized to a lesser degree during periodic survey flights using helicopters or fixed winged aircraft.

Cumulative Impacts

Impacts on wilderness character from past, present, and reasonably foreseeable future actions under alternative B would be the same as those described under alternative A. These cumulative impacts would be primarily minimal adverse impacts caused by an increase in human activity during ongoing park management activities. The use of motorized equipment, human presence, and area closures within wilderness areas would increase under alternative B during capture and translocation activities, which would contribute substantial short-term, adverse impacts on the wilderness character of the Olympic Peninsula. These direct impacts would be limited to the 4-week total annual duration of management activities and would mostly impact only high-elevation areas. When the impacts of alternative B are added to the past, present, and reasonably foreseeable future impacts, the overall cumulative impact on wilderness character would be substantial and adverse for the first 3 to 5 years because of the intensity of actions involving removal teams and helicopter use in wilderness; however, in the long term, there would be some recovery of the natural quality of the wilderness character from the removal of 50% of the mountain goat population, and a reduced adverse cumulative effect. Alternative B would contribute a substantial adverse increment to cumulative impacts in the short term, due to the intrusive nature of management activities, and a minimal adverse increment over the long term after intensive capture and translocation activities have ceased.

Conclusion

Baiting, trapping, netting, darting, and capturing exotic mountain goats for translocation would have adverse impacts on the untrammeled quality of wilderness character by directly manipulating a mountain goat population in wilderness. The use of motorized equipment, especially helicopters and associated noise production, area closures, and temporary placement of traps and salt blocks would have short-term, but sometimes severe, adverse impacts on the untrammeled, undeveloped, and solitude or primitive and unconfined recreational qualities of wilderness character during the two 2-week management periods per year of initial management. The reduction of exotic mountain goats would support some recovery of natural conditions in wilderness resulting in long-term, beneficial impacts on the natural quality of wilderness character. Cumulative impacts would continue to be adverse and the adverse contribution from alternative B would be substantial in the short term during the two 2-week management periods per year of initial management while helicopters are being used to trap and transport mountain goats, but less adverse in the long term when alternative B would involve only periodic maintenance and could provide

long-term benefits through the reduction of the mountain goat population. Alternative B would have more adverse impacts on wilderness character than alternative A due to its dependence on motorized equipment, especially helicopters, during the two 2-week management periods per year. When compared with alternatives C and D, alternative B would have the most adverse impacts on wilderness character because maintenance activities to reduce the mountain goat population, and helicopter-based population surveys, would continue indefinitely into the future.

Alternative C: Lethal Removal

Impacts Associated with Staging Areas

Under alternative C, if staging areas are used, they would not be located in designated wilderness. However, adverse impacts on adjacent wilderness areas could result from noise produced from motorized vehicles and equipment. Noise from staging areas would likely elevate sound levels to 45 dBA, a level at which noise would be audible to all visitors and wildlife up to 1 mile from the staging area. When helicopters are landing or taking off from staging areas, sound levels and attenuation distances would temporarily elevate to levels similar to those described in the “Acoustic Environment” section. For more information on these impacts, refer to the “Acoustic Environment” section.

Impacts Associated with Lethal Removal Activities in Mountain Goat Habitat

Untrammeled. Under alternative C, firearms would be used for both ground- and helicopter-based lethal removal of mountain goats within wilderness. Mountain goat carcasses resulting from lethal reduction would be left in the field but would be relocated at least 325 feet away from high-use trails and campsites, or where visible from high visitor use areas. Similar to alternative B, this management tool would aid in population control and have intermittent, short-term, adverse impacts on the untrammeled quality of wilderness character, as this would be considered direct human intervention of wildlife in wilderness areas.

Natural. Similar to alternative B, the lethal reduction of mountain goats under alternative C would remove an exotic species and support the recovery of soils and plants, including endemic species, because browsing, grazing, wallowing, trailing, and trampling would be eliminated, resulting in long-term, beneficial impacts on the natural quality of wilderness character. Implementation of alternative C would accelerate soil and plant recovery because lethal reduction would take less time to reduce the mountain goat population than capture and translocation.

Undeveloped. Similar to alternative B, the use of motorized equipment such as helicopters would cause short-term, adverse effects on the undeveloped quality of wilderness character. This could result in up to 8 hours of flight time over wilderness per day during the two separate 2-week management periods per year. Although, helicopters would not land in wilderness to pick-up and drop-off capture crews and sling mountain goats, there may be up to 100 landings to remove mountain goat carcasses. The future quality of wilderness character on the Olympic Peninsula may also be improved because the elimination of mountain goats would no longer require the periodic disturbance by aircraft to perform surveys of their population abundance.

Opportunities for Solitude or Primitive and Unconfined Recreation. Under alternative C, noise would be produced in wilderness from helicopters or fixed-wing airplane, as well as from firearms, reaching high decibel levels for short periods of time during operations. Similar to alternative B, temporary area closures within the vicinity of lethal aerial removal would be required during periods of high visitor use in July, August, and September. Operations would occur over the course of two separate 2-week periods per year, up to 8 flight hours per day. Areas with a high density of mountain goats such as High Divide, Lena

Lakes, Hurricane Ridge, Lake of the Angels, and Mount Ellinor would likely be closed for more efficient management and for visitor and operator safety. Similar to alternative B, both the noise produced and temporary area closures in wilderness would have short-term, adverse impacts on the solitude or primitive and unconfined recreational quality of wilderness character.

Cumulative Impacts

Impacts on wilderness character from past, present, and reasonably foreseeable future actions under alternative C would be the same as those described under alternative A. These cumulative impacts would be primarily minimal adverse impacts caused by an increase in human activity during ongoing park management activities. The use of motorized equipment, especially helicopters, temporary area closures, and noise within wilderness would increase under this alternative during lethal removal activities, which would contribute short-term, adverse impacts on the wilderness character of the Olympic Peninsula. These direct impacts would be limited to the duration of two 2-week management periods per year and would mostly impact high-elevation areas for the first 1 to 3 years of initial management. When the impacts of alternative C are added to the past, present, and reasonably foreseeable future impacts, an overall adverse cumulative impact on wilderness character would occur. Management activities under alternative C would contribute the greatest adverse impact on the cumulative impact scenario over the short term due to the use of motorized equipment. In the long term, however, the removal of mountain goats would allow the recovery of the natural quality of the wilderness character from the elimination of an exotic species. Alternative C would, therefore, contribute a minimal adverse increment to the overall adverse cumulative impact over the long term.

Conclusion

The lethal reduction of mountain goats, involving the use of motorized equipment and associated noise production, temporary area closures, and temporary placement of salt blocks would have short-term, adverse impacts on the untrammeled, natural, undeveloped, and solitude or primitive and unconfined recreational qualities of wilderness character during the two 2-week management periods per year of initial management. Similar to alternative B, alternative C would have more adverse impacts on wilderness character than alternative A because it would trammel wilderness with helicopter-based activities used to reduce the mountain goat population, affecting the undeveloped quality of wilderness character through noise production, and affecting primitive and unconfined recreation opportunity by temporarily closing certain areas of the park or adjacent national forest. Lethal reduction would, however, support the recovery of natural conditions in wilderness, resulting in long-term, beneficial impacts on the natural quality of wilderness character. Also, alternative C would have fewer long-term, adverse impacts on wilderness character than alternative B because less maintenance activities would be required to manage the mountain goat population, and future aircraft-based population surveys for mountain goats would become unnecessary. Overall, when the impacts of the past, present, and reasonably foreseeable future actions are combined with the impacts of alternative C, an overall adverse impact would be expected. Alternative C would contribute a substantial adverse increment to the overall cumulative impact in the short term and a minimal adverse increment in the long term.

Alternative D: Combination of Capture and Translocation and Lethal Removal (Preferred Alternative)

Impacts Associated with Staging Areas

Under alternative D, efforts to remove mountain goats would take place in wilderness areas on the Olympic Peninsula. Staging areas would not be located in designated wilderness, but adverse impacts on

adjacent wilderness areas could result from noise produced from motorized vehicles and equipment. Noise from helicopters at staging areas would likely elevate sound levels to 45 dBA, a level at which noise would be audible to all visitors and wildlife up to 1 mile from the staging area. When helicopters are landing or taking off from staging areas, sound levels and attenuation distances would temporarily elevate to levels similar to those described in the "Acoustic Environment" section.

Impacts Associated with Capture, Translocation, and Lethal Removal Activities in Mountain Goat Habitat

Untrammeled. Alternative D would utilize a combination of capture and translocation and lethal removal tools to reduce the mountain goat population by at least 90%, which is expected to eventually extirpate this population from the Olympic Peninsula. The specific management elements and actions that could be used for capture and translocation are described under alternative B. The specific management elements and actions that could be used for the lethal removal of mountain goats are described under alternative C. These management tools would have short-term, adverse impacts on the untrammeled quality of wilderness character, as the actions would be considered direct human intervention with wildlife in wilderness areas.

Natural. Helicopter landings and ground-based operations are not expected to permanently damage or alter soils and plants because the anticipated rotor wash, landing skids, and foot traffic would only temporarily compact soils and flatten vegetation. Similar to alternatives B and C, the capture, translocation, and lethal reduction of mountain goats under alternative D would remove an exotic species and support the recovery of soils and plants, including endemic species because browsing, grazing, wallowing, trailing, and trampling would be eliminated, resulting in long-term, beneficial impacts on the natural quality of wilderness character.

Undeveloped. Similar to alternatives B and C, the use of motorized equipment such as helicopters would cause short-term, adverse effects on the undeveloped quality of wilderness character under alternative D. The future quality of wilderness character on the Olympic Peninsula may also be improved because the elimination of mountain goats would no longer require the periodic disturbance by aircraft to perform surveys of their population abundance.

Opportunities for Solitude or Primitive and Unconfined Recreation. Similar to alternatives B and C, both the noise produced and temporary closures to various areas in wilderness under alternative D would have short-term, adverse impacts on the solitude or primitive and unconfined recreation quality of wilderness character. Impacts from helicopter use under alternative D would occur over two 2-week periods annually for 4 years. In years 1 and 2 capture operations would take place; in years 3 and 4 primarily lethal removal operations would take place.

Cumulative Impacts

Impacts on wilderness character from past, present, and reasonably foreseeable future actions under alternative D would be the same as those described under alternative A. These cumulative impacts would be primarily minimal adverse impacts caused by an increase in human activity during ongoing park management activities. The use of motorized equipment, temporary area closures, and noise would increase under this alternative during capture and translocation, and lethal removal activities, which would contribute substantial short-term, adverse impacts on the wilderness character of the Olympic Peninsula. However, these direct impacts would be limited to the short-term duration of management activities and would mostly impact high-elevation areas. When the impacts of alternative D are added to the past, present, and reasonably foreseeable future impacts, an overall adverse cumulative impact on wilderness character would occur in the short term from the use of motorized equipment, and alternative

D would contribute a substantial adverse increment. In the long term, the removal of mountain goats would allow the recovery of the natural quality of the wilderness character from the elimination of an exotic species, and alternative D would therefore contribute a minimal adverse increment to the overall adverse cumulative impact.

Conclusion

The capture, translocation, and lethal reduction of mountain goats, the use of motorized equipment, noise production, temporary area closures, and temporary placement of drop nets and salt blocks would have short-term, adverse impacts on the untrammeled, natural, undeveloped, solitude or primitive and unconfined recreational qualities of wilderness character during the two 2-week management periods per year of initial management, or four years total. These management tools would, however, indirectly benefit recovery of natural conditions in wilderness by eliminating the mountain goat population. Alternative D would have more adverse impacts on wilderness character than alternative A, because it would trammel wilderness by reducing the mountain goat population, affect the undeveloped quality of wilderness character by the use of motorized equipment, affect solitude by utilizing noise-producing tools such as aircraft and firearms, and affect primitive and unconfined recreation by temporarily closing certain areas of the park or national forest. Alternative D would have fewer adverse impacts than alternative B because maintenance activities would primarily consist of lethal removal, which would reduce the duration and frequency of impacts on wilderness character. Furthermore, future helicopter-based population surveys, which would negatively affect the undeveloped quality of wilderness character, would become unnecessary. However, alternative D would have more adverse impacts than alternative C because initial management would last longer. The cumulative effects of alternative D would be similar to those in alternatives B and C, and are expected to be adverse. Overall, when the impacts of the past, present, and reasonably foreseeable future actions are combined with the impacts of alternative D, an overall adverse impact would be expected. Alternative D would contribute a substantial adverse increment in the short term and a minimal adverse increment to the overall cumulative impact in the long term.

WILDLIFE AND WILDLIFE HABITAT, INCLUDING SPECIAL-STATUS SPECIES

Pursuant to section 4.4.1.1 of NPS *Management Policies 2006*, NPS is directed to maintain as parts of the natural ecosystems of parks all plants and animals native to park ecosystems. Section 4.1.5 directs NPS to restore natural systems. This requirement includes language dictating the removal of exotic species in order to restore native plants and animals.

Methods and Assumptions

Potential impacts on wildlife and wildlife habitat, including special-status species, were evaluated based on resource expert knowledge and professional judgment, review of literature, anticipated locations for management activities, and the resource-specific issues identified in chapter 1. General assumptions for impacts on wildlife and special-status species are described below. Each alternative provides additional assumptions as appropriate. Impacts on species protected by the *Endangered Species Act* (ESA) are discussed in the “Threatened or Endangered Species” section of this chapter.

A large number of species could be directly affected by noise and disturbance associated with human presence, equipment, and use of helicopters and firearms during the implementation of the various mountain goat management actions. There are not specific references available for all species that are present in these areas, and as noted in several studies (e.g., NPS 1994; Manci et al. 1988); there is no

direct correlation between a specific sound level and responses by wildlife. Also, the response to aircraft or firearm noise can be highly variable depending on the species, type of study, ecological characteristics of the area, and other attributes (NPS 1994). Responses of flight or stress would be expected for all wildlife species that may be disturbed, and therefore impacts on various mammals and birds are addressed together for the staging areas and then for the subalpine and alpine mountain goat habitat where capture or lethal removal would be conducted. To comply with the USDA Forest Service requirement to complete a biological evaluation for USDA Forest Service special-status species, the potential impacts on individual species are provided in appendix G.

Analysis Period. For the analysis of impacts of the action alternatives to wildlife, including special-status species, it is expected that the majority of impacts within staging areas would occur within the first 3 to 5 years of project implementation, during which most initial management activities would probably occur. Impacts in alpine and subalpine areas where mountain goats would be captured or lethally removed would be observed both in the short term, during initial management activities, and in the long term, following completion of maintenance activities.

Analysis Area. The area of analysis for impacts of alternatives on wildlife, including special-status species, is the project area including mountain goat habitat and staging areas within the park, on adjacent Olympic National Forest lands, and on areas immediately surrounding the project area.

Duration and Type of Impacts. The analysis of the duration and type of impacts on wildlife and wildlife habitat under each alternative is based on the following issue statements:

- **Issue Statement.** Proposed activities associated with the use of staging areas for the management of mountain goats (including site preparation and any aircraft or vehicular traffic to and from sites), would have the potential to impact wildlife and wildlife habitat, including special-status species.
- **Issue Statement.** Proposed activities associated with management of mountain goats on the Olympic Peninsula (including actions associated with hazing, aversive conditioning, capture, and lethal removal), such as the use of aircraft or firearms, would have the potential to impact wildlife and wildlife habitat, including special-status species.

Analysis of Impacts on Wildlife in Olympic National Forest. Two of the five staging areas (i.e., Hamma Hamma and Mt. Ellinor) are located in Olympic National Forest, and the other three are located in Olympic National Park. Impacts discussed below associated with the preparation and use of staging areas would apply to the wildlife within and surrounding the staging areas located in the national forest.

The wildlife species in the national forest would be similar to those in the park, but there would be substantially fewer adverse impacts on wildlife and wildlife habitat in the national forest from management activities because about 90% of the mountain goat habitat is in the park. For the analysis of impacts on wildlife, including special-status species, it is assumed that the types of impacts on wildlife species would be the same for management activities occurring on both NPS and adjacent Olympic National Forest lands within the project area.

Alternative A: No Action

Impacts Associated with Management Activities in Mountain Goat Habitat

In order to limit mountain goat-human interactions in the park, management activities at ground level would occasionally be taken to haze mountain goats that become conditioned and aggressive to humans.

These activities would also disturb any nearby wildlife in a manner similar to how they react when they see or hear people on foot doing other activities, which may cause animals to experience stress and/or temporarily flee the area. Management activities would use hazing, such as shooting mountain goats with paintball guns, nonlethal shotgun rounds, or shouting and throwing rocks. These actions would likewise generate infrequent, intermittent noise that would adversely impact wildlife behavior; however, noise disturbance generated by hazing activities would not be expected to carry over long distances. Wildlife that would be directly affected by hazing and lethal removal activities are those that share similar habitat with mountain goats, as described in chapter 3, including snowshoe hare, coyote, bobcat, cougar, black bear, and various bird species. Management activities at ground level would occur more often than activities using aircraft. Adverse impacts on wildlife would be minimal because these management activities would be of very short duration, occurring only long enough to haze or lethally remove hazardous mountain goats and only in rare and extreme circumstances. These activities would be limited to certain areas of the park and are intended to modify mountain goat behavior and to drive mountain goats away from visitor use areas.

Indirect effects to wildlife and wildlife habitat under alternative A would consist of continued degradation of habitat and forage resources due to the continued presence of mountain goats within the project area. These impacts may increase over time commensurate with an increasing mountain goat population. Continued depletion of forage resources used by native herbivorous wildlife species including snowshoe hare. Over time, these adverse impacts would expand geographically and increase in intensity as the mountain goat population continues to grow and disperse until it reaches a carrying capacity, which was estimated at 1,000 mountain goats in 1983 (Jenkins et al. 2016). While limited management of mountain goats would occur under alternative A, these actions are not expected to affect the projected increase of mountain goats on the Olympic Peninsula, and would therefore not prevent the increasingly adverse impacts on habitat that would continue indefinitely into the future until the mountain goat population reaches its carrying capacity. Therefore, these indirect impacts are more severe to wildlife and wildlife habitat, than the direct impacts from hazing of mountain goats.

Impacts on Special-Status Wildlife Species

Alternative A would result in both direct and indirect effects on state-listed species of concern such as the Olympic marmot and Olympic pocket gopher, as well as a few special-status species recognized by the USDA Forest Service. Direct impacts from mountain goat management actions would include noise, human presence, or other temporary disturbances from hazing, or very infrequent capture or lethal removal of conditioned or aggressive mountain goats. These effects would be short-term and adverse. The continued presence and growth of the mountain goat population under this no-action alternative would result in long-term, indirect, adverse effects on special-status species due to ongoing degradation of subalpine habitat caused by mountain goats. Mountain goats would continue to impact forage resources used by the Roosevelt elk and black-tailed deer, both Olympic National Forest management indicator species, and the endemic Olympic marmot, a Regional Forester Sensitive species. Mountain goats would also continue to degrade habitat used by the Olympic marmot and the Olympic pocket gopher. The USDA Forest Service has determined that for their special-status species, alternative A would have no adverse impact on any species (see appendix G).

Cumulative Impacts

Under alternative A, past, present, and reasonably foreseeable future actions with the potential to have cumulative impacts on wildlife and wildlife habitat, including special-status species, include: ongoing operations and maintenance activities in both the park and national forest; vital signs monitoring, Olympic marmot monitoring, soil surveys, and other scientific research activities in the park; and hunting in the national forest. Additional past, present, and reasonably foreseeable future actions occurring in the

surrounding region that could impact wildlife and wildlife habitat in the project area include increasing occurrence of military, commercial, and private overflights, as well as fire management operations.

Trail maintenance activities within alpine and subalpine areas could adversely impact ground dwelling wildlife species if trail expansion or rerouting resulted in impacts on previously undisturbed areas. Small-scale habitat disturbance could also result from trampling and vegetation removal during clearing, grading, and surfacing of trails. In addition, wildlife could be temporarily displaced due to the presence of work crews.

Survey activities that involve park and forest service staff, as well as volunteers, traveling off designated trails could cause localized adverse impacts on various wildlife species in alpine and subalpine areas, as some species may flee areas due to human presence. Such activities include surveys for Olympic marmot and soil surveys, vital signs monitoring, and other scientific research activities. Because survey activities would be small in scale, intermittent, and short-term in duration, any adverse impacts on wildlife would be minimal and temporary.

Overflight activities related to military, commercial, and private aircraft, as well as ongoing park and national forest operations and maintenance activities, would produce noise, which would impact wildlife by causing stress or flight reactions. Elk and mountain goat monitoring flights would also occur, but would be infrequent, primarily using small aircraft, and would produce levels of noise that would impact some wildlife. In addition, commercial and military flights would primarily occur at higher elevations, which would result in minimal adverse cumulative impacts on wildlife in the project area. For more information on impacts associated with noise from past, present, and reasonably foreseeable future actions, please refer to the “Acoustic Environment” section in this chapter.

Hunting is not allowed within the park, but occurs in Olympic National Forest within the project area. Human disturbance and noise associated with hunting, including the use of vehicles and firearms, would potentially cause animals to experience stress, altering their behavior, or causing them to flee from the area. The impacts of hunting are expected to be experienced on an individual level, and no effects would occur to populations of species. Therefore, hunting would result in short-term, adverse cumulative impacts on wildlife.

The impacts of alternative A on wildlife and wildlife habitat, including special-status species, are mostly indirect and related to continued habitat degradation due to the presence of large numbers of mountain goats, which would be adverse and lasting indefinitely. When these impacts of alternative A are combined with the impacts of other past, present, and reasonably foreseeable future actions, an overall minimal adverse cumulative effect would be expected. Alternative A would contribute a noticeable adverse increment to the overall cumulative impact.

Conclusion

Direct impacts on wildlife and wildlife habitat, including special-status species, under alternative A would only be occasional and short-term in duration, resulting from hazing or lethal removal of mountain goats that pose a threat to human safety. Mountain goat management activities would result in temporary disturbances to wildlife due to noise and the presence of humans. Because the increasing mountain goat population under alternative A would continue to degrade wildlife habitat, there would be indirect, adverse impacts on wildlife habitat that would continue indefinitely into the future, including habitat for some special-status species that share the same environment as mountain goats. Despite rare, short-term, adverse impacts on wildlife from hazing activities being less severe than the impacts from initial management and maintenance activities under the action alternatives, impacts on wildlife from alternative A would be greater than those of the action alternatives because the mountain goat population would not

be reduced or eliminated. Overall, the contribution to cumulative impacts of alternative A on wildlife and wildlife habitat, including special-status species, would be adverse, noticeable, and last indefinitely. When combined with the impacts on wildlife and wildlife habitat by other past, present, and reasonably foreseeable future actions, an overall adverse cumulative effect would be expected.

Alternative B: Capture and Translocation

Impacts Associated with Staging Areas

All staging areas would be located in previously disturbed areas, most of which have already been cleared, limiting any direct, adverse impacts on wildlife and wildlife habitat. In all locations, there may be some need for site leveling and grading activities, which would result in minimal ground disturbance and removal of surface vegetation. This could directly affect all ground-dwelling wildlife occurring near staging areas. Sound and vibration producing machinery, such as grading equipment and trucks, used for site preparation activities would also have a direct, adverse effect on these species' behaviors. Staging area preparation activities would disrupt regular wildlife behavior and cause stress to wildlife within the vicinity, causing them to flee the area. Management activities under alternative B, which would occur over the 5-year initial management period with most activity in years 1 and 2, would require a large area to accommodate the additional activities such as veterinary care and mountain goat processing; therefore, the impacts on wildlife from the associated staging area's activities would also occur over this area and duration. However, site preparation activities would result in minimal adverse impacts on wildlife for several reasons. Site preparation activities would be located in relatively open areas of land where few species would be likely to occur; any removal of vegetation would be minimal and would not likely result in a long-term decline or measurable loss of species abundance. In addition, site preparation activities would be relatively small in scale and short-term in duration (requiring site preparation at the beginning of each management season for the duration of initial management activities) and would likely be done in early to late fall, outside of most species' breeding and nesting periods. The impacts are expected to be experienced on an individual level, and no effects would be realized to populations of species.

Other direct impacts associated with disturbance to wildlife in areas surrounding staging areas during management activities would include vehicles driving on existing roads to and from staging areas, as well as takeoff and landing of helicopters. These activities could adversely impact wildlife through potential direct collision, or by producing sound and vibration resulting in the temporary displacement of species such as birds or mammals. Possible wildlife responses to noise and visual cues of people, helicopters, trucks and other associated equipment can range from an alert posturing to a very energetic escape response that could separate young from mothers or cause injuries (NPS 1994; Stankowich 2008). Wildlife behavior, including breeding and rearing of young, could be affected for some species during management activities at staging areas. The duration of these impacts would be limited to the portion of each two separate 2-week management period during which a particular staging area is being utilized, which would occur in mid- to late July and late August to mid-September. Although some species may have breeding seasons that extend into these months, many of the common birds and mammals in the vicinity of the staging areas (e.g., various birds, raccoons, skunks, and squirrels) have earlier nesting or breeding periods with breeding in late winter to early spring and births occurring in late spring to late summer (WDFW 2005). The duration of potential adverse impacts on wildlife would be relatively short-term, and the noise produced by vehicles and associated human activities would result in impacts on wildlife lasting only minutes to hours. Flight paths for helicopters entering and leaving the staging areas would be designated to avoid adverse impacts on birds within nearby forests (see the discussion of impacts on northern spotted owl and marbled murrelet in the "Threatened or Endangered Species" section). Helicopters would gain altitude quickly and directly over the staging areas before flying off at a higher altitude, which would minimize noise effects on wildlife in adjacent habitat. Still, some birds and mammals that would be present along the designated flight path could flee for short periods during take-

offs and landings. Any responses to the noise and disturbance in and around staging areas may affect individuals but is unlikely to reduce species populations or abundance on a landscape level. Additionally, the loss of any individuals inadvertently killed by collision with vehicles or helicopters would not affect overall local population viability.

Impacts Associated with Capture and Translocation Activities in Mountain Goat Habitat

Under alternative B, management activities would have short-term, direct, adverse impacts on wildlife sharing subalpine and alpine habitat with mountain goats. These impacts would be expected to occur two times per year during 2-week management periods (mid- to late July and late August to mid-September) for up to 8 hours per day, and with up to three helicopter landings per flight in mountain goat habitat. Helicopter hovering and landing, as well as ground-based capture activities, would produce loud noise for up to several hours at a time. This noise would directly impact those mammals and birds that live in these areas, causing them stress for the duration of the disturbance, or causing them to temporarily evacuate their habitat or retreat into burrows, as described in the "Acoustic Environment" section. Maintenance activities to keep the mountain goat population at low levels and aerial surveys to monitor the remaining population would create similar disturbances as the initial management flights, but would occur less frequently.

Wildlife that could be adversely impacted include, but are not limited to, small mammals such as snowshoe hare and larger species such as Roosevelt elk, black bear, and possibly cliff dwelling raptors that could be displaced from their perches. Impacts during nesting and breeding season would not be expected because most of these species would not be in prime breeding season during the weeks when actions would be taken in mid- to late July and late August to mid-September (e.g., black bear mate in June and July with births occurring in January and February; elk breed in the fall and calves are born in May to early June) (WDFW 2005). Individuals affected by noise and disturbance would likely return to areas previously occupied once the aircraft has left the area, and no direct mortality or injury is expected. Other wildlife that could be affected by helicopter noise are those species that occupy lower elevation forests that are under the flight paths taken to access mountain goat territory, which would vary but cover a wide range of habitats (see figure 5 in chapter 2). As noted in the "Acoustic Environment" and "Threatened or Endangered Species" sections, it is expected that flyovers would be done at least 500 feet AGL to minimize adverse impacts on northern spotted owl and marbled murrelet habitat. This would also minimize adverse impacts on other mammals such as squirrels, raccoons, bats, and forest bird species such as crow, ravens, thrushes, jays, grouse, and neotropical migrants. Decibel levels for flyovers would not exceed more than about 75 dB directly below the helicopter at 500 feet AGL and would dissipate with distance, as described in the "Acoustic Environment" section in chapter 3 and shown in figure 15 in the "Acoustic Environment" section. Also, helicopters would be moving through the area rapidly and at high elevations; as a result, the duration of noise exposure for wildlife would likely not last more than a few minutes. The timing of the actions in late July and September would also minimize adverse impacts on breeding and nesting birds and mammals, because many of these species have nesting and breeding seasons that begin in early spring and extend to mid- to late-summer (e.g., raccoons, skunks, and various bird species) (WDFW 2005). Therefore, effects to wildlife, including special-status species, from helicopter flyovers would be limited to intermittent periods spread over different flight paths and would result in minimal adverse impacts on wildlife.

Indirect, adverse impacts on wildlife would occur over the long term because mountain goats would continue to degrade habitat used by other wildlife species, including snowshoe hare, through trampling of vegetation, creating or expanding trails, and wallowing. Over the 3- to 5-year initial management period, these adverse impacts would progressively decrease until initial management activities are complete as capture and translocation would reduce the mountain goat population. Beneficial impacts on wildlife

habitat would occur within areas where large numbers of mountain goats are removed, because an exotic species adversely affecting the habitat of native species would be removed from the ecosystem. These beneficial effects could be realized if mountain goat management activities continue at a level to keep the mountain goat population from rebounding. However, any remaining mountain goats on the Olympic Peninsula would continue to impact wildlife through habitat degradation, primarily in areas where mountain goats may be difficult to capture. Although maintenance activities following initial management would seek to prevent mountain goat population numbers from increasing, it is likely that a rebound to pre-reduction numbers could occur in 10 to 15 years following management actions. If a rebound occurs, adverse impacts on wildlife habitat would continue until the population was reduced again.

Impacts on Special-Status Wildlife Species

Alternative B would result in direct and indirect effects on state-listed species of concern and special-status species recognized by the USDA Forest Service, resulting from mountain goat management actions. Noise at lower elevation staging areas and noise from flights over forested areas could affect birds and mammals of lower elevation forests by eliciting stress or flight responses; this may affect individuals of such special-status species as bald eagle, northern goshawk, peregrine falcon, and a variety of other birds, resulting in direct effects. There would be no impact on Olympic pocket gopher at any of the staging areas (Stinson 2005). The actions taken to capture mountain goats in the subalpine environment would involve landing and hovering of helicopters and crews and intermittent but loud disturbances to such species that occupy that habitat such as Olympic marmot, Olympic pocket gopher, Roosevelt elk, black tailed deer, Olympic grasshopper, and several USDA Forest Service sensitive butterflies that are known to occur in higher elevation habitats or at higher elevation staging areas. The continued presence of 50% of the mountain goat population would result in indirect effects on special-status species due to the continued degradation of subalpine habitat. Mountain goats would continue to impact forage resources used by the Roosevelt elk, black-tailed deer, and endemic Olympic marmot in the project area and would continue to degrade habitat used by the Olympic marmot and the Olympic pocket gopher. The USDA Forest Service has made impact evaluations for their special-status species that could occur in the project area, and these evaluations can be found in appendix G. For species that could be impacted under alternative B, the impacts would not likely cause a trend toward federal listing or loss of population viability.

Cumulative Impacts

Impacts on wildlife and wildlife habitat, including special-status species, from past, present, and reasonably foreseeable future actions under alternative B would be the same as those described for alternative A. Under alternative B, the presence of humans, helicopter noise, and ground disturbance would increase during capture and translocation activities, which would have short-term, adverse impacts on wildlife and wildlife habitat. However, these direct impacts would be limited to the management periods when mountain goat capture and translocation activities would occur. Potential long-term, beneficial impacts on wildlife and wildlife habitat could occur from the increased ability of native wildlife to move freely through their habitat and from reduced habitat degradation by mountain goats. When the contribution of alternative B is added to the other past, present, and reasonably foreseeable impacts, the overall cumulative impact on wildlife and wildlife habitat, including special-status species, on the Olympic Peninsula would be beneficial over the long term, despite the intense, short-term, adverse effects of the translocation actions. The removal of approximately 50% of the exotic mountain goat population under alternative B would be responsible for the majority of these benefits to other wildlife and wildlife habitat through reduced competition with and habitat disturbance by mountain goats, and this long-term benefit to wildlife habitat would slightly override the other adverse effects that are mostly short term and limited to disturbance of individuals.

Conclusion

Direct, adverse impacts on wildlife and wildlife habitat, including special-status species, under alternative B would include temporary disturbance or displacement of individual animals due to the preparation and use of staging areas for capture and translocation of mountain goats. These impacts would be limited to a small area and would occur during only two 2-week periods per year. Aircraft and other equipment noise at staging areas and throughout the mountain goat range could disrupt regular wildlife behavior on a short-term basis, lasting only a few minutes to a few hours at any site. Wildlife that share the same habitat as mountain goats would experience these direct, adverse impacts.

Indirect, adverse impacts on wildlife and wildlife habitat, including special-status species, would include ongoing degradation of habitat during initial stages of mountain goat management activities due to continued mountain goat activity. However, indirect impacts on wildlife and wildlife habitat would be beneficial in contrast to alternative A because the removal of mountain goats from the Olympic Mountains would reduce habitat degradation from mountain goat trampling, trailing, and wallowing, thereby improving habitat conditions for native wildlife. However, these benefits would be less than those under alternatives C and D because only 50% of the mountain goat population would be removed.

When combined with the primarily adverse impacts of other past, present, and reasonably foreseeable future actions, alternative B would contribute some short-term, adverse effects on individuals and a noticeable long-term benefit to wildlife species and the alpine habitat, resulting in an overall long-term, beneficial impact on wildlife and wildlife habitat, including special-status species.

Alternative C: Lethal Removal

Impacts Associated with Staging Areas

Impacts on wildlife and wildlife habitat from site preparation and management activities in staging areas would be similar to those described for alternative B. The adverse impacts on mammals and birds are expected to be experienced on an individual level, and no effects would be realized to populations of any species.

Impacts Associated with Lethal Removal Activities in Mountain Goat Habitat

Under alternative C, short-term, direct, adverse impacts on wildlife would occur during initial stages of mountain goat management activities related to noise from the use of aircraft and firearms. These impacts could affect any wildlife species that use mountain goat habitat, but the impacts would occur on an individual level and not a population level. Direct impacts associated with helicopter use would be similar to those discussed for alternative B, but to a lesser degree as the number of flights needed to eliminate the population would decrease as the population decreases. Also in an effort to reduce the use of helicopters for lethal removal, management would start with ground-based activities in year 1, possibly reducing the helicopter hours needed in for lethal removal in years 2 and 3. There would be more on-the-ground disturbance over scattered areas from ground-based lethal removal. Because ground-based lethal removal activities could occur at any time during the year, there is a greater possibility of impacts referenced in the "Acoustic Environment" section occurring during breeding or nesting seasons. However, these on-the-ground impacts would only occur in localized areas for a short duration.

Unlike alternative B, alternative C would reduce the mountain goat population by at least 90% and is expected to result in the eventual elimination of the mountain goat population on the Olympic Peninsula, resulting in long-term, indirect, beneficial impacts on wildlife habitat. While the existing mountain goat population would continue to have short-term impacts on wildlife habitat, as described for alternative B, it

is likely that the mountain goat population would be reduced more quickly under alternative C because lethal removal activities would be more effective at removing exotic mountain goats than capture and translocation activities. Adverse impacts on wildlife habitat would progressively decrease until initial management activities are complete and the mountain goat population is reduced or eliminated. Also similar to alternative B, wildlife would have a greater ability to move freely through their habitat due to reduced numbers of mountain goats, resulting in long-term, indirect, beneficial impacts. Initial management activities under alternative C could last 3 to 5 years, with most of the activity in years 1 to 3. Maintenance activities, after year 5, would involve lethal removal and would have the same adverse impacts on wildlife, which would occur opportunistically during any time of year and be limited to locations where mountain goats were able to avoid initial management activities.

Under alternative C, short-term, indirect, beneficial impacts are anticipated to carnivorous and omnivorous wildlife that live in subalpine habitat, such as black bears and coyotes, from having approximately 625 to 675 mountain goat carcasses on the landscape. These carcasses would likely attract predators and scavengers from surrounding areas until they are consumed or decomposed over the course of the years that lethal removal would be conducted.

Impacts on Special-Status Wildlife Species

Alternative C would result in direct, adverse effects on state-listed species of concern and special-status species recognized by the USDA Forest Service, resulting from mountain goat management actions. As described for alternative B, noise at lower elevation staging areas and noise from flights over forested areas could affect birds and mammals of lower elevation forests by eliciting stress or flight responses; this may affect species such as bald eagle, northern goshawk, peregrine falcon, and a variety of birds. There would be no impact on Olympic pocket gopher at any of the staging areas (Stinson 2005). The actions taken to lethally remove mountain goats in the subalpine environment would involve landing and hovering of helicopters and crews and intermittent but loud disturbances from the helicopters and firearms to such species that occupy that habitat such as Olympic marmot, Olympic pocket gopher, Roosevelt elk, black tailed deer, Olympic grasshopper, and several USDA Forest Service sensitive butterflies that are known to occur in higher elevation habitats or at higher elevation staging areas. Because mountain goat carcasses could attract coyotes into Olympic marmot habitat and indirectly increase predation on marmots, all mountain goat carcasses would be removed from active marmot colonies when it is safe to do so (e.g., contains a safe landing zone). In frontcountry areas (e.g., Hurricane Ridge), carcasses could be removed by foot. The USDA Forest Service has determined impacts for their special-status species that could occur in the project area (see appendix G for species-specific information and impact evaluations). Actions under alternative C may impact individuals but the actions are not likely to cause a trend toward federal listing or loss of population viability.

Cumulative Impacts

Impacts on wildlife and wildlife habitat, including special-status species, from past, present, and reasonably foreseeable future actions under alternative C would be the same as those described for alternative A, and are mostly adverse due to disturbance effects from human activities. Under alternative C, the presence of humans, noise from helicopters and firearms, and ground disturbance would increase during lethal removal activities, which would have short-term, adverse impacts on wildlife and wildlife habitat. However, these direct impacts would be limited in time and geographic location and could benefit some wildlife species that scavenge mountain goat carcasses, although mountain goat carcasses would be removed from Olympic marmot habitat in areas with potential for increased coyote predation. Alternative C would contribute beneficial impacts on wildlife from the increased ability of native wildlife to move freely through their habitat and from reduced habitat degradation by mountain goats, which would last indefinitely. When the incremental contribution of alternative C is added to the other past, present, and

reasonably foreseeable impacts, the overall cumulative impact on wildlife and wildlife habitat, including special-status species, on the Olympic Peninsula would be noticeably beneficial because exotic mountain goats and their impacts on wildlife habitat would be significantly reduced or eliminated.

Conclusion

The types of impacts on wildlife and wildlife habitat, including special-status species, under alternative C would be similar to those described for alternative B. Impacts would likely occur over a shorter time frame as the number of flights would decrease with decreasing mountain goat population, especially with an initial reduction using only ground-based lethal removal in year 1, possibly reducing the helicopter hours needed in years 2 and 3. Short-term, direct, adverse impacts on wildlife, including special-status species, would include noise and disturbance related helicopter- and ground-based activities over the course of 3 to 5 years and for two separate 2-week periods during the year. Aircraft noise from overflights throughout the Olympic Mountains would temporarily affect forest wildlife behavior, but the effects would be minimal based on flight path altitudes and duration. There would also be some direct, beneficial impacts on wildlife in the short term, from the presence of mountain goat carcasses which would provide additional food resources.

Short-term, indirect, adverse impacts on wildlife habitat may occur during initial stages of mountain goat management activities due to continued wallowing, trailing, and trampling behaviors of the remaining mountain goat population. However, indirect, beneficial impacts on wildlife habitat would occur over the long term as the mountain goat population decreases, resulting in a reduction in habitat degradation caused by mountain goats. This may also benefit wildlife by increasing their ability to move freely throughout the landscape. Impacts on wildlife, including special-status species, and wildlife habitat under alternative C would be slightly less than impacts associated with alternative B, which would leave more mountain goats on the landscape, and alternative D, which would take longer to implement.

When combined with the primarily adverse impacts of other past, present, and reasonably foreseeable future actions, alternative C would contribute some short-term, adverse effects on individuals and a noticeable long-term benefit to wildlife species and the alpine habitat, resulting in an overall long-term, beneficial impact on wildlife and wildlife habitat, including special-status species.

Alternative D: Combination of Capture and Translocation and Lethal Removal (Preferred Alternative)

Impacts Associated with Staging Areas

The types of impacts from staging areas under alternative D would be the same as those described for alternative B. Site preparation activities would result in minimal direct, adverse impacts on wildlife and wildlife habitat because activities would be located in relatively open and disturbed areas where few species would be likely to occur, and would be relatively small in scale and short-term in duration (requiring site preparation at the beginning of each management season for the duration of initial management activities).

Impacts Associated with Capture, Translocation, and Lethal Removal Activities in Mountain Goat Habitat

Impacts associated with management of mountain goats in mountain goat habitat under alternative D would reflect a combination of the impacts from capture and translocation and lethal removal activities described under alternatives B and C. By using both methods of mountain goat removal, the population

would likely be reduced more quickly than if only the capture and translocation method was used, but less quickly than if only lethal removal was used. As with alternatives B and C, management activities under alternative D that utilize aircraft and firearms in mountain goat habitat would produce sound that could disturb all wildlife species, resulting in short-term, direct, adverse impacts. While the specific duration of management actions would vary during the 5-year initial management phase, activities would be limited to the two separate 2-week management periods and would only last for a few minutes to a few hours at specific affected locations, resulting in minimal adverse impacts. As with alternative C, maintenance activities under alternative D would involve opportunistic lethal removal and would have the same direct, adverse impacts on wildlife as under initial management, but would be limited to locations where mountain goats remain on the landscape.

Similar to alternative C, some, short-term, indirect, beneficial impacts on carnivorous and omnivorous wildlife are anticipated from having approximately 275 to 325 mountain goat carcasses on the landscape over the time that lethal removal would occur. These carcasses would likely attract predators and scavengers from around the surrounding areas until the net increase in food is consumed or decomposed. Also similar to alternatives B and C, wildlife would have a greater ability to move freely as capture and translocation and lethal removal operations reduce the numbers of mountain goats resulting in long-term, indirect, beneficial impacts.

Overall impacts on wildlife and wildlife habitat would progressively decrease until initial management activities are complete and any remaining mountain goats would not have measurable impacts on wildlife and wildlife habitat. As with alternatives B and C, whereas direct, adverse impacts on wildlife and wildlife habitat would occur during initial stages of mountain goat management activities, indirect, beneficial impacts on wildlife habitat would last indefinitely because habitat degradation caused by an exotic species would be eliminated.

Impacts on Special-Status Wildlife Species

Mountain goat management actions under alternative D would result in direct and indirect effects on state-listed species of concern and special-status species recognized by the USDA Forest Service. As described for alternative B, noise at lower elevation staging areas and noise from flights over forested areas could affect birds and mammals of lower elevation forests by eliciting stress or flight responses; this may affect species such as bald eagle, northern goshawk, peregrine falcon, and a variety of birds. The timing of the actions in mid- to late July and late August to mid-September would minimize adverse impacts on breeding and nesting. The actions taken to capture mountain goats in the subalpine environment would involve landing and hovering of helicopters and crews and intermittent but loud disturbances to such species that occupy that habitat such as Olympic marmot, Olympic pocket gopher, Roosevelt elk, black tailed deer, Olympic grasshopper, and several USDA Forest Service sensitive butterflies that are known to occur in higher elevation habitats or at higher elevation staging areas. There would be no impact on Olympic pocket gopher at any of the staging areas (Stinson 2005). Because mountain goat carcasses could attract coyotes into Olympic marmot habitat and indirectly increase predation on marmots, all mountain goat carcasses would be removed from active marmot colonies when it is safe to do so (e.g., contains a safe landing zone). In frontcountry areas (e.g., Hurricane Ridge), carcasses could be removed by foot. The USDA Forest Service has determined impacts for their special-status species that could occur in the project area (see appendix G for species specific information and impact evaluations). Actions under alternative D may impact individuals but the actions are not likely to cause a trend toward federal listing or loss of population viability.

Cumulative Impacts

Impacts on wildlife and wildlife habitat, including special-status species, from past, present, and reasonably foreseeable future actions under alternative D would be the same as those described for alternative A, and are mostly adverse due to disturbance effects from human activities. Under alternative D, short-term adverse impacts on wildlife and wildlife habitat would occur from the presence of humans, noise from helicopters and firearms, and ground disturbance, which would increase during capture and removal, and lethal removal activities. However, these direct impacts would be limited in time and space and could benefit some wildlife that scavenge mountain goat carcasses, although mountain goat carcasses would be removed from Olympic marmot habitat in areas with potential for increased coyote predation. Alternative D would contribute indirect, beneficial impacts on wildlife from the increased ability of native wildlife to move freely through their habitat and from reduced habitat degradation by mountain goats, which would last indefinitely. When the incremental contribution of alternative D is added to the other past, present, and reasonably foreseeable impacts, the overall cumulative impact on wildlife and wildlife habitat, including special-status species, on the Olympic Peninsula would be noticeably beneficial. Alternative D would largely contribute to this impact through the removal of the majority of exotic mountain goats, and their impacts on wildlife and wildlife habitat would be eliminated.

Conclusion

The types of impacts on wildlife and wildlife habitat under alternative D would be similar to those described for alternatives B and C. The preparation and use of staging areas would cause direct, adverse impacts on wildlife as some individuals would be displaced and disturbed. Under alternative D, the impacts on wildlife from preparation and use of the staging areas would occur over less time than those described for alternative B because the initial management activities are expected to happen faster than those of alternative B and over a longer period than under alternative C because staging areas would be used more often. Firearm and aircraft noise throughout the project area and helicopter noise at staging areas could temporarily disrupt regular wildlife behavior, causing a flight or stress response. There would also be some short-term, indirect, beneficial impacts on wildlife from the presence of mountain goat carcasses, which would provide food resources for some wildlife species.

Indirect, adverse impacts on wildlife habitat may exist during initial stages of mountain goat management activities due to continued wallowing, trailing, and trampling behaviors of the remaining mountain goat population. After the reduction of the mountain goat population by at least 90%, long-term, beneficial impacts on wildlife would result from a reduction in habitat degradation caused by mountain goat trampling, wallowing, and trailing and an increased ability to move freely throughout the landscape.

Alternative D would result in slightly fewer impacts than alternative B because the switch to lethal removal under alternative D would reduce the mountain goat population to a greater degree during initial management than would exclusive capture and translocation operations under alternative B. However, alternative D would have slightly greater impacts than alternative C because the capture and translocation operations under alternative D would require greater time and effort during initial management than would exclusive lethal removal under alternative C.

When combined with the primarily adverse impacts of other past, present, and reasonably foreseeable future actions, alternative D would contribute some short-term, adverse effects on individuals and a noticeable long-term benefit to wildlife species and the alpine habitat, resulting in an overall long-term, beneficial impact on wildlife and wildlife habitat, including special-status species.

VEGETATION, INCLUDING SPECIAL-STATUS PLANT SPECIES

NPS *Management Policies 2006* (NPS 2006) directs parks to provide for the protection of park resources. The *Management Policies 2006* states that the NPS "will try to maintain all the components and processes of naturally evolving park ecosystems, including the natural abundance, diversity, and genetic and ecological integrity of the plant and animal species native to those ecosystems" (NPS 2006, section 4.1). NPS *Management Policies 2006*, section 4.4.2 also states "[w]henever possible, natural processes will be relied upon to maintain native plant and animal species and influence natural fluctuations in populations of these species. The Service may intervene to manage populations or individuals of native species only when such intervention would not cause unacceptable impacts to the populations of the species or to other components and processes of the ecosystems that support them."

The *Record of Decision for the Olympic National Park General Management Plan and Environmental Impact Statement* (NPS 2008b) directs park management to place emphasis on the promotion of natural processes. The *Record of Decision for the Olympic National Park General Management Plan and Environmental Impact Statement* directs NPS managers to manage the park's native animal and plant populations to "promote long-term viability, including maintaining age structures, abundance, density, and distributions within normal ranges, and a full range of natural genetic variability" (NPS 2008b).

Methods and Assumptions

Potential impacts on vegetation were evaluated based on resource expert knowledge and professional judgment, review of available research, locations where mountain goats occur, and anticipated locations for mountain goat management activities. Maps showing vegetation cover, communications with park staff, and past vegetation classification data were used to identify baseline conditions within the project area, including information on the condition and composition of the vegetation in the park. Past studies on mountain goat habitat and vegetation use were used to identify which plant communities could be affected by management actions as well as by mountain goats themselves from herbivory, trampling, and wallowing.

Analysis Period. For the analysis of impacts on vegetation, it is expected that the majority of impacts in alpine and subalpine areas of the project area where mountain goats would be captured or lethally removed would occur primarily in the short term, during active management activities. Impacts on vegetation in alpine and subalpine areas resulting from the mountain goats browsing, grazing, trampling, and wallowing would occur over the long term.

Analysis Area. The area of analysis for impacts of the alternatives on vegetation includes areas of Olympic National Park and Olympic National Forest currently or potentially utilized as habitat by mountain goats. Additionally, the area of analysis for the action alternatives includes capture and staging areas used to conduct mountain goat management activities.

Duration and Type of Impacts. The analysis of the duration and type of impacts on vegetation under each alternative is based on the following issue statement:

- **Issue Statement.** Mountain goats damage and kill vegetation within sensitive alpine and subalpine communities through herbivory, trampling, and wallowing behaviors. Any management of mountain goats that would reduce or eliminate them from areas with sensitive alpine and subalpine vegetative communities would remove a large source of adverse impacts on these resources.

- **Issue Statement.** Management activities could result in the removal of small trees and brush at staging areas.

Alternative A: No Action

Impacts Associated with Management Activities in Mountain Goat Habitat

Under alternative A, mountain goat management activities would be limited largely to nuisance mountain goat control through hazing, use of interpretive tools to educate the public about mountain goat safety, and occasional area closures. Through herbivory and wallowing behaviors, mountain goats have directly and indirectly affected the vegetation within the park. Changes in the relative abundance of plant species have been observed as a result of mountain goat herbivory; this has altered competitive interactions among plant species. As the mountain goat population continues to grow, it would increase the potential for heavier, long-term, sustained browsing and grazing pressure on plant communities and could lead to further changes in the relative abundance of plant species in existing mountain goat summer and winter range within the park and on adjacent national forest land. Additionally, it is expected that mountain goat habitat use and associated herbivory could expand over a larger area. Grazing pressure would be especially likely to intensify in areas of habitat preferentially selected by mountain goats, such as rocky outcrops and cliffs, leading to increased adverse impacts on plant communities in those habitats. Olympic subalpine and alpine plant communities are particularly sensitive to soil disturbance (Belsky and Del Moral 1982); therefore, soil disturbance associated with wallowing, trailing, and trampling by mountain goats or rutting behavior would be expected to compound the adverse impacts on vegetation associated with herbivory.

Impacts on Special-Status Plant Species

Under alternative A, continued mountain goat presence in alpine and subalpine communities would result in continued impacts on endemic and state-listed plant species including Cotton's milkvetch, triangular-lobed moonwort, tall bugbane, royal Jacob's ladder (also known as great polemonium), and Olympic cut-leaf synthyris (also known as featherleaf kittentails). The USDA Forest Service has determined that continued and increased herbivory, trampling, and wallowing by mountain goats under alternative A would also result in continued impacts on individuals of some Olympic National Forest Regional Forester sensitive plant species, but would not cause a trend toward federal listing of the taxa or a loss of population viability (see appendix G).

Overall, alternative A would result in continued and increasingly adverse impacts on vegetation, including special-status plant species, over an indefinite time frame because of continued and increasing pressure from herbivory, trampling, and soil disturbance from wallowing associated with an increasing population of exotic mountain goats.

Cumulative Impacts

Past, present, and reasonably foreseeable future actions with the potential to impact vegetation, including special-status plant species, include ongoing operations and maintenance activities (e.g., trail repair), vital signs monitoring, soil surveys, and scientific research activities. Trail repair and maintenance activities in alpine and subalpine areas could have temporary adverse impacts on vegetation through compaction of undisturbed soils and sensitive vegetation during clearing, grading, and surfacing of trails, and removal of vegetation in the trail footprint. Trail repair and maintenance activities would also decrease erosion of sensitive soils and discourage visitors from traveling off designated trails, protecting sensitive vegetation and resulting in overall beneficial impacts. Vital signs monitoring, soil surveys, and other scientific research activities could result in intermittent, temporary adverse impacts from trampling of vegetation by

NPS staff and researchers entering areas of sensitive vegetation on foot. These activities would not cause lasting impacts, but over time, would not be expected to have any adverse impact on vegetation, and monitoring and studies can benefit vegetation by providing important information on the status of plants in the ecosystem. Overall these past, present, and reasonably foreseeable future actions would have beneficial impacts on vegetation, including special-status plant species. However, the overall cumulative impact under alternative A would be adverse, largely due to the substantial adverse increment contributed by alternative A from contribution of the continued presence of mountain goats in the project area.

Conclusion

Alternative A would not involve any active measures to decrease the mountain goat population in the Olympic Mountains, and therefore it is likely that the mountain goat population would continue to grow. Herbivory in alpine and subalpine plant communities and soil disturbance associated with wallowing, trailing, and trampling, and rutting behaviors would continue and would be likely to increase with continued growth of the mountain goat population. This could result in continued deterioration in the condition of native alpine and subalpine plant communities. Continued mountain goat behavior would result in continued impacts on endemic and state-listed plant species and USDA Forest Service sensitive plant species from herbivory, trampling, and wallowing. Adverse impacts on vegetation, including special-status plant species, would result over an indefinite duration of time, and these would contribute a substantial adverse increment to overall adverse cumulative impacts.

Alternative B: Capture and Translocation

Impacts Associated with Staging Areas

While staging areas would be located in previously disturbed areas, site preparation activities would involve site leveling and grading, which would cause direct, adverse impacts at all staging areas from removal or crushing of vegetation within the footprint of the staging areas. Clearing of a small number of trees less than 20 inches in diameter at breast height could be required to enable safe helicopter flight at all staging areas, and mowing or clearing of small shrubs would be necessary to facilitate operations at the Sweets staging area, which is located in a disturbed meadow. Staging area preparation and use would have relatively minimal adverse impacts on project area vegetation.

Impacts Associated with Capture and Translocation Activities in Mountain Goat Habitat

Adverse impacts on vegetation under alternative B could result from crushing of vegetation associated with helicopter landings during capture of mountain goats as well as trampling of vegetation by management personnel entering mountain goat habitat on foot and handling captured mountain goats on the ground. However, given the small-scale of these activities, any adverse impacts would be localized and the vegetation would quickly recover, with minimal evidence of disturbance afterwards. Alternative B would involve up to three helicopter landings per capture, which would typically occur on the flattest, driest, and largest available open area. During maintenance activities, these minor, adverse impacts on vegetation could also occur, but they would be very limited relative to the overall extent of subalpine plant communities in the Olympic Mountains, and would not be perceptible.

Reduction of the mountain goat population by 50% and the dispersal of the mountain goats that could remain in the ecosystem would result in reduced impacts on sensitive alpine and subalpine plant communities from mountain goat herbivory, trampling, and wallowing behaviors. This would reduce the potential for additional damage to sensitive plant communities in alpine and subalpine areas in the short term. However, implementation of alternative B may delay the park and Olympic National Forest in

reaching both soil and plant recovery, as the remaining mountain goats would continue to adversely impact vegetation, including special-status plant species. If mountain goats rebound as expected to population levels approaching current abundance due to incomplete removal, it would result in future adverse impacts related to herbivory, trampling, and wallowing. Thus, while it is likely that alternative B could have noticeable, short-term, beneficial impacts on vegetation due to a substantial reduction of mountain goats, these beneficial impacts would likely not persist beyond 10 to 15 years when the population could rebound.

Impacts on Special-Status Plant Species

Landing of helicopters or trampling of vegetation by ground crews could result in adverse impacts on vegetation, but those actions would not be expected to have adverse population-level impacts on special-status plants. Any adverse impacts would likely be low, given the localized nature of management activities at specific sites and the distribution of these plant species' populations across the larger landscape. Under alternative B, the reduction of exotic mountain goats in alpine and subalpine communities on the Olympic Peninsula would result in a reduction of impacts from mountain goat herbivory, trampling, or wallowing on state-listed plant species. The USDA Forest Service has determined that these reduced impacts would also benefit several plants classified as Olympic National Forest Regional Forester sensitive plant species (see appendix G).

Cumulative Impacts

Impacts on vegetation, including special-status plant species, from past, present, and reasonably foreseeable future actions under alternative B would be the same as those described for alternative A, which are mostly beneficial. Under alternative B, management activities associated with capture and translocation of mountain goats would contribute short-term, adverse impacts on vegetation from the trampling of plants during mountain goat capture and translocation activities and small tree removal at staging areas. However, these impacts would be localized to staging areas and capture sites and be of limited duration. During the 20-year analysis period, the reduction of exotic mountain goats under alternative B would produce substantial indirect benefits to vegetation due to reduced grazing, wallowing, and trampling in many parts of the Olympic Mountains. When the noticeable long-term benefits of alternative B are added to other past, present, and reasonably foreseeable future impacts, the overall cumulative impact on vegetation, including special-status plant species, would be beneficial and largely due to the contributions of alternative B.

Conclusion

Under alternative B, mountain goat capture and translocation activities would result in short-term, adverse impacts related to the removal, trampling and crushing of vegetation by ground crews during capture and handling of mountain goats on the ground. Helicopter landings would create potential for damage to sensitive vegetation by crushing by helicopter skids. The removal of mountain goats and associated reduction in pressure on sensitive vegetation, including special-status plant species, from grazing, trampling, and wallowing would reduce a source of adverse impacts on vegetation, resulting in beneficial impacts. Although maintenance activities following initial management would seek to prevent mountain goat population numbers from increasing, it is likely that a rebound to pre-reduction numbers could occur in 10 to 15 years following management actions. If a rebound occurs, adverse impacts on vegetation would continue until the population was reduced again. If alternative B is successful in maintaining a low mountain goat population through ongoing maintenance, then alternative B would contribute a noticeable beneficial increment to overall beneficial cumulative impacts on vegetation. These beneficial impacts would not be as pronounced as they would under alternatives C and D, because some mountain goats would still remain.

Alternative C: Lethal Removal

Impacts Associated with Staging Areas

Impacts on vegetation at staging areas would be the same as described for alternative B. Adverse impacts on vegetation at all staging would occur from site preparation, which could include the clearing of a limited number of small trees less than 20 inches in diameter at breast height and mowing and clearing of small shrubs to facilitate helicopter and mountain goat processing operations.

Impacts Associated with Lethal Removal Activities in Mountain Goat Habitat

Under alternative C, management personnel accessing mountain goat habitat on foot to conduct lethal removal activities, or to move carcasses, could create localized adverse impacts related to trampling or crushing of vegetation. Any adverse impacts on vegetation would be intermittent, localized within the areas where ground crews are operating at a given time, and would occur most frequently during the initial phase of reduction, which is likely to last 1 to 3 years but may extend up to 5 years. Lethal removal activities conducted using aircraft would not be likely to involve landing of helicopters in areas of potentially sensitive alpine and subalpine vegetation, except to possibly move mountain goat carcasses on limited occasions when carcasses fall within 325 feet (100 meters) of high visitor use areas. Therefore, adverse impacts on vegetation from crushing by helicopter skids would be negligible. Ground crews conducting lethal removal activities and/or moving carcasses during the maintenance phase could also have negligible impacts on vegetation similar to those related to trampling or crushing of vegetation. It is expected that management activities would take place with decreasing frequency as the mountain goat population is reduced, and the potential for adverse impacts would thus continue to diminish. After the cessation of lethal removal activities under alternative C, it is likely that areas of affected vegetation would recover on their own quickly, without any active restoration efforts. During previous mountain goat removal efforts in the park, biologists observed vegetation to quickly recover within areas that had been heavily impacted by mountain goats for decades. By removing at least 90% of the mountain goat population, which is expected to extirpate the population, the implementation of alternative C would likely result in the elimination of mountain goat herbivory, trampling, and wallowing, thereby resulting in long-term, beneficial impacts on vegetation.

Impacts on Special-Status Plant Species

If trampling or crushing of vegetation by ground crews result in adverse impacts on vegetation, those actions would not be expected to have adverse impacts on special-status plants at the species level. Under alternative C, reduction of mountain goats in Olympic National Park in alpine and subalpine communities through lethal removal would result in the elimination or reduction of impacts from herbivory, trampling, or wallowing to state-listed plant species. The USDA Forest Service has determined that a reduction of mountain goats, resulting in decreased herbivory, trampling, and wallowing under alternative C, would also result in a reduction of impacts on individual Olympic National Forest Regional Forester sensitive plant species that would be beneficial over the long term (see appendix G).

Cumulative Impacts

Impacts on vegetation, including special-status plant species, of past, present, and reasonably foreseeable future actions under alternative C would be the same as those described for alternative A, which are mostly beneficial. Under alternative C, management activities associated with lethal removal would contribute temporary adverse impacts on alpine and subalpine vegetation resulting from trampling of plants, although impacts would be localized to capture sites and staging areas and be of limited duration. Under alternative C, the removal of at least 90% of the goat population and likely elimination of mountain

goats over time would have lasting indirect, beneficial impacts on vegetation, including special-status plant species, due to the elimination of grazing, wallowing, and trampling of vegetation by exotic mountain goats. When the substantial beneficial contribution of alternative C is combined with other past, present, and reasonably foreseeable future impacts, the overall cumulative impacts on vegetation, including special-status plant species, under alternative C would be beneficial, primarily due to the contributions of alternative C.

Conclusion

Alternative C would remove at least 90% of the mountain goats from the Olympic Mountains within approximately 3 years and would seek to eventually eliminate the population. Disturbance to sensitive plant communities, including special-status plant species, from mountain goat grazing, trampling, and wallowing would likewise be eliminated. Alternative C would have greater beneficial impacts on vegetation than alternative B, because goats would remain in the ecosystem under alternative B; and alternative C would have slightly greater beneficial impacts than alternative D, because the mountain goats would be removed more quickly under alternative C. Alternative C would contribute a substantial beneficial increment to the overall beneficial cumulative impacts on vegetation and special-status plant species.

Alternative D: Combination of Capture and Translocation and Lethal Removal (Preferred Alternative)

Impacts Associated with Staging Areas

Impacts on vegetation at staging areas would be the same as described for alternative B. Adverse impacts on vegetation at all staging would occur from site preparation, which could include the clearing of a limited number of small trees less than 20 inches in diameter at breast height and mowing and clearing of small shrubs to facilitate helicopter and mountain goat processing operations

Impacts Associated with Capture, Translocation, and Lethal Removal Activities in Mountain Goat Habitat

Impacts associated with management activities in mountain goat habitat under alternative D would be a combination of those described for alternatives B and C. Mountain goat management activities could result in adverse impacts from ground disturbance associated with the landing of helicopters, ground capture and translocation efforts, and carcass removal, all of which could disturb vegetation, including special-status plant species. During the first 2 years, the potential for temporary, adverse impacts on vegetation from helicopter landings would be similar to alternative B, because capture efforts would involve a similar number of landings in alpine or subalpine habitat. However, these impacts would not persist and the vegetation in these areas would quickly recover. The impacts from helicopter landings would also become substantially lower as the proportion of mountain goats taken by lethal removal relative to those taken by capture increases over the course of years 2 to 4. It is likely that in the final 2 years of initial management, the only potential for adverse impacts on vegetation would be related to ground crews conducting lethal removal activities and/or moving carcasses. Potential impacts on vegetation during the maintenance phase would be the same as those described for alternative C.

A reduction of at least 90% and the expected eventual elimination of the mountain goat population would result in long-term, beneficial impacts on vegetation through the prevention of additional future damage to sensitive alpine and subalpine plant communities from grazing, trampling, and wallowing. The elimination of the mountain goat population would result in long-term, beneficial impacts on vegetation.

Impacts on Special-Status Plant Species

If ground disturbance resulted in adverse impacts on vegetation due to landing of helicopters, ground capture and translocation efforts, or carcass removal, those actions would not be expected to have adverse impacts on special-status plants at the species level. Under alternative D, a reduction of at least 90% of mountain goats in Olympic National Park in alpine and subalpine communities through capture and translocation and lethal removal would result in the elimination or reduction of impacts from herbivory, trampling, or wallowing to state-listed plant species. The USDA Forest Service has determined that a reduction of mountain goats, resulting in decreased herbivory, trampling, and wallowing under alternative D, would also result in a reduction of impacts on individual Olympic National Forest Regional Forester sensitive plant species that would be beneficial over the long term (see appendix G).

Cumulative Impacts

Impacts on vegetation, including special-status plant species, of past, present, and reasonably foreseeable future actions under alternative D would be the same as those described for alternative A, and would contribute overall beneficial impacts. Alternative D would contribute direct, adverse impacts on vegetation during initial management activities resulting from damage to vegetation during helicopter landings and trampling of vegetation by management personnel entering alpine and subalpine areas on foot. However, lasting beneficial impacts on vegetation, including special-status plant species, would result from substantial reduction and elimination of the mountain goat population, which would eliminate additional future impacts on sensitive alpine and subalpine vegetation from mountain goat grazing, trampling, and wallowing. When the substantial beneficial contribution of alternative D is combined with other past, present, and reasonably foreseeable future impacts, the overall cumulative impacts on vegetation, including special-status plant species, under alternative D would be beneficial over the long term, primarily due to the impacts of alternative D.

Conclusion

Alternative D would result in short-term, adverse impacts during initial management activities that would be related to the potential for damage to sensitive vegetation through crushing by helicopter skids during helicopter landings and the trampling of vegetation during ground-based capture, handling, and lethal removal efforts. The removal of at least 90% of the mountain goat population and expected elimination of mountain goats over time would result in the elimination of adverse impacts from additional mountain goat grazing, trampling, and wallowing and associated disturbance to sensitive alpine and subalpine plant communities and special-status plant species. Alternative D would have slightly less beneficial impacts on vegetation than alternative C, because it would take longer to reduce the mountain goat population; and alternative D would have a greater beneficial impact than alternative B, because mountain goats would remain in the ecosystem under alternative B. Past, present, and reasonably foreseeable future actions would contribute overall beneficial cumulative impacts resulting from trail repair and maintenance, vital signs monitoring, and scientific research activities. The overall impacts of cumulative projects on vegetation and special-status plant species would be beneficial. Alternative D would contribute a substantial beneficial increment to overall beneficial cumulative impacts on vegetation, including special-status plant species.

THREATENED OR ENDANGERED SPECIES

The ESA, NPS *Management Policies 2006*, NEPA, and applicable regulations require the analysis of potential impacts on special-status species (federal or state endangered, threatened, candidate, or species of concern). Additionally, according to section 4.4.2.3 of NPS *Management Policies 2006*, NPS must "manage critical habitat […] to maintain and enhance their value for the recovery of threatened and endangered species" (NPS 2006). In compliance with the requirements of USDA Forest Service Manual (FSM) 2630.3., FSM 2670-2671, FSM 2672.4, FSM W.O. Amendments 2600-95-7, and the ESA of 1973, actions and programs authorized, funded, or carried out by the USDA Forest Service are required to assess a project's potential to affect federally listed species.

This analysis serves as both a NEPA assessment of impacts on federally listed species (federal endangered, threatened, or candidate) that could be impacted by mountain goat management actions and a biological assessment as required by section 7 of the ESA. As noted in chapter 1, the only federally listed species that were carried through for detailed analysis in this chapter are the northern spotted owl and the marbled murrelet. Other federally listed species that could occur in the project area but were not expected to be affected by the proposed actions are dismissed from detailed analysis in chapter 1.

The US Fish and Wildlife Service (USFWS) guidance for implementing section 7 consultation under the ESA (USFWS 2017) uses the following terminology to assess impacts on federally listed species:

> ***No Effect.*** This conclusion is reached if the proposed action and its interrelated and interdependent actions will not directly or indirectly affect listed species or destroy/adversely modify designated critical habitat. Formal section 7 consultation is not required when the *no effect* conclusion is reached.
>
> ***May Affect, but Not Likely to Adversely Affect.*** This conclusion is appropriate when effects to the species or critical habitat are expected to be beneficial, discountable, or insignificant. Beneficial effects are contemporaneous positive effects without any adverse effects to the species or habitat. Insignificant effects relate to the size of the impact (and should never reach the scale where take occurs), while discountable effects are those that are extremely unlikely to occur. Based on best judgment, a person would not: (1) be able to meaningfully measure, detect, or evaluate insignificant effects; or (2) expect discountable effects to occur. If the project scientist making the determination and the project manager agree that the project "*is not likely to adversely affect*" listed species or critical habitat, the intra-service section 7 consultation process is completed.
>
> ***May Affect, Likely to Adversely Affect.*** This conclusion is reached if any adverse effect to listed species or critical habitat may occur as a direct or indirect result of the proposed USFWS action or its interrelated or interdependent actions, and the effect is not discountable or insignificant. In the event the overall effect of the proposed action is beneficial to the listed species or critical habitat, but may also cause some adverse effect on individuals of the listed species or segments of the critical habitat, then the determination should be "*is likely to adversely affect*." Such a determination requires formal section 7 consultation.

A section 7 determination of effect summary is included at the end of the analysis for each alternative.

Methods and Assumptions

Potential impacts on northern spotted owl and marbled murrelet were evaluated based on resource expert knowledge and professional judgment, review of literature, anticipated locations for management

activities, and the resource-specific issues identified in chapter 1. General assumptions for impacts are described below. Each alternative provides additional assumptions as appropriate.

Analysis Period. For the analysis of impacts of the action alternatives to northern spotted owl and marbled murrelet, it is expected that the majority of impacts within staging areas would occur within the first 3 to 5 years of project implementation since most management activities would be expected to occur within this time frame. Impacts in alpine and subalpine areas where mountain goats would be captured or lethally removed would be observed both in the short term, during initial management activities, and in the long term, following completion of maintenance activities.

Action Area. To describe the effects to federally threatened or endangered species, the term "action area" is used as defined in 50 CFR 402.02. The action area is all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action. The action area is the project area including mountain goat habitat and staging areas within the park, in adjacent Olympic National Forest, and on areas immediately surrounding the project area.

Duration and Type of Impacts. The analysis of the duration and type of impacts on northern spotted owl and marbled murrelet under each alternative was based on the following issue statements:

- **Issue Statement.** Proposed activities associated with the management of mountain goats on the Olympic Peninsula, such as the use of aircraft or firearms, would have the potential to impact threatened or endangered species, or designated critical habitat, during management activities.

Analysis of Impacts on Threatened or Endangered Species in Olympic National Forest. The effect determination made by the USDA Forest Service for threatened or endangered species and designated critical habitat in Olympic National Forest is *no effect* and can be found in appendix G. Effects on federally threatened or endangered species and their habitat would be less in Olympic National Forest because the majority of the actions would occur in the park. These effects are discussed in detail in this section of chapter 4.

Alternative A: No Action

Impacts Associated with Management Activities in Mountain Goat Habitat

Limited management of mountain goats would take place under alternative A; however, over time, the mountain goat population is expected to continue to grow and expand geographically. An increased mountain goat population would have no effect on spotted owl or marbled murrelet because these bird species inhabit low-elevation, mature forests and mountain goats occupy higher, non-forested areas. Thus, there would be no direct or indirect impacts related to the remaining goat population.

Cumulative Impacts

Because there would be no impacts on northern spotted owl and marbled murrelet under alternative A, there would be no cumulative impacts in conjunction with past, present, and reasonably foreseeable future actions.

Conclusion

Management activities under alternative A would not result in any direct or indirect adverse impacts on northern spotted owl and marbled murrelet. Because there are no impacts under alternative A, there would be no cumulative impacts in conjunction with past, present, and reasonably foreseeable future actions.

Section 7 Determination Summary

Based on the analysis, the ESA effects determination under alternative A is *no effect* on marbled murrelet or northern spotted owl.

Alternative B: Capture and Translocation

Impacts Associated with Staging Areas

Staging areas would be located in previously disturbed areas; however, site preparation activities would involve site leveling and grading, which would result in minimal ground disturbance and removal of surface vegetation within the footprint of the staging area. These activities could potentially result in direct, adverse impacts on any northern spotted owls or marbled murrelets if they are present in these areas, due to temporary increases in noise and human presence. The Sweets staging area is less than one-half mile south of marbled murrelet critical habitat. However, the Sweets staging area has been used in the past as a helicopter base and a flight path has been agreed upon by NPS and USFWS that would allow helicopters to take off and land at the Sweets staging area with a "*no effect"* determination for the northern spotted owl or marbled murrelet (figure 12) (Johnson pers. comm. 2016a). The Hamma Hamma and Mt. Ellinor staging areas are within marbled murrelet designated critical habitat and northern spotted owl potential habitat. However, a field reconnaissance was conducted in November 2016, to assess the habitat immediately adjacent to and surrounding the staging area at Mt. Ellinor (figure 13) and Hamma Hamma (figure 14). Based on this reconnaissance, it was determined that these areas are not suitable for northern spotted owl or marbled murrelet habitat (Piper pers. comm. 2016b, 2016c); and therefore, there would be *no effect* on these species during preparation of the staging areas or during the use of the staging areas for management activities. Under alternative B, sound and vibration producing machinery used for site preparation activities would occur over a longer duration than other action alternatives since the management activities, including use of staging areas, would last for a longer duration. Because no northern spotted owls or marbled murrelets would likely inhabit the staging areas in their currently disturbed states, there would be *no effect* to these species from site preparation at any of the staging areas, and there would be *no effect* to these species from helicopter flights taking off and landing at the staging areas. If any individual northern spotted owl or marbled murrelet is observed during project operations, a wildlife biologist would be notified and measures to minimize or eliminate harassment would be applied.

Impacts Associated with Capture and Translocation Activities in Mountain Goat Habitat

Helicopters would fly over potential habitat of northern spotted owl and marbled murrelet during capture and translocation activities, but the capture and translocation areas are at higher alpine elevations that are not used as habitat by these species. Helicopter use during capture and translocation activities may cause individuals to temporarily disperse or flee, resulting in direct, adverse impacts on these federally listed species. Helicopter altitudes would be higher (at least 500 feet AGL, and likely higher over valleys), resulting in less intense vibrations and noise than those experienced during take-off and landing operations near staging areas.

FIGURE 12. SWEETS STAGING AREA

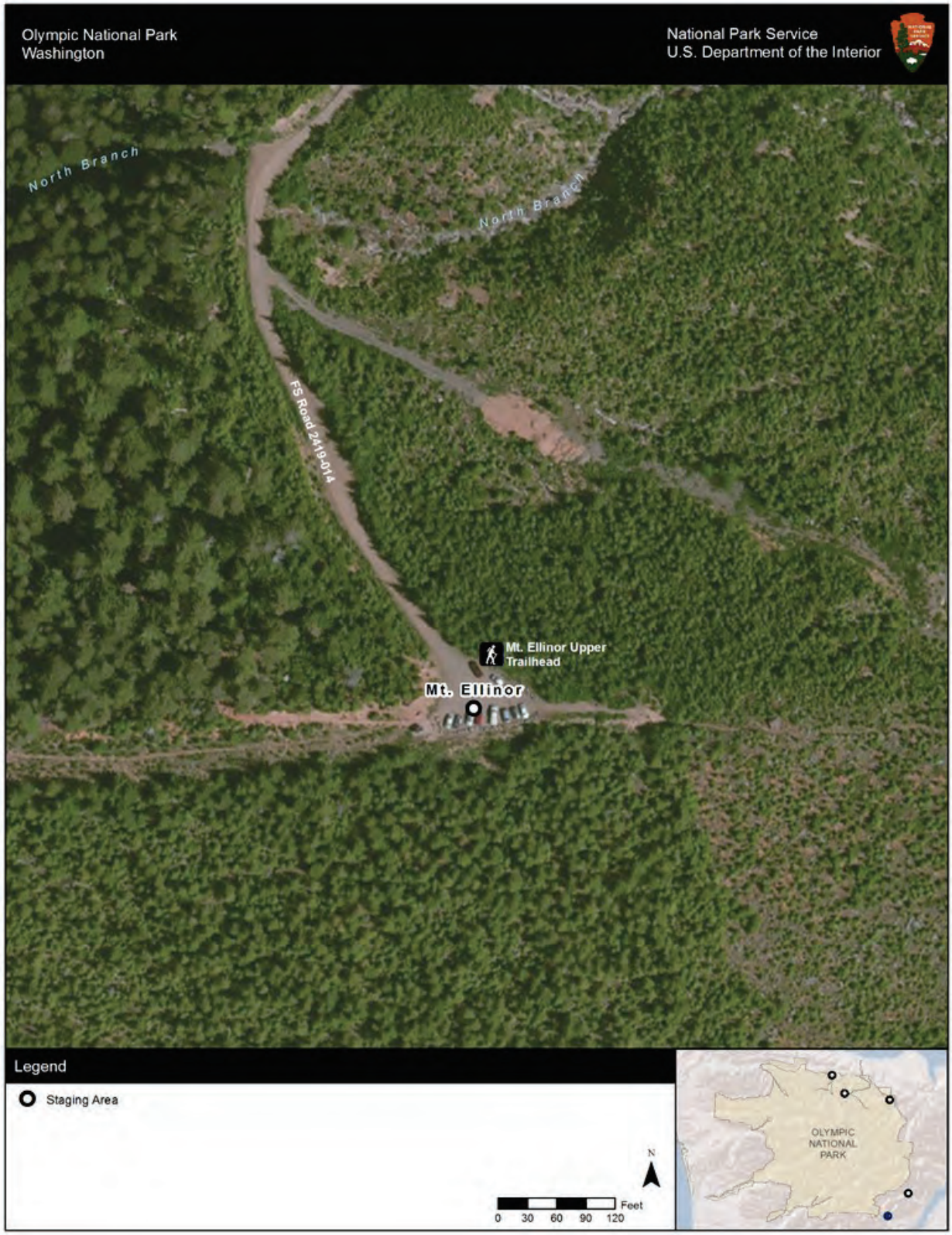


FIGURE 13. MT. ELLINOR STAGING AREA

FIGURE 14. HAMMA HAMMA STAGING AREA

During the marbled murrelet nesting season, helicopter operations more than 440 yards from known nests or from suitable nest trees in unsurveyed nesting habitat, would have *no effect* on this species. Helicopter operations 111 yards to 440 yards *may effect, but are not likely adversely affect* marbled murrelet due to noise (Miller pers. comm. 2016a). As noted in the "Acoustic Environment" section, it is expected that flyovers would be done at least 500 feet above the ground to minimize impacts on northern spotted owl and marbled murrelet. Also, helicopters would be moving through the area rapidly and at high elevations; as a result, the duration of noise exposure for federally listed species would likely not last more than a few minutes. Dispersed individuals would likely return to areas previously occupied once the aircraft has left the area. Management activities under alternative B would only be expected to occur during two separate 2-week management periods per year in mid- to late July and late August to mid-September, for 8 hours per day; therefore, adverse effects to northern spotted owl and marbled murrelet would be short-term in nature. Maintenance activities and future aerial surveys would involve flights over several days to weeks and would have similar types of disturbance impacts but over a much more limited period.

Reduced mountain goat populations as a result of the implementation of alternative B would have no indirect effects on northern spotted owl or marbled murrelet because mountain goats do not utilize the mature forest habitat required by these species. Furthermore, these birds inhabit the tree canopy, and are not ground nesting birds.

Cumulative Impacts

Under alternative B, past, present, and reasonably foreseeable future actions with the potential to have cumulative impacts on northern spotted owl and marbled murrelet, include ongoing operations and maintenance activities in both the park and national forest; vital signs monitoring, soil surveys, and other scientific research activities in the park; and hunting in the national forest. Other past, present, and reasonably foreseeable future actions occurring in the surrounding region that could impact these species in the project area include increasing occurrence of military, commercial, and private overflights, as well as fire management operations.

Trail maintenance activities within mature forest below 4,000 feet above sea level could temporarily adversely affect the northern spotted owl or marbled murrelet due to noise and human presence. Expansion or rerouting of trails could result in trampling and small scale habitat destruction during clearing, grading, and surfacing of trails causing impacts on federally listed species habitat.

All hunting, monitoring, and survey activities, including the scientific research activities, involving park staff and volunteers traveling off designated trails could result in localized, direct, adverse effects to the northern spotted owl or marbled murrelet. These species may flee as a result of noise or human presence. Because survey activities would be small in scale, intermittent, and short-term in duration, effects would be negligible.

Overflight activities related to military, commercial, and private aircraft would produce sound, which could cause northern spotted owl or marbled murrelet to flee their existing habitat for short periods of time if any flight paths are made at low altitude in proximity to low-elevation forested habitat. However, these types of flights would be infrequent and occur at elevations that are too high to affect northern spotted owl or marbled murrelet. Likewise, elk monitoring flights using helicopters and small aircraft would occur infrequently and, due to their focus on higher elevation, open habitat, would be unlikely impact these two threatened bird species. Fire management operations could also occur on rare occasions, during which aircraft and ground disturbances could impact these species when they occur within low-elevation, mature forested areas.

Overall, some short-term, adverse cumulative effects to northern spotted owl or marbled murrelet in mountain goat habitat would result from actions considered in the cumulative scenario. Park management activities would result in short-term, adverse impacts where activities may disturb these species. Alternative B could result in short-term, adverse effects to these species due to helicopter noise. When the small incremental contribution of alternative B is added to the other past, present, and reasonably foreseeable impacts, the overall cumulative impact on northern spotted owl and marbled murrelet would be adverse but short-term and of limited frequency and duration.

Conclusion

Alternative B would result in short-term, direct, adverse effects to northern spotted owl and marbled murrelet during initial stages of mountain goat management activities due to noise from helicopter flights over designated critical habitat and the presence of humans. Once established based on conditions, previously agreed upon travel corridors and flight altitudes for helicopters would be used during operations. If any individual northern spotted owl or marbled murrelet is observed during project operations, a wildlife biologist would be notified and measures to minimize or eliminate harassment would be applied. When combined with other past, present, and reasonably foreseeable actions, alternative B would contribute a small adverse increment to the overall adverse cumulative impact.

Section 7 Determination Summary

Based on the analysis, under alternative B, proposed staging area actions would have *no effect* on northern spotted owl or marbled murrelet; however, the ESA effects determination for capture and translocation activities is *may affect, but not likely adversely affect* northern spotted owl or marbled murrelet. There would be *no effect* to designated critical habitat.

Alternative C: Lethal Removal

Impacts Associated with Staging Areas

Under alternative C, effects to northern spotted owl and marbled murrelet from site preparation and management activities at staging areas would be the same as those described under alternative B. Because none of these species would likely inhabit the staging areas in their currently disturbed states, and based on the flight path proposed at the Sweets staging area, there would be *no effect* to these species from the preparation of the staging areas or the use of helicopters at the staging areas. Site preparation activities would be relatively small in scale and short-term in duration (requiring site preparation at the beginning of each management season for the duration of initial management activities). If any individual northern spotted owl or marbled murrelet is observed during project operations, a wildlife biologist would be notified and measures to minimize or eliminate harassment would be applied.

Impacts Associated with Lethal Removal Activities in Mountain Goat Habitat

Alternative C would substantially reduce or eliminate the mountain goat population on the Olympic Peninsula using helicopter- and ground-based lethal removal methods. Potential direct, adverse impacts on northern spotted owl and marbled murrelet would include noise disturbances from helicopters flying over potential habitat or firearms and the presence of humans during management activities if these take place in or near northern spotted owl or marbled murrelet habitat. These activities may temporarily disturb or displace northern spotted owl or marbled murrelet. There would be no indirect impacts on these species due to changes in mountain goat population because they inhabit the tree canopy, and are not ground nesting birds. Thus, the effects determination for proposed management actions under alternative C is *may affect, but not likely to adversely affect* northern spotted owl and marbled murrelet.

Cumulative Impacts

Impacts on northern spotted owl and marbled murrelet from past, present, and reasonably foreseeable future actions under alternative C, while mostly adverse, would be short-term and minimal. Under alternative C, there would be short-term, direct, adverse effects to northern spotted owl and marbled murrelet as a result of using aircraft and firearms. When the small incremental contribution of alternative C is added to the other past, present, and reasonably foreseeable impacts, the overall cumulative impact on northern spotted owl and marbled murrelet would be adverse but short-term and of limited frequency and duration.

Conclusion

Effects to northern spotted owl and marbled murrelet under alternative C would be similar to those described for alternative B. Short-term, adverse impacts may occur during initial stages of mountain goat management activities due to noise from helicopters and firearms, and the presence of humans. If any individual northern spotted owl or marbled murrelet is observed during project operations, a wildlife biologist would be notified and measures to minimize or eliminate harassment would be applied. Alternative C would contribute a small adverse increment to the overall adverse cumulative impact.

Section 7 Determination Summary

Based on the analysis, under alternative C, proposed staging area actions would have *no effect* on northern spotted owl or marbled murrelet; however, the ESA effects determination for lethal removal activities is *may affect, but not likely adversely affect* northern spotted owl or marbled murrelet. There would be *no effect* to designated critical habitat.

Alternative D: Combination of Capture and Translocation and Lethal Removal (Preferred Alternative)

Impacts Associated with Staging Areas

Under alternative D, effects to northern spotted owl and marbled murrelet from site preparation and management activities at staging areas would be the same as those described under alternative B. Because neither northern spotted owl nor marbled murrelet would likely inhabit the staging areas in their currently disturbed states, there would be *no effect* to these species from the preparation of the staging areas or the use of helicopters at the staging areas. Site preparation activities would be relatively small in scale and short-term in duration (requiring site preparation at the beginning of each management season for the duration of initial management activities). Also, if any individual northern spotted owl or marbled murrelet is observed during project operations, a wildlife biologist would be notified and measures to minimize or eliminate harassment would be applied.

Impacts Associated with Capture, Translocation, and Lethal Removal Activities in Mountain Goat Habitat

As with alternatives B and C, management activities utilizing helicopters in mountain goat habitat under alternative D would produce sound that could disturb northern spotted owl and marbled murrelet, resulting in direct, adverse impacts. As with alternative C, these impacts under alternative D would be limited to the two separate 2-week management periods annually during the initial management phase, but would occur across more years than alternatives B and C because capture, translocation, and lethal removal activities would require more years for initial management than exclusive capture and

translocation or exclusive lethal removal. Ground-based lethal removal methods would result in noise disturbances associated with firearm use and the presence of humans, which could temporarily disturb or displace northern spotted owl or marbled murrelet. The duration of management actions would vary, but direct impacts from helicopter and firearm use would likely be short-term in duration. Maintenance activities would cause effects similar to those described for initial management actions, but would be infrequent and of short duration (1 to 5 days) if needed. There would be no indirect impacts on these species due to changes in mountain goat population because they inhabit the tree canopy, and are not ground nesting birds. Thus, the effects determination for proposed management actions under alternative D is *may affect, but not likely to adversely affect* northern spotted owl and marbled murrelet.

Cumulative Impacts

Impacts on northern spotted owl and marbled murrelet from past, present, and reasonably foreseeable future actions under alternative D would be the same as those described for alternative B, and while mostly adverse, would be short-term and of minor significance. Under alternative D, there would be short-term, adverse effects to northern spotted owl and marbled murrelet resulting from the use of aircraft and firearms. When the small incremental contribution of alternative D is added to the other past, present, and reasonably foreseeable future impacts, the overall cumulative impact on northern spotted owl and marbled murrelet would be adverse but short-term and of limited frequency and duration.

Conclusion

Effects to northern spotted owl and marbled murrelet under alternative D would be similar to those described for alternatives B and C. Short-term, adverse effects may occur during initial stages of mountain goat management activities due to noise from helicopters and firearms, and the presence of humans. Once established based on conditions, previously agreed upon travel corridors and flight altitudes for helicopters would be used during operations. If any individual northern spotted owl or marbled murrelet is observed during project operations, a wildlife biologist would be notified and measures to minimize or eliminate harassment would be applied. Alternative D would contribute a small adverse increment to the overall adverse cumulative impact.

Section 7 Determination Summary

Based on the analysis, under alternative D, proposed staging area actions would have *no effect* on northern spotted owl or marbled murrelet; however, the ESA effects determination for capture, translocation, and lethal removal activities is *may affect, but not likely to adversely affect* northern spotted owl or marbled murrelet. There would be *no effect* to designated critical habitat.

ACOUSTIC ENVIRONMENT

Guiding Regulations and Policies

An intact natural soundscape enhances visitor experience and allows for natural functioning of wildlife communication. General management of the acoustic environment by NPS is detailed in NPS *Management Policies 2006* and Director's Order 47. These policies require NPS to protect and restore the natural conditions and soundscapes of parks including those that have been affected by unnatural and unacceptable noise. The Director's Order also directs park managers to measure acoustic conditions, differentiate existing or proposed human-made sounds that are consistent with park purposes, set acoustic goals based on the sounds deemed consistent with the park purpose, and determine which noise sources are impacting the parks (NPS 2000). Additionally, on lands administered by NPS, 36 CFR 2.12 prohibits

the operation of motorized vehicles that create noise in excess of 60 dBA at 50 feet from the source or noise which is unreasonable as determined by the nature, purpose, location, and time of occurrence of the noise as well as the park's purpose and the impact the noise has on park users.

The importance of the natural soundscape is also highlighted in the *Wilderness Act* of 1964 (16 USC 1131 et seq.), which states that one of the criteria defining wilderness is whether an area provides "outstanding opportunities for solitude or a primitive and unconfined type of recreation." Olympic National Park, 95% of which is designated as wilderness, is one of the best examples of a natural soundscape found anywhere in the national park system and includes natural sounds that are part of the biological or physical resources of the park (NPS 2008a). Visitors and wildlife can be affected by the presence of human-caused noise within this natural soundscape, and by the resulting inability to hear natural sounds that would have been audible in the absence of human-caused noise. Additional impacts of noise on various resources are discussed further in the "Wildlife and Wildlife Habitat, including Special-Status Species," "Visitor Use and Experience," and "Wilderness Character" sections in this chapter.

Methods and Assumptions

Potential impacts on the acoustic environment were analyzed using average existing ambient sound levels (the composite, all-inclusive sound associated with a given environment, including human-caused sounds) within the park as baseline metrics, along with thresholds developed through review of available literature for disturbance to humans and wildlife from human-caused noise. This information was then compared with the expected noise levels that would be generated by management activities, specifically the use of helicopters, vehicles, stationary equipment, and firearms. Impacts were evaluated based on the potential for management activities under any of the alternatives to create widespread, adverse noise impacts over sustained periods of time that substantially surpass ambient sound levels and thresholds for human and wildlife impacts.

The analysis of the duration and type of impacts on the acoustic environment is based on the following issue statement:

- **Issue Statement.** Potential activities associated with the management of mountain goats, specifically the use of aircraft and firearms, would result in noise that would be temporary and limited in duration but could in turn impact visitors, wildlife, and wilderness character within the park and adjacent national forest.

Noise Impact Criteria for Human Annoyance

The US Environmental Protection Agency recommends that in areas of outdoor activity where quiet is a basis of use, $L_{eq,}$ or the equivalent sound level determined by the logarithmic average of sound levels of a specific period; (e.g., a day, and a night; the duration of a backcountry visit, etc.) should not exceed the daytime natural ambient sound level. Sound levels above this level can result in human interference and annoyance (EPA 1974).

The relative loudness of sounds as perceived by the human ear is expressed in A-weighted decibels, abbreviated dBA (OSHA 2013). The following values illustrate some key sound level thresholds and the effects that they have on humans:

- 35 dBA – This value is designed to address health effects of sleep interruption; noises at this loudness can have effects on blood pressure while sleeping (Harabaldis et al. 2008).

- 45 dBA – This value represents the recommendation from the World Health Organization that noise levels inside bedrooms remain below 45 dBA (Berglund, Lindvall, and Schwela 1999).
- 52 dBA – This value is based on the US Environmental Protection Agency's level for speaking in a raised voice to an audience at 10 meters (EPA 1974). This represents the sound level at which an interpretive program would be affected.
- 60 dBA – This value is the sound level where normal communications at individuals standing 1 meter apart would be interrupted. This represents the sound level at which recreational visitors conversing would be affected, including hikers and kayakers (EPA 1974).

Noise Impact Criteria for Effects to Wildlife

The potential exists for human-caused sounds to adversely impact wildlife because many animals rely on auditory clues for predator avoidance, mate attraction, obtaining nesting territories, and finding prey (Dufour 1980). Wildlife reactions to human-caused sounds can range from mild reactions, such as an increase in heart rate, to more severe reactions, such as damaging effects on metabolism and hormone balance. Behavioral and physiological responses have the potential to cause injury, energy loss (from movement away from a noise source), decrease in food intake, habitat avoidance and abandonment, and reproductive losses (NPS 1994). Documented responses to a variety of anthropogenic noise sources have included shifts in physiology (e.g., impaired hearing, elevated stress hormone levels), alteration of key behaviors (e.g., foraging, vigilance, movement), and interference with ability to detect important natural sounds (Shannon et al. 2015). It is not possible to predict exactly how and at what levels human-caused sounds would impact animals because different species vary tremendously in their responses to noise (Dufour 1980). Delaney et al. (1999) found that the number of Mexican spotted owls flushing (e.g., fleeing their cover) in response to human-caused noise increased as the noise source became closer and noises became louder, and impacts were generally found to occur at levels above 45 dBA. Luz and Smith (1976) found that pronghorn antelope were not disturbed by helicopter flyovers at 60 dBA, but flyovers at 77 dBA produced strong fright reactions in which the antelope fled. A comprehensive review of scientific literature published from 1990 to 2013 on the effects of anthropogenic noise on wildlife found that overall, the range of noise levels documented to induce annoyance in humans and responses in terrestrial wildlife are similar, but that noise sources that are novel, unpredictable, or are acoustically similar to biologically relevant sounds would elicit wildlife responses similar to the responses associated with predation risk (startling or flight responses) (Shannon et al. 2015). Additionally, the authors found that these noises do not need to be experienced at a high intensity to elicit anti-predator behavior. Based on these findings, it is assumed that impacts on wildlife are likely to occur at levels equivalent to or lower than those considered to cause impacts on humans.

Impact Criteria for Reduction in Listening Area

An increase above the ambient sound level affects the ability of humans and animals to perceive other sounds within a certain distance. In general, the higher the ambient sound level, the shorter the distance from which other sounds (for example those of a songbird) can be heard. This concept is expressed in terms of listening area and alerting distance. In terms of impact metrics, a 3 dBA increase above the ambient sound level is an important indicator of potential impact because it results in a 50% reduction in listening area for humans and animals and a 30% reduction in alerting distance, as described below (NPS 2010a).

Reduction in listening area quantifies the degradation of hearing performance in humans and animals as a result of an increase in ambient noise level. Under ambient sound conditions, a sound is audible within a certain area around a visitor or animal. If there is an increase over the ambient sound level due to a noise event, the area in which the sound is audible decreases. Table 19 illustrates the relationship between

increases above the ambient sound level and listening area reduction at the frequencies where the increase occurs.

TABLE 19. REDUCTION IN LISTENING AREA AND ALERTING DISTANCE DUE TO INCREASES IN AMBIENT SOUND LEVELS

dBA Ambient Increase	3	6	10	20
Percent Reduction in Listening Area	50%	75%	90%	99%
Percent Reduction in Alerting Distance	30%	50%	70%	90%

L_{max} Analysis of General Noise Impacts of Management Actions

Rationale for the L_{max} Methodology

To provide a baseline for determining maximum possible noise effects and comparing the effects of the alternatives on the acoustic environment, this plan/EIS provides an analysis of the area of the park and national forest potentially affected by noise based on the L_{max} metric. The key advantage of the L_{max} analysis is that it allows for a comparative analysis of the maximum potential noise impacts in areas likely to be affected by mountain goat management operations compared to ambient sound levels, and does not require unavailable data on the specific staging area(s), flight paths, flight trajectories, and mountain goat management areas that would be in use at a specific given time during the multi-year duration of initial management activities. A disadvantage of the L_{max}-based analysis is that it accounts for the maximum impact of one noise source at one point (e.g., one helicopter at the moment that helicopter is passing). For example, the L_{max} metric would not account for the amount of time in between helicopter flights that remains unaffected by helicopter noise. This is important given that noise from helicopter flights associated with the action alternatives would affect the acoustic environment of the Olympic Mountains for a sustained period of up to 8 hours each operating day; however, that noise would be limited to this 8-hour period each day over a management time frame of 12 days, twice per year. Moreover, helicopter noise would not occur in most areas of the park and would often be transient in nature due to helicopters passing rather than remaining in an area for an extended length of time.

Potential Noise Impacts from Equipment Used in Goat Management Operations. In order to assess L_{max} sound levels, it is necessary to define the assumed noise characteristics of the equipment to be used. Potential helicopter noise impacts were computed based on an interactive map-based noise attenuation calculator created by NPS, which incorporates a variety of metrics including the type of noise source, distance AGL, distance from the receiver, height of the receiver, and temperature and humidity conditions. For purpose of this analysis, it is assumed that NPS would be using a Bell 206L model helicopter for all flight operations, which is a typical aircraft used for wildlife management. If two helicopters were used for aerial operations, they would not be flying in tandem so overall noise impacts would not necessarily be more intense. Also, with two helicopters in use, it is likely that the operations could be accomplished more quickly than using one helicopter, which would reduce the amount of overall flight hours needed.

Height AGL was assumed to be a minimum of 500 feet while in flight to and from staging areas, based upon general operational and safety protocol for helicopter flights in Olympic National Park. Helicopters would descend to heights of approximately 30 feet AGL and slow their speed over management areas while pursuing mountain goats for capture or lethal removal (Happe pers. comm. 2016). Meteorological inputs selected to represent approximate daytime conditions at Port Angeles in late summer were 65°F and 56% relative humidity (WRCC 2016). The height of the average receiver (i.e., human listener) was assumed to be 5.5 feet.

The noise attenuation calculator tool was used to determine the distance from the source at which helicopter noise would decrease to be equivalent to the existing average ambient sound level. Sound level assumptions used for the impact analysis were a uniform existing ambient sound level of 33.3 dBA, across all areas of Olympic National Park, based on an acoustic environment and soundscape resource summary for Olympic National Park (Wood 2015).

It is assumed that firearms used for lethal removal activities would likely consist of shotguns for helicopter-based operations and .30 caliber rifles for ground-based operations. It is further assumed that noise from firearms used in aerial operations would likely be drowned out by helicopter noise and therefore the impact on the acoustic environment would not substantially differ from that described for helicopter noise. Noise levels from ground-based lethal removal operations would have additional impacts on the acoustic environment, because noise from firearms can be as much as 160 dBA or more at the point where a weapon is discharged (CDC 2011).

Finally, it was assumed that in addition to noise from helicopters taking off and landing, the primary noise sources at staging areas would consist of support vehicles, including pickup trucks, fuel trucks, and refrigerated trucks. Depending on the particular needs of the staging operation, stationary equipment such as generators or compressors for refrigeration equipment may also be used. According to the Federal Highway Administration Construction Noise Handbook (FHWA 2016), measured L_{max} values for a pickup truck, flatbed truck, refrigeration unit, and generator, all fell within the range of 75–80 dBA at 50 feet.

Analysis of Potential Noise Impacts. Based on analysis conducted using the NPS noise attenuation calculator tool, the L_{max} sound level from a helicopter at a given point during flight to or from a staging area at 500 feet AGL would be approximately 75.9 dBA for a receiver directly beneath the flight path. Helicopter noise would affect the acoustic environment over distances of up to approximately 2.8 miles before sound levels attenuated to ambient levels. Taking into account a 2.8-mile radius, a helicopter at a given point on the flight path would impact ambient sound levels over an area of approximately 24.6 square miles, or 15,744 acres. Helicopter noise would likely not be audible to humans and wildlife at the full extent of this distance. However, helicopter noise would reach sound levels of 45 dBA at approximately 1.4 miles, at which point it would likely be noticeable to all visitors within that distance and wildlife reactions may begin to be observed. At approximately 0.3 mile, helicopter noise would exceed 60 dBA, which is the sound level where normal communications between individuals standing 3 feet apart would become difficult and wildlife reactions would be likely.

When helicopters are operating at a height of 30 feet AGL, the L_{max} sound level from a helicopter at a given point would be approximately 102 decibels for a receiver directly beneath the flight path. The noise from a helicopter operating at a given point over the management area would affect the acoustic environment over distances of up to approximately 2.6 miles before sound levels attenuated to average ambient levels. Taking into account a 2.6-mile radius, a helicopter at a given point on the flight path could impact ambient sound levels over an area of approximately 21.2 square miles, or 13,568 acres. Helicopter noise would reach sound levels of 45 dBA at approximately 1.2 miles. Helicopter noise would reach 60 dBA at approximately 0.3 mile.

It would be possible for firearm noise from a single shot to affect acoustic resources at distances up to several miles before sound levels would reach average ambient conditions. Based on a sound attenuation rate for a stationary source of 6 dBA per doubling of distance (FHWA 2011), and assuming a sound level of 160 dBA at the point where the weapon is discharged, a gunshot could be audible to humans and wildlife up to a mile or more away. It must be noted that because of the instantaneous nature of a gunshot, variables such as topography, ground cover, atmospheric pressure, and many other factors make the attenuation distance for a gunshot difficult to predict.

Based on the same sound attenuation rate for a stationary source used above, and assuming maximum sound levels of 80 dBA at 50 feet, noise from vehicles and equipment operating at staging areas could affect acoustic resources at distances of up to approximately two miles before sound levels would reach average ambient conditions. Noise from vehicles and equipment would reach sound levels of 35 dBA at approximately 1.7 miles and 45 dBA at approximately 1 mile. Noise from staging areas would reach 60 dBA at approximately 0.3 mile.

The analysis presents the predicted maximum distance at which the ambient sound condition would be affected, and the maximum distances at which noise would be audible to humans and wildlife at levels approaching key sound level thresholds discussed in the sections "Noise Impact Criteria for Human Annoyance" and "Noise Impact Criteria for Effects to Wildlife." The attenuation of noise from helicopters, firearms, and vehicles and equipment at staging areas would be affected by topography, vegetation, atmospheric pressure, and in the case of helicopters, speed of travel. In addition, the duration and fixedness of noise-creating activities and therefore the amount of time visitors or wildlife would experience noise impacts, would vary by noise source. Helicopter flights would generate sustained noise over a period of up to 8 hours per day over a maximum duration of 12 days, twice per year; however, the perceived noise levels would fluctuate for humans or wildlife at a given point on the landscape because helicopters would be moving through the area quickly. Vehicles and equipment at staging areas could generate noise over the full duration of daylight hours during each 2-week management period and this noise would be perceived by visitors and wildlife at relatively predictable levels at a given distance; however, noise levels would vary over the course of a day depending on whether vehicles and equipment are running. Firearm noise, while potentially audible over long distances, would be instantaneous. Finally, the specific location of a noise source on the landscape during a given management period cannot be predicted under any of the alternatives. General helicopter flight paths would be determined by the locations of mountain goat management activities, which would be selected a year prior to management activities based on the location and distribution of mountain goats on the landscape. Specific helicopter flight paths under any of the alternatives would generally take the most efficient path between staging areas and management areas, but would ultimately be subject to pilots' judgment based on factors such as wind and weather. Specific staging areas to be used during a given management period would be selected based on the locations of mountain goat management activities during that management period. As a result, the analysis of the alternatives presents a generalized illustration of the differences among the alternatives with respect to the types of impacts on acoustic resources that may occur under each. The impacts of noise on wilderness, wildlife, and visitor use are discussed further under the analysis of the impacts of the alternatives on each of those resources.

Alternative A: No Action

Impacts

Under alternative A, no management efforts would be undertaken to remove mountain goats from the Olympic Mountains. As a result, the use of helicopters, firearms, vehicles, and equipment that would be necessary for mountain goat removal would not take place. Existing mountain goat management actions would occasionally involve the lethal removal of nuisance mountain goats by management personnel. Lethal removal of goats using firearms would generate adverse impacts on acoustic resources because of the noise that gunshots would create. Impacts on the acoustic environment from lethal removal would be almost instantaneous and would happen very infrequently and only when conditioned mountain goats act aggressively or attack humans. Hazing activities, such as shooting mountain goats with paintball guns, nonlethal shotgun rounds, or shouting and throwing rocks, would likewise generate infrequent, intermittent noise that would adversely impact acoustic resources; these noise disturbances would not be expected to carry over long distances. Some occasional helicopter use would also take place in association with lethal removal operations in accordance with the 2011 *Mountain Goat Action Plan* (appendix A),

which would result in occasional helicopter noise impacts similar to those described previously. Overall, mountain goat management activities under alternative A would not be expected to elevate sound levels above average ambient sound levels in the Olympic Mountains very frequently or over long durations of time; however, because of the continued presence of mountain goats, these impacts would occur over an indefinite period. Furthermore, it would remain necessary to conduct periodic helicopter surveys to monitor mountain goat population abundance, which are currently performed every 5 years and includes approximately 30 hours of flight time distributed over 6 to 7 days in July or August. The impacts on the acoustic environment from these surveys would be the same as they are under current mountain goat management. Minimal adverse impacts would occur because the noise produced by ongoing mountain goat management activities, while generally infrequent and short-term in duration, would occur on a limited basis over an indefinite time due to the continued abundance of mountain goats.

Cumulative Impacts

Past, present, and reasonably foreseeable future actions with the potential to impact the acoustic environment in the park include Roosevelt elk monitoring flights and other flights that may be associated with vital signs monitoring, ongoing operations and maintenance (e.g., radio repeater maintenance and search and rescue operations). Ongoing actions with the potential to impact the acoustic environment outside of the park on adjoining NFS lands include hunting of any game species. Other actions in the surrounding Olympic Peninsula that currently impact or could impact the acoustic environment include military, commercial, private, and fire suppression overflights.

Elk monitoring would involve 2 to 3 days of helicopter flights, with one flight in the morning and one in the evening, every year or every other year. Radio repeater maintenance would consist of approximately one to three helicopter flights each year to support radio repeater maintenance. Search and rescue operations are unpredictable, and would involve intermittent helicopter flights as needed to conduct search and rescue efforts. All of these activities would have adverse impacts on acoustic resources similar to those described for helicopter operations. The number of flights per year for all of these activities in aggregate would be limited, most would be short-term in duration, and during the majority of the year these impacts would not occur. Military, commercial, and private overflights would adversely affect the acoustic environment in the project area at different sound levels and different degrees of frequency. Commercial and military overflights would occur causing intermittent adverse impacts on the acoustic environment. Military overflights would have a greater effect on ambient sound levels as some aircraft produce audible levels of 45 dBA for up to 10 miles at an altitude of 30,000 feet. The effects from military overflights would occur most often in the northern portion of the project area, while the effects from commercial overflights would be experienced throughout the project area.

Hunting in Olympic National Forest would generate minimal adverse impacts on acoustic resources related to the use of firearms, and these would be similar to the impacts from firearm use. Impacts from hunting mountain goats would occur intermittently, and only during two 10-day periods in September and October, over which span of time the harvest of only six goats would be permitted. Firearms hunting for other species would also occur in the forest from August 1 through April 30 depending on the species being pursued, and would cause intermittent adverse impacts on the acoustic environment in the Forest when hunting occurs during management activities.

Overall, past, present, and reasonably foreseeable actions would result in adverse impacts on acoustic resources. Alternative A would add minimal short-term, adverse effects because the noise from helicopter flights, firearm usage, and hazing activities under this alternative would elevate sound levels above average ambient sound levels and disturb humans and wildlife. These adverse impacts would affect areas less than a mile to several miles from the noise source but would generally not occur for long durations; however, the continued presence of mountain goats could result in impacts occurring over an indefinite

period in the future. The contribution to cumulative impacts of alternative A from ongoing mountain goat management activities would be adverse, intermittent, and last for an indefinite period. When the incremental impacts of alternative A are added to the impacts of other past, present, and reasonably foreseeable future actions, the overall cumulative impacts on the acoustic environment would be adverse. The effects of alternative A would add a minimal adverse increment to the overall cumulative impacts because the noise produced by ongoing mountain goat management activities, while generally infrequent and short-term in duration, would occur over an indefinite time due to the continued abundance of mountain goats.

Conclusion

Under alternative A, occasional lethal removal activities would involve the intermittent use of firearms and the occasional use of helicopters that would be disruptive to the acoustic environment for brief periods of time but over an indefinite time span. Hazing activities such as shooting mountain goats with paintball guns, yelling, and rock throwing would also generate localized noise that would be briefly disruptive to the acoustic environment and would be much lower in volume than firearm or helicopter noise. Past, present, and reasonably foreseeable future actions such helicopter, commercial, and military flights and firearm usage would contribute adverse cumulative impacts. Overall cumulative impacts on the acoustic environment under alternative A would be adverse. The effects of alternative A would add a minimal adverse increment to the overall cumulative impacts because the noise produced by ongoing mountain goat management activities, while generally infrequent and short-term in duration, would occur on a limited basis over an indefinite time due to the continued abundance of mountain goats.

Alternative B: Capture and Translocation

Impacts

Under alternative B, capture and translocation efforts would result in adverse impacts on the acoustic environment from the use of vehicles, helicopters, and human activity associated with staging areas and mountain goat capture activity as described under the “Analysis of Potential Noise Impacts” section. These impacts would take place during daylight hours for the full duration of each 2-week management period, twice per year. Noise from staging areas would likely elevate sound levels to 45 dBA, a level at which noise would be audible to all visitors and wildlife reactions may begin to be observed, at a distance of up to 1 mile from the staging area. When helicopters are landing or taking off from staging areas, sound levels and attenuation distances would temporarily elevate to levels similar to those described for a helicopter operating at 30 feet AGL. These adverse impacts on the acoustic environment, which would be variable but could be sustained over a large portion of the day, would be concentrated at two staging areas during a given management period – one in the northern portion of Olympic National Park, and one on national forest land toward the southeastern edge of the Olympic Mountains. Due to the logistics of capture and translocation, the expected overall duration of staging area impacts would be greatest during the two separate 2-week management periods per year (mid- to late July and late August to mid-September) during the first 2 to 3 years, but could occur up to 5 years. It is likely that the staging areas to be used, and therefore the location of the adverse impacts on the acoustic environment, could change as necessary during each management period.

Capture operations in backcountry areas undertaken by helicopter would also result in adverse impacts on the acoustic environment as described previously. These impacts would occur over a maximum of 8 hours per day, for a maximum period of 12 days during each of the two 2-week management periods per year. Adverse impacts on acoustic resources would be more heavily concentrated in areas where mountain goat capture is taking place. This is because helicopters would be flying at approximately 30 feet AGL while moving slowly over a geographically limited area where the capture is occurring, subjecting these capture

areas to sustained periods of high sound levels of 100 dBA or more. Helicopters flying to and from staging areas would be flying at higher elevations, at least 500 feet AGL and sometimes up to 1,000 to 5,000 feet AGL, especially over valleys and at higher speeds, and while noise levels immediately beneath flight paths would exceed levels that would be expected to impair human communication and elicit flight responses from wildlife, these noise levels would not be sustained at any given point for a long period.

Figure 15 shows hypothetical representative helicopter flight paths from the Hurricane staging area to an area of high mountain goat density on the north flank of Mt. Olympus, and from the Hamma Hamma staging area to an area of high mountain goat density near Crystal Peak and Chimney Peak. The flight paths shown represent the shortest straight-line distances that helicopters could fly in optimal weather conditions between these staging areas and areas where capture operations could potentially take place. The staging areas shown are intended to provide a representative scenario under a hypothetical management period where two staging areas would be used simultaneously, one in the north and one in the south. Shown for each flight path are polygons representing the distances from the flight path over which the noise from one helicopter overflight would attenuate to 45 dBA, which is the level where noise would be audible to all visitors and wildlife reactions may begin to be observed (1.2 miles), and approximately 33 dBA, which is the average ambient noise level in the park (3.1 miles). Variants to each of these flight paths, as well as potential flights to other nearby areas of mountain goat habitat that can easily be accessed from the two staging areas, would be expected over the course of time during which the staging area is open because mountain goats would move and could be caught anywhere they are highly concentrated. Actual flight paths would vary and be determined by weather, mountain goat distribution, and the ability to catch mountain goats. As figure 15 suggests, the adverse impacts on acoustic resources from helicopter flights would extend over a limited geographical area relative to the overall extent of the park and national forest, and large portions of the park and national forest would remain unaffected over the course of a 2-week management period. Impacts would nonetheless extend over thousands of acres at a given time, impacting wildlife habitat and human use areas within that range. As noted in the "Analysis of Potential Noise Impacts" section, the attenuation of noise from helicopters, firearms, and vehicles and equipment at staging areas would be affected by topography, vegetation, atmospheric pressure, and in the case of helicopters, speed of travel. Figure 15 indicates that these impacts could have the potential to occur anywhere within roughly the eastern two-thirds of the Olympic Mountains, for an anticipated maximum period of 8 hours per day over two separate 2-week management periods annually, for 4 years.

Following the completion of mountain goat capture operations during initial management under alternative B, helicopter flights would be necessary on an intermittent basis, as mountain goats would remain on the landscape and periodic capture operations would be required to manage nuisance mountain goats who may be encroaching on visitor use areas. As additional capture operations become necessary during the maintenance phase, the adverse impacts on the acoustic environment from the use of staging areas and helicopter flights would be similar to those described previously and illustrated in figure 15. Maintenance activities would be necessary over an indefinite time frame in order to maintain the mountain goat population at the lowest possible level and mitigate conflicts with visitors, but would be expected to take place far less frequently, every 5 to 10 years and lasting about 2 weeks per year. Therefore, over time, the overall impacts on the acoustic environment would be diminished compared to the initial management phase.

Furthermore, it would remain necessary to conduct periodic helicopter surveys for mountain goats approximately every 5 years in order to monitor population abundance, which usually includes approximately 30 hours of flight time distributed over 6 to 7 days in July or August. Aerial surveys would also be required to monitor goat presence. These surveys would occur every 4 to 6 years for 6 days, and 4 to 5 hours per day by the NPS, with additional surveys by the WDFW. These would result in adverse impacts on the acoustic environment similar to those described for initial management.

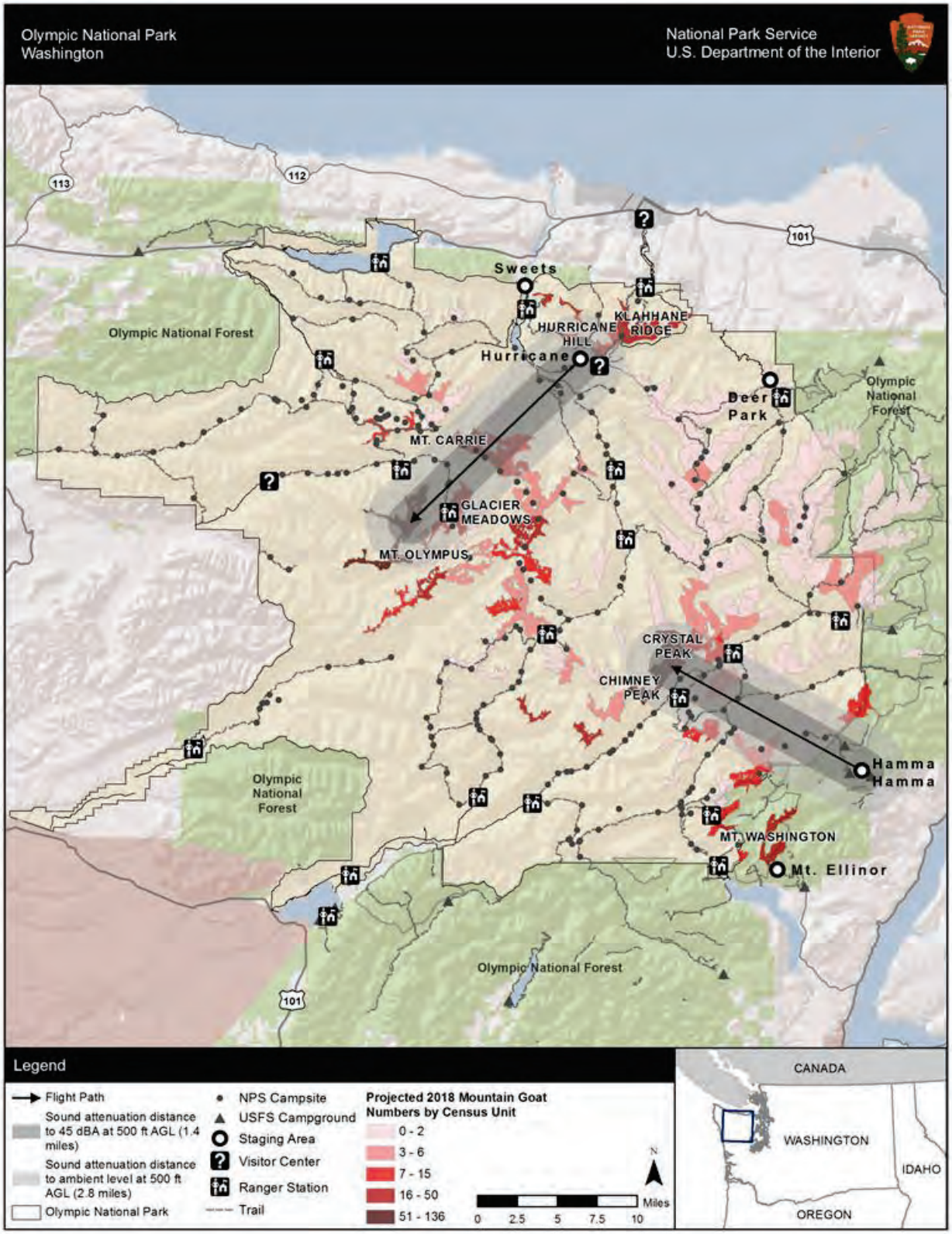


FIGURE 15. REPRESENTATIVE HELICOPTER FLIGHT PATHS AND POTENTIAL IMPACTS ON THE ACOUSTIC ENVIRONMENT OF THE OLYMPIC PENINSULA

Cumulative Impacts

Impacts on the acoustic environment from past, present, and reasonably foreseeable future actions under alternative B would be the same as those described for alternative A, and would be adverse. Under alternative B, management activities would contribute infrequent to sustained adverse impacts on the acoustic environment from the use of vehicles, stationary equipment, and helicopters at staging areas and from helicopter flights involved in capture operations in the backcountry, but only for certain periods each year. After 5 years, these short-term, adverse impacts would be expected to become more intermittent and less intense as the mountain goat population decreases but would continue indefinitely in the future as maintenance activities occur assuming that the population persists and rebounds. When the impacts of alternative B are added to the impacts of present and reasonably foreseeable actions, an overall adverse cumulative impact on the acoustic environment would result. Alternative B would contribute an adverse increment that is infrequent but sometimes intense in certain locations to the overall adverse cumulative impacts.

Conclusion

Under alternative B, the acoustic environment in Olympic National Park and Olympic National Forest would be adversely affected by noise from helicopters, vehicles, and equipment operating at the staging areas, along with helicopter noise from mountain goat capture operations in the backcountry. These intensive, short-term impacts would be most frequent during the 3- to 5-year initial management phase. Following initial management, the reduced mountain goat population would necessitate far less frequent capture and translocation operations, and therefore the adverse impacts on the acoustic environment would become less pronounced, but still present on an infrequent basis. Ongoing past, present, and reasonably foreseeable future actions would contribute primarily adverse cumulative impacts. Alternative B would contribute infrequent and sometimes locally intense adverse impacts related to the use of vehicles and helicopters for capture operations during the two 2-week management periods per year of initial management, and overall cumulative impacts would be adverse.

Alternative C: Lethal Removal

Impacts

Under alternative C, adverse impacts on the acoustic environment would result from staging area activities and helicopter flights. Similar to alternative B, these adverse impacts would result from elevated sound levels at staging areas from the use of vehicles, helicopters, and human activity as well as impacts from sound attenuation. Unlike alternative B, the duration of these impacts could be shorter and less frequent and less intense because there would likely be fewer visits to the staging areas, especially with an initial reduction using only ground-based lethal removal efforts in year 1, possibly reducing the helicopter hours needed in years 2 and 3. Overall, these impacts would occur over a relatively shorter time frame because lethal removal would be expected to be more efficient at reducing the mountain goat population and thus would be anticipated to last 3 years.

Helicopter operations in backcountry areas under alternative C would have adverse impacts on the acoustic environment that would be similar to those described for alternative B; however, additional adverse impacts would result from the use of firearms and helicopters to lethally remove mountain goats. During helicopter-based lethal removal, in optimal atmospheric conditions and unobstructed by vegetation or topography, it could be possible for firearm use to impact the acoustic environment over greater distances than helicopter noise. However, given the intensity and sustained nature of helicopter noise, the actual existing conditions on the landscape, and the fact that firearm noise would be instantaneous, it is not anticipated that firearm use would have a substantial additive effect to the overall

adverse impacts on acoustic resources when occurring simultaneously with helicopter noise. During times of the season when helicopter use is not taking place, lethal removal would continue under alternative C in the form of ground-based lethal removal. This would result in intermittent adverse impacts on the acoustic environment from firearm use over the course of the summer and fall for at least 3 years. As a result, the overall adverse impacts on acoustic resources during initial management under alternative C would be similar to the impacts of alternative B, but the overall duration of these impacts would be shorter.

Initial management actions under alternative C are expected to reduce the mountain goat population by at least 90%, and as a result, the maintenance phase would involve intermittent helicopter- and ground-based lethal removal that is short in duration. Although it is not possible to predict specific areas where mountain goats would persist after initial maintenance, all staging areas would not be used during maintenance activities and are expected to be limited to the Sweets staging area (see figure 3 in chapter 2 and figure 12 in this chapter). Also, the remaining mountain goats would probably seek steep rocky terrain where helicopter-based operations must be used, because access from the ground may not be possible. Therefore, adverse impacts on the acoustic environment from staging area activities would continue through management activities. Lethal removal of mountain goats for maintenance activities would likely be fewer in number each season and shorter in duration (1 to 5 days) than under initial management; this would result in a fewer number of gunshots per operation and decreased adverse impacts. Management activities would cease after the extremely small number of mountain goats remaining on the landscape and their sparse distribution in remote areas would make further maintenance activities impractical, either due to high costs or risks to those engaged in the removal activities. Although the desired population goal following initial management and maintenance activities is zero mountain goats, it may not be possible to lethally remove more than at least 90% of the population. The mountain goat population remaining following these actions would not represent a sustainable population and the number would likely eventually dwindle to zero. Maintenance activities would most likely occur 5 to 15 years after initial action and last for 1 to 5 days. There would be no need for aerial surveys to monitor mountain goat abundance on the Olympic Peninsula, but some reconnaissance flights would occur prior to maintenance operations. Therefore, there would be short-term, adverse impacts on acoustic resources during initial management and maintenance activities because of staging area noise, helicopters, and firearm use. These impacts would be less frequent, less intense, and occur over a relatively short time frame because lethal removal would remove goats quicker than the alternatives using capture operations. Adverse impacts on acoustic resources from any type of mountain goat management activities would permanently cease following the end of maintenance activities, resulting in long-term, beneficial impacts on acoustic resources.

Cumulative Impacts

Impacts on the acoustic environment of the Olympic Peninsula from past, present, and reasonably foreseeable future actions under alternative C would be the same as those described under alternative A, and are mostly adverse. Under alternative C, adverse impacts on the acoustic environment would occur that are similar to those for alternative B due to direct, adverse impacts from helicopter flights and firearm use during lethal removal operations, including future maintenance operations. Once mountain goats are greatly reduced or eliminated, any type of mountain goat management activities would permanently cease, resulting in a long-term, beneficial impact on acoustic resources. When the impacts of alternative C are added to the impacts of past, present, and reasonably foreseeable future actions, the overall cumulative impacts on the acoustic environment would be adverse, despite alternative C contributing a minimal, long-term, beneficial increment.

Conclusion

Under alternative C, the acoustic environment in Olympic National Park and Olympic National Forest would be adversely affected for 1 to 3 years during the initial management period, and limited to the two 2-week management periods per year in years 2 and 3. Impacts would involve infrequent to sustained noise from helicopters, vehicles, and equipment operating at staging areas, along with intermittent helicopter and instantaneous firearm noise in the backcountry. Following initial management, maintenance activities would consist of ground- and helicopter-based lethal removal resulting in similar adverse impacts. At this point, the adverse impacts on the acoustic environment would become much more intermittent and less pronounced. Alternative C would result in a substantial reduction or elimination of mountain goats in the Olympic Mountains and thus adverse impacts on the acoustic environment from any type of mountain goat management action would be reduced or cease. The impacts of this alternative are expected to be less than alternative B because lethal removal activities would require less use of staging areas and allow for shorter duration initial management and maintenance activities. Additionally, the impacts on the acoustic environment from periodic helicopter surveys to monitor mountain goat abundance would be eliminated on the Olympic Peninsula under alternative C. Past, present, and reasonably foreseeable future actions would contribute overall adverse cumulative impacts. Alternative C would contribute a minimal, long-term benefit by reducing the need for future flights associated mountain goat management, but overall cumulative impacts would be adverse because of the short-term, adverse impacts associated initial management and management activities throughout the project area.

Alternative D: Combination of Capture and Translocation and Lethal Removal (Preferred Alternative)

Impacts

Alternative D would result in adverse impacts on acoustic resources from staging area activities and helicopter flights that would be similar to those described for alternative B. In addition, alternative D would result in impacts from firearm use that would be similar to those for alternative C. The duration of the overall impacts under alternative D could be the longest among the alternatives with initial management activities lasting 3 to 5 years, and with most of the activity occurring in years 1 to 4, due to the use of the combined management approaches as well as the goal of translocating as many mountain goats as possible prior to a transition to lethal removal; this duration could be one year longer than the minimum duration of the initial management activities under either alternatives B or C. Alternative D would prioritize the helicopter- or ground-based capture and translocation of mountain goats during the first 2 to 3 full years of initial management resulting in intermittent, short-term, adverse impacts from vehicle and equipment use, human activities, and helicopter take offs and landings at staging areas as well as adverse impacts from helicopter flights during transit and capture activities. Initial management would likely consist primarily of lethal removal during the final 2 years, although it is possible that lethal removal of mountain goats could begin as early as the first year. Firearm noise, which would be audible over a wider area but would be instantaneous in duration and intermittent in frequency, would have adverse impacts on the acoustic environment. Lethal removal activities would also have short-term, intermittent adverse impacts because of helicopter flights in the backcountry. The overall duration of adverse impacts would likely be 5 years, with the impacts from helicopter- and ground-based capture and lethal removal lasting a maximum of 8 hours per day over two separate 2-week management periods each year in mid- to late July and in late August to mid-September. Associated staging area impacts could take place anytime during daylight hours and would last for a slightly longer period of each day over the same duration that helicopter operations would be ongoing. Adverse impacts on acoustic resources from firearm noise associated with lethal removal would take place intermittently throughout the summer and

fall. These impacts would begin as soon as it is determined that mountain goats had become too difficult to capture, which is expected to occur in year 3 but could possibly occur as soon as year 1.

Maintenance activities under alternative D would be the same as those described for alternative C. Similar to alternative C, alternative D would be expected to remove at least 90% of the mountain goat population during initial management, such that maintenance activities would consist of intermittent ground- and helicopter-based lethal removal to target the remaining 10% of the population. Maintenance activities would likely take place on a less frequent basis than ground-based lethal removal during initial management. As with alternative C, all staging areas would not likely be necessary during maintenance activities and therefore adverse impacts on the acoustic environment would be limited to intermittent, infrequent helicopter flights and firearm use. Maintenance activities would likely continue 5 to 15 years following the conclusion of initial management until costs or risks to those engaged in the removal activities are determined to be too high. Any mountain goats remaining on the landscape would be too few for the population to rebound, and therefore adverse impacts from any type of mountain goat management would end. Therefore, alternative D would have intermittent adverse impacts on the acoustic environment during the initial management and maintenance phases that are short in duration. There would be no long-term impacts on the acoustic environment following the conclusion of mountain goat management actions.

Cumulative Impacts

Impacts on the acoustic environment of the Olympic Peninsula from past, present, and reasonably foreseeable future actions under alternative D would be the same as those described for alternative A, and would be adverse. Alternative D would result in direct, adverse impacts on the acoustic environment from vehicle use, human activity, and helicopter transit and take offs and landings during capture and translocation and lethal removal activities. Firearm use during lethal removal would result in intermittent, short-term, adverse impacts that would occur over a wide area. When the impacts of alternative D are added to the impacts of past, present, and reasonably foreseeable future actions, the overall cumulative impacts on the acoustic environment would be adverse, despite alternative D contributing a minimal, long-term, beneficial increment.

Conclusion

Under alternative D, the acoustic environment in Olympic National Park and Olympic National Forest would be adversely affected during the first 3 to 5 years of initial management by infrequent to sustained noise from helicopters, vehicles, and equipment operating at staging areas, along with intermittent helicopter noise in the backcountry. During approximately the final 2 years of initial management, firearm use would result in adverse impacts on the acoustic environment that would be audible over wider distances but would be instantaneous in duration. Following 5 years of initial management, helicopter and firearm use would continue as needed on an irregular basis for the life of this plan/EIS, with staging area use limited to the Sweets staging area. At this point, the adverse impacts on the acoustic environment would become much more intermittent and less pronounced. Alternative D would result in a reduction of at least 90% or extirpation of mountain goats in the Olympic Mountains and thus adverse impacts on the acoustic environment from any type of mountain goat management action would cease. Alternative D would contribute adverse impacts during the initial management and maintenance phases, but is expected to be less than alternative B because the ultimate removal of the mountain goats under this alternative would eliminate the need for future helicopter surveys approximately every 5 years to monitor mountain goat abundance on the Olympic Peninsula. Alternative D would contribute a minimal long-term benefit by reducing flights associated with mountain goat management, but overall cumulative impacts would be adverse because of the adverse impacts associated with initial management and management activities throughout the project area.

SOILS

According to NPS *Management Policies 2006*, the NPS will preserve and protect geologic resources and features from adverse effects of human activity, while allowing natural processes to continue (NPS 2006). These policies also state that the NPS will strive to understand and preserve the soil resources of park units and to prevent, to the extent possible, the unnatural erosion, physical removal, or contamination of the soil, or its contamination of other resources.

Methods and Assumptions

Potential impacts on soils were evaluated based on resource expert knowledge and professional judgment, anticipated locations for management activities, and the resource-specific issues identified in chapter 1. Impacts related to staging areas and management actions were dismissed in chapter 1 because these areas were sited in locations where soils have already been disturbed and where minimal grading would be necessary, or no impacts would occur from other management actions. General assumptions for impacts on soils are described below. Each alternative provides additional assumptions as appropriate.

Analysis Period. The presence of mountain goats causes impacts on soils in alpine and subalpine areas. Therefore, the analysis period for soils is the life of the plan.

Analysis Area. The area of analysis for impacts of the alternatives on soils includes areas of Olympic National Park and Olympic National Forest currently or potentially utilized as habitat by mountain goats. Additionally, the area of analysis for the action alternatives includes capture and staging areas used to conduct mountain goat management activities.

Duration and Type of Impacts. The analysis of the duration and type of impacts on soils is based on the following issue statement:

- **Issue Statement.** Mountain goats cause soil disturbance and erosion, which can impact soil integrity as well as the associated vegetative communities. Any management of mountain goats that would reduce or eliminate them from areas with sensitive soils would result in beneficial impacts on soils in the Olympic Mountains.

Analysis of Impacts on Soils in Olympic National Forest. Because Olympic National Park contains approximately 90% of the mountain goat habitat in the project area, fewer management activities would take place in the national forest than in the park. Therefore, the impacts on soils would be similar to those in the park, but there would be substantially fewer impacts on soils on the forest from management activities. For the analysis of impacts on soils, it is assumed that impacts on soils would be the same for management activities occurring on both NPS and adjacent NFS lands within the project area.

Alternative A: No Action

Impacts

Implementation of alternative A would result in similar impacts on soils as impacts currently occurring within the project area. Mountain goats would continue to disturb sensitive alpine and subalpine soils by wallowing, trailing, and trampling, as shown in the photo in the “Soils” section in chapter 3. These behaviors would continue to dislodge and remove surface rocks and vegetation, exposing the sensitive mineral soils beneath. Over time, these impacts would expand geographically and would increase in intensity as the mountain goat population continues to grow and disperse. Considering the slow

development of these sensitive soils, it is likely that they would be unable to recover in the near future. While limited management of mountain goats would occur under alternative A, these actions are not expected to prevent the increase in the mountain goat population and would therefore not prevent increasingly adverse impacts on soils.

Cumulative Impacts

Trail maintenance activities in alpine and subalpine areas could adversely affect sensitive soils. The expansion or rerouting of trails would result in adverse impacts on soils because the clearing, grading, and surfacing of trails would disturb and compact previously undisturbed soils, remove vegetation in the trail footprint, and expose soils to wind and water erosion. However, some trail maintenance activities would result in beneficial impacts because they decrease erosion, discourage visitors from traveling off designated trails, and protect sensitive soils.

Short-term disturbances to soils including sensitive soils in alpine and subalpine areas are anticipated due to present and reasonably foreseeable future soil survey activities in the park because these activities would involve small-scale removal and replacement of soil samples until approximately 2019. Survey activities would be small in scale, intermittent, and short-term in duration, therefore adverse impacts on sensitive alpine soils would be very limited and affect small areas.

Overall, both adverse and beneficial cumulative impacts on soils in mountain goat habitat would result from present and reasonably foreseeable future actions. Park management activities that disturb the ground would result in localized short-term, adverse impacts; however, some of these activities, such as trail maintenance, would contribute to soil stabilization in off-trail areas, which would be particularly beneficial to sensitive alpine and subalpine soils. Alternative A would add a disproportionate adverse effect because the wallowing, trailing, and trampling behaviors of the increasing number of mountain goats anticipated under this alternative would disturb and expose soils. When the incremental impacts of alternative A are added to the impacts of past, present, and reasonably foreseeable future actions, the overall cumulative impacts on soils would be adverse. The effects of alternative A would add a substantial adverse increment to the overall cumulative impacts because of the effect the increasing mountain goat population would have on soils.

Conclusion

Because the increasing mountain goat population would continue to disturb sensitive alpine and subalpine soils, impacts on soils under alternative A would be adverse, would continue indefinitely into the future, and soils would be unlikely to recover in the reasonably foreseeable future. Long-term, adverse impacts on soils under alternative A would be greater than impacts associated with any of the action alternatives because exotic mountain goats would remain at current or increasingly high levels on the peninsula. Cumulative impacts would be adverse and long-term in nature, and alternative A would contribute a substantial adverse increment to this due to the continued presence of hundreds of exotic mountain goats.

Alternative B: Capture and Translocation

Impacts

Under alternative B, the mountain goat population would be reduced by about 50%, and maintenance activities would be needed to keep the population at low levels. With a reduced mountain goat population, sensitive alpine and subalpine soils would be subject to less disturbance and degradation from wallowing, trampling, and trailing and could have an opportunity to recover over time, providing a long-term, beneficial impact. However, there would be some continued adverse impacts on sensitive alpine and

subalpine soils due to wallowing, trailing, and trampling associated with the mountain goats that are not captured and remain on the landscape.

Cumulative Impacts

The impacts of past, present, and reasonably foreseeable actions to soils on the Olympic Peninsula are the same as those described for alternative A, and would be both adverse and beneficial. Assuming that maintenance continues and substantially reduces the mountain goat population, alternative B would have long-term, beneficial impacts on soils, although there would be some continued adverse effects from mountain goats that remain on the land. When the impacts of alternative B are added to the impacts of past, present, and reasonably foreseeable future actions, overall cumulative impacts on soils would be beneficial. Alternative B would contribute a noticeable beneficial increment to cumulative impacts from the reduction in the number of mountain goats.

Conclusion

While adverse impacts on soils may exist due to continued wallowing, trailing, and trampling behaviors of the remaining mountain goat population, there would be substantial, long-term, beneficial impacts on soils compared to current conditions, assuming the mountain goat population reduction of 50% is maintained. These beneficial impacts would not be as pronounced as they would under alternatives C and D, because some mountain goats would still remain on the landscape, and the results would be dependent on continued maintenance of the reduced mountain goat population.

As described in the cumulative impacts analysis, if maintenance continues and the mountain goat population is kept low, alternative B would contribute impacts that would be primarily beneficial. When the impacts of alternative B are added to the impacts of past, present, and reasonably foreseeable future actions, the overall cumulative impacts on soils would be beneficial. Alternative B would contribute a noticeable beneficial increment to cumulative impacts from the reduction in the number of mountain goats.

Alternative C: Lethal Removal

Impacts

Alternative C would reduce the mountain goat population on the Olympic Peninsula by at least 90%, and would likely lead to the elimination of mountain goats on the peninsula. While the existing mountain goat population would continue to impact sensitive alpine and subalpine soils, as described for alternative B, during the management activities, those impacts would diminish quickly under alternative C because lethal removal activities would be more effective at removing mountain goats, compared to capture and translocation. Impacts would progressively decrease until initial management activities are complete and any remaining mountain goats would not have measurable impacts on soils, resulting in long-term, beneficial impacts on soils.

Cumulative Impacts

The adverse and beneficial impacts from the past, present, and reasonably foreseeable future actions under alternative C would be the same as described under alternative A. Alternative C would add long-term, beneficial impacts because the mountain goat population would be substantially diminished or eliminated over time, which would prevent soil degradation. When the incremental impacts of alternative C are added to the impacts of past, present, and reasonably foreseeable future actions, the overall cumulative impacts on soils would be beneficial. The effects of alternative C would contribute a

substantial beneficial increment to the overall cumulative impacts because of the elimination of the mountain goat population.

Conclusion

Under alternative C, short-term, adverse impacts on soils may exist during initial stages of mountain goat management activities due to continued wallowing, trailing, and trampling behaviors of the remaining mountain goat population; there would be substantial, long-term, beneficial impacts on soils from the substantial reduction or elimination of the population. Adverse impacts on soils from mountain goats under alternative C would be substantially less than impacts associated with alternative A, and slightly less than impacts associated with alternatives B and D, which would likely reduce the mountain goat population less quickly during initial stages of management. Overall cumulative impacts would be beneficial, and alternative C would contribute a substantial, long-term, beneficial increment to overall cumulative impacts.

Alternative D: Combination of Capture and Translocation and Lethal Removal (Preferred Alternative)

Impacts

Because alternative D would involve both capture and translocation and lethal removal activities, it is likely that the mountain goat population would diminish relatively quickly under alternative D. Short-term, adverse impacts on soils may exist during initial stages of mountain goat management activities due to continued wallowing, trailing, and trampling behaviors of the remaining mountain goat population; but there would be substantial, long-term, beneficial impacts on soils and disturbance to sensitive soils after reduction is completed. At most, 10% of the mountain goat population would remain after initial management actions, and this population would not be sustainable. Therefore, there would be a long-term benefit from the removal of mountain goats and their associated impacts on soils.

Cumulative Impacts

The adverse and beneficial impacts from the past, present, and reasonably foreseeable future actions under alternative D would be the same as described under alternative A. Alternative D would add long-term, beneficial impacts because the mountain goat population would be substantially diminished or eliminated over time, which would prevent soil degradation from goat wallowing, trailing, and trampling. When the incremental impacts of alternative D are added to the impacts of past, present, and reasonably foreseeable future actions, the overall cumulative impacts on soils would be beneficial. Alternative D would contribute a substantial beneficial increment to the overall cumulative impacts because of the elimination of the mountain goat population.

Conclusion

Impacts on soils under alternative D would be similar to those described for alternatives B and C, with long-term benefits based on eliminating the mountain goat population and its associated adverse effects. Short-term, adverse impacts on soils would continue to occur during the initial management phase, due to continued wallowing, trailing, and trampling behaviors of the remaining mountain goat population; but there would be substantial, long-term, beneficial impacts on soils after the mountain goat population has been reduced. Adverse impacts on soils from mountain goats under alternative D would be substantially less than impacts associated with alternative A, slightly less than impacts associated with alternative B, which would likely reduce the mountain goat population less quickly during the initial management stage

and could leave a sizeable number of mountain goats on the land, and slightly more than alternative C, which would likely reduce the mountain goat population more quickly during initial stage of management. Overall cumulative impacts would be beneficial and alternative D would contribute a substantial beneficial increment to the overall cumulative impacts.

ARCHEOLOGICAL RESOURCES

The *National Historic Preservation Act* and NEPA require that agencies consider the effects of any federal undertaking or action on cultural resources, including archeological resources. Also, NPS *Management Policies 2006* and Director's Order 28: *Cultural Resource Management Guidelines* (NPS 1998) call for the consideration of cultural resources in planning proposals, and taking into account the concerns of traditionally associated peoples and stakeholders when making decisions about cultural resources.

Methods and Assumptions

National Environmental Policy Act Methodology and Assumptions

The data for this analysis comes from databases of archeological sites maintained by park and USDA Forest Service archeologists. Only known archeological sites within the project area (lands above 4,900 feet above mean sea level and staging areas) are included in the analysis. The location of these sites in relationship to mountain goat activities was used to determine the potential impacts on archeological resources. However, there have been limited archeological surveys within the park and therefore, these sites represent only a subset of those present. There is the potential for additional and currently unknown resources to be present within the area of analysis. Therefore, the presence of archeological sites in relationship to areas of mountain goat activity is an indirect measure for impacts on this resource.

Impacts on archeological resources can be direct or indirect as well as beneficial or adverse. Direct impacts are those that physically alter the resource as a result of the implementation of an activity, while indirect impacts are those that may occur inadvertently during or after an activity. For example, construction may have direct impacts on an archeological site by disturbing in-situ deposits and indirect impacts by changing runoff patterns and causing future erosion within a site. Direct and indirect impacts can be either adverse or beneficial. Adverse impacts are those that alter the integrity of archeological resources in a way that could change the eligibility for the National Register of Historic Places. Beneficial impacts are those that promote the retention of important characteristics of an archeological site.

For the purposes of this analysis, direct effects are considered to be those that would result from the implementation of the proposed management activities for each action alternative. These activities include capture, lethal removal, baiting, helicopter use, and the use of staging areas. Except for baiting and staging areas, the location of management activities is somewhat unpredictable as it depends on the location of the mountain goats and where they go during management actions. Therefore, it is not possible to identify archeological resources in advance for all potential management activity locations. However, capture, lethal removal, and helicopter use involve minor or no ground disturbance (e.g., they would be conducted from the air, on foot, etc.) and therefore they are not anticipated to impact archeological sites.

There is the potential for direct effects on archeological resources from baiting and actions conducted at proposed staging areas. Baiting has the potential to impact archeological sites if salt blocks are placed on or near archeological sites and mountain goats are attracted to the area and proceed to wallow or trample within the site. The use of staging areas could impact sites if ground disturbance is needed to prepare or use the area. However, mitigation measures have been established to ensure that there are no adverse impacts on archeological resources from these activities. Staging areas are located in areas that have

already been disturbed (e.g., roads, parking areas, etc.). Therefore, it is assumed that these would have no adverse impacts on archeological resources as long as no additional ground disturbance is required. Per a letter to the State Historic Preservation Office (SHPO) from the NPS dated September 6, 2016, if additional ground disturbance is necessary, the areas would be inventoried for archeological resources prior to their use. All salt block locations in either the park or national forest would be reviewed by cultural resource professionals prior to their use in order to ensure that archeological sites are not impacted.

Indirect impacts on archeological resources would come from the continued presence of mountain goats within the park and their potential to damage archeological sites through trampling, wallowing and trailing.

National Historic Preservation Act Section 106 Methodology and Assumptions

This impact analysis is intended to comply not only with the requirements of NEPA but also with section 106 of the *National Historic Preservation Act* of 1966, as amended. In accordance with the Advisory Council on Historic Preservation regulations implementing section 106 (36 CFR 800, "Protection of Historic Properties"), impacts on historic properties are identified and evaluated by (1) determining the area of potential effects; (2) identifying historic properties present in the area of potential effect that are listed in or eligible for listing in the National Register of Historic Places; (3) applying the criteria of adverse effect to these historic properties; and (4) identifying methods to avoid, minimize, or mitigate any adverse effects, if they exist.

Under the Advisory Council on Historic Preservation regulations, a determination of either *adverse effect* or *no adverse effect* must be made for affected historic properties eligible for or listed in the National Register of Historic Places. An *adverse effect* occurs whenever an undertaking alters, either directly or indirectly, any characteristic of a historic property that qualifies it for inclusion in the National Register of Historic Places (e.g., diminishes the integrity of the property's location, design, setting, materials, workmanship, feeling, or association). Adverse effects also include reasonably foreseeable effects that could occur later in time, be farther removed in distance, or be cumulative (36 CFR 800.5, "Assessment of Adverse Effects"). A determination of *no adverse effect* means the undertaking would not diminish the historic property's integrity in a manner that alters any characteristics of the property that qualify it for the National Register of Historic Places.

CEQ regulations and Director's Order 12 also call for a discussion of the appropriateness of mitigation, as well as an analysis of how effective the mitigation would be in reducing the intensity of a potential impact. However, any resultant reduction in intensity of impact resulting from mitigation is an estimate of the effectiveness of mitigation only under NEPA. It does not suggest that the level of effect as defined by section 106 is similarly reduced—although an *adverse effect* under section 106 may be mitigated, the effect remains adverse.

The NPS is the lead agency for compliance with section 106 of the *National Historic Preservation Act*. As such, they have initiated consultation with the Washington State SHPO on the area of potential effect and potential effects. In a letter to the Washington State SHPO dated September 6, 2016, the NPS recommended that the area of potential effect for section 106 purposes includes all the lands within Olympic National Park, excluding the coastal strip, as well as all lands within the Hood Canal Ranger District of the Olympic National Forest. The area of potential effect is larger than the proposed project area because it encompasses all the staging areas however; no management activities are anticipated to occur outside of the areas discussed in this plan/EIS.

As noted in the section above regarding the NEPA analysis, only two activities associated with management actions have the potential to impact archeological resources – baiting and staging areas. Per the letter to the Washington SHPO, the park would survey staging areas or other selected areas if any new ground disturbing activities are required. These would go through Washington State SHPO review prior to implementation and use. This has been incorporated as a mitigation measure into the plan/EIS. It is assumed that any new archeological sites identified during these reviews would be avoided and therefore, there would be no adverse effect to archeological resources as a result of management activities.

Analysis Period. For the analysis of impacts of the action alternatives to archeological resources, it is expected that the majority of impacts would occur within the first 5 years of project implementation since most management activities would be expected to occur within this time frame. Impacts in alpine and subalpine areas of the project area would be observed primarily in the long term.

Analysis Area. The area of analysis for impacts of alternatives on archeological sites is the project area including mountain goat habitat, primarily lands above 4,900 feet above sea level, within the park and in adjacent Olympic National Forest, as well as all of the staging areas. Although the area of potential effect for the *National Historic Preservation Act*, section 106 is larger than the project area, no activities are anticipated to occur outside of the project area and therefore it is the focus of the discussion below.

Duration and Type of Impacts. The analysis of the duration and type of impacts on archeological sites under each alternative was based on the following issue statement:

- **Issue Statement.** Mountain goat wallowing behavior has the potential to degrade or destroy archeological resources on the Olympic Peninsula.

Analysis of Impacts on Archeological Resources in Olympic National Forest. For the analysis of impacts on archeological resources it is assumed that the type of impacts would be the same for management activities occurring within both the park and in adjacent Olympic National Forest, but that most impacts would occur in the park, where about 90% of the mountain goat habitat is found.

Alternative A: No Action

Impacts Associated with Management Activities in Mountain Goat Habitat

Under alternative A, the park would continue nuisance control activities such as lethal removal and hazing of mountain goats exhibiting unacceptable behavior but these management activities are not anticipated to slow the projected growth of the mountain goat population or decrease its numbers. Instead, the population is expected to increase under alternative A. Mountain goats would continue to adversely impact archeological sites by trampling or wallowing, which disturbs intact archeological deposits and reduces the integrity of the resource, potentially leading to impacts on National Register of Historic Places eligibility. Additionally, the population increase over time would result in a higher likelihood of impacts on archeological resources from wallowing, trailing, and trampling behaviors. These impacts would expand geographically and in intensity as the population grows and disperses. Impacts on archeological sites in the project area would therefore be adverse and permanent in nature.

Cumulative Impacts

While there is the potential for adverse impacts on archeological resources under alternative A, because of the continued presence of mountain goats, there are no impacts anticipated as a result of other past, present or reasonably foreseeable actions. Therefore, the implementation of this alternative would result in no cumulative impacts.

Conclusion

Because the mountain goat population would continue to grow, there would be an increased potential to adversely and permanently impact archeological resources from mountain goat wallowing, trailing, and trampling behaviors. There would be no cumulative impacts from the implementation of alternative A.

Assessment of Effect for Section 106

Alternative A would constitute an undertaking under section 106 of the National Historic Preservation Act because the mountain goats would remain and the mountain goat population in the park would increase over time. This would be expected to result in a continued and increased adverse effect on archeological sites, which would be a change in (worsening of) existing conditions. If this alternative is selected and implemented, the NPS would conduct robust consultation and coordination with the SHPO and affiliated tribes to develop and implement a strategy combining archeological inventory, assessment, and mitigation sufficient to document and protect significant archeological resources to the best extent possible.

Alternative B: Capture and Translocation

Impacts Associated with Capture and Translocation Activities in Mountain Goat Habitat

There are no direct effects associated with alternative B as the management activities proposed under this alternative would not impact archeological sites. There is the potential for indirect, adverse impacts from the continued presence of mountain goats within the project area.

The mountain goat population would decrease by approximately 50% under this alternative, therefore reducing the potential for adverse impacts on archeological resources within the project area from mountain goat trailing, trampling, and wallowing would be a long-term benefit. However, there is the potential that with 50% of the mountain goats remaining on the landscape, population numbers could rebound if management actions are not continued. Therefore, adverse impacts would continue to occur because of the presence of mountain goats and could increase over time if the population rebounds and maintenance is not completed to keep the population low. Similar to alternative A, these adverse impacts would expand geographically and in intensity as the population grows and disperses and would be permanent in nature.

Cumulative Impacts

Similar to alternative A, there are no impacts anticipated as a result of other past, present or reasonably foreseeable projects. Therefore, the implementation of this alternative would result in no cumulative impacts.

Conclusion

Alternative B would reduce the mountain goat population by 50%, providing some beneficial impacts on archeological resources because there would be fewer mountain goats on the landscape that could wallow or trample archeological sites. However, the mountain goat population that remains would continue to have adverse effects and the population could rebound, resulting in similar adverse effects to those described in the no-action alternative. Mountain goats would continue to impact sites until management activities succeeded in reducing herd numbers; this would take longer under alternative B than under the

other action alternatives. There are no cumulative impacts anticipated from the implementation of this alternative in conjunction with other activities.

Assessment of Effect for Section 106

Per the mitigations in this plan/EIS, site specific archeological surveys and additional section 106 review would be conducted for any new ground disturbing activities associated with this alternative, including placing salt blocks and creating staging areas. It is anticipated that any archeological resources identified during these surveys would be avoided. Therefore, there would be *no adverse effect* to archeological resources.

Alternative C: Lethal Removal

Impacts Associated with Lethal Removal Activities in Mountain Goat Habitat

There are no direct effects associated with alternative C as the management activities proposed under this alternative would not impact archeological sites. There is the potential for indirect impacts from the removal of mountain goats from the project area.

Under this alternative, the mountain goat population would be reduced by at least 90% and is expected that over time they may be eliminated from the project area entirely. The reduction in the mountain goat population would be beneficial to archeological resources, as it would almost entirely eliminate the potential for these animals to adversely impact archeological sites through wallowing, trailing, or trampling.

Cumulative Impacts

Similar to alternative A, there are no impacts anticipated as a result of other past, present or reasonably foreseeable projects. Therefore, the implementation of this alternative would result in no cumulative impacts.

Conclusion

This alternative would be beneficial to archeological resources because it would result in a greater decline in mountain goat numbers, therefore reducing future impacts on sites through trampling, wallowing, and trailing. The benefits of alternative C to archeological resources would be realized more quickly than the other action alternatives that would take longer to reduce mountain goat populations. There are no cumulative impacts anticipated from the implementation of this alternative when combined with other past, present or reasonably foreseeable projects.

Assessment of Effect for Section 106

Given the mitigation requiring additional archeological survey and section 106 review for any new ground disturbing activities, such as staging area preparation and salt block placement, there would be *no adverse effect* to archeological resources under this alternative.

Alternative D: Combination of Capture and Translocation and Lethal Removal (Preferred Alternative)

Impacts Associated with Capture, Translocation, and Lethal Removal Activities in Mountain Goat Habitat

There are no direct effects associated with alternative D as the management activities proposed under this alternative would not impact archeological sites. There is the potential for indirect impacts from the removal of mountain goats from the project area.

Under alternative D, at least 90% of the mountain goat population would be eliminated from the park through capture and translocation and lethal removal. The impacts of this alternative are anticipated to be the same as alternative C; the reduction in the mountain goat population would result in long-term, beneficial impacts on archeological resources because the number of mountain goats would be reduced to where there was little chance for archeological sites to be impacted.

Cumulative Impacts

Similar to alternative A, there are no impacts anticipated as a result of other past, present or reasonably foreseeable projects. Therefore, the implementation of this alternative would result in no cumulative impacts.

Conclusion

Under alternative D, there would be a substantial decline in mountain goats or an eventual elimination of the population, similar to alternative C. This would result in long-term, beneficial impacts on archeological resources. There are no cumulative impacts anticipated from the implementation of these activities in conjunction with other activities.

Assessment of Effect for Section 106

There would be no adverse effect to archeological resources under this alternative. The majority of ground-based management activities would occur within small areas and cause little to no ground disturbance. There is little likelihood of these activities impacting known or unknown archeological resources. Additional survey and section 106 review would be required prior to any new ground disturbing activities. Given that new archeological sites would likely be avoided, these activities are anticipated to have *no adverse effect*.

VISITOR USE AND EXPERIENCE

The NPS *Management Policies 2006* states that "[t]he fundamental purpose of all parks also includes providing for enjoyment of park resources and values by the people of the United States" (NPS 2006). Part of visitor use and experience is visitor access to enjoying park resources and values. NPS *Management Policies 2006* states that "all reasonable efforts will be undertaken to make NPS facilities, programs, and services accessible to and usable by all people…" (NPS 2006).

Many of the areas that mountain goats inhabit are also popular destinations for park visitors, both in the frontcountry (e.g., Hurricane Ridge) and backcountry (e.g., Royal Basin). Therefore, there is a high potential for mountain goat-human interactions in the park (appendix A). Responses to the possibility of seeing mountain goats vary. Some visitors, interested in viewing all wildlife, welcome the opportunity to

see the mountain goats, while others exhibit fear of an encounter, and ask park personnel how to avoid them (Burger pers. comm. 2015).

Depending on the type and location of use and visitors' attitudes and preferences, the alternatives would have varying effects on visitor use and experience related to area closures during ongoing mountain goat management activities, noise, and the visible presence of helicopters and aircraft as well as the reduced potential for mountain goat-human encounters as initial population reduction activities give way to longer-term maintenance activities.

All management actions, including management of visitor use and recreation, at Olympic National Forest are guided and directed by the 1990 *Land and Resource Management Plan* (FS 1990) as amended by the 1994 *Northwest Forest Plan* (USDA/DOI 1994) and the *Pacific Northwest Region Invasive Plant Program Final EIS* and Record of Decision (ROD) (FS 2005).

Methods and Assumptions

To assess impacts on visitor use and experience in Olympic National Park and Olympic National Forest, the analysis of alternatives considered current types of visitor uses occurring in areas where mountain goats may be encountered. Based on this information, the potential effects of the implementation of the alternatives on visitor use and experience were analyzed. Additionally, the potential for impacts on visitor use and experience that would be attributable to the effects of the alternatives on the soundscape was analyzed.

Analysis Period. For the analysis of impacts on visitor use and experience, it is expected that the majority of adverse impacts related to the action alternatives would occur within the first 5 or fewer years of project implementation since most management activities would be expected to occur within this time frame. However, the overall visitor experience would change when goat habitat, or previously-used goat habitat, is visited over the life of this plan.

Analysis Area. The area of analysis for impacts of the alternatives on visitor use and experience includes the portions of Olympic National Park and Olympic National Forest where mountain goat populations and mountain goat management activities overlap with visitor use.

Duration and Type of Impacts. The analysis of the duration and type of impacts on visitor use and experience under each alternative was based on the following issue statements:

- **Issue Statement.** Visitors have indicated that the presence of habituated mountain goats deters them from hiking on trails within the park and adjacent national forest. Other visitors have indicated that the presence of mountain goats enhances the visitor experience. In addition, proposed mountain goat management activities could result in the temporary closure of areas or the use of helicopters that could disrupt visitor activities.
- **Issue Statement.** Management actions proposed to reduce or eliminate mountain goats on the Olympic Peninsula could result in a reduced or eliminated mountain goat population within Olympic National Forest, substantially reducing the potential for hunting and thereby impacting recreational hunting opportunities.
- **Issue Statement.** Management activities associated with the management of mountain goats, specifically the use of aircraft and firearms, would generate intermittent loud noises that could disrupt visitor enjoyment of natural soundscapes within the Olympic Mountains.

Analysis of Impacts on Visitor Use and Experience in Olympic National Forest. Visitor use within mountain goat habitat in park and Olympic National Forest is largely similar, and may be connected through recreational use of roads and trails, or cross-country travels, that cross jurisdictions. Hunting is the sole visitor use occurring on national forest land that is prohibited on national park land and may have the potential to be substantially affected by mountain goat management activities. It is thus assumed for this analysis that impacts on visitor use and experience would be similar for management activities occurring on NPS and adjacent NFS lands within the project area; however, it must be noted that nearly 90% of the mountain goat habitat occurs in the park and therefore impacts in the national forest would be less pronounced. Hunting was addressed where applicable.

Alternative A: No Action

Impacts Associated with Management Activities in Mountain Goat Habitat

Under alternative A, options for the management of mountain goats would be limited to management actions currently taking place in Olympic National Park and Olympic National Forest, as described in chapter 2. Mountain goats would continue to be present in alpine and subalpine areas of the park and adjacent national forest where they are currently found, and will likely both increase in number and expand their habitat use to additional areas. The likelihood that visitors could encounter mountain goats would persist, and could potentially increase, as would the potential for visitors to encounter dust bowl type conditions where goats have disturbed soils through wallowing. Aversive conditioning and hazing activities, as well as the rare lethal removal of mountain goats involved in conflicts with humans, could on rare occasion create disruptive noise and may require some temporary, localized area closures, which would result in adverse impacts on visitor use and experience and would continue over the long term. In addition, temporary access restrictions and trail closures due to reports of negative mountain goat-human interactions would likely continue and could become more frequent or widespread, resulting in adverse impacts on visitor use and experience. Lastly, visitors to the Olympic Peninsula may experience brief adverse impacts from periodic flights of helicopters used to survey for mountain goats, approximately every 5 years for approximately 30 hours of flight time distributed over 6 to 7 days in July or August. Under alternative A, these adverse impacts would continue for an indefinite period, because mountain goats would remain on the landscape for the foreseeable future. For visitors whose experience is enhanced by the ability to view mountain goats, beneficial impacts would result and would continue over an indefinite period. Hunters selected to hunt in Olympic National Forest would experience beneficial impacts, since mountain goats would continue to be available for hunting in the national forest. It must be noted that few mountain goats are currently taken through hunting on the Olympic Peninsula and that the current structure of the Olympic Peninsula mountain goat hunt is not intended to produce a sustainable hunt, but rather to reduce conflict by removing mountain goats. The likelihood of harvesting a mountain goat may nonetheless increase with an increase in population as a result of continued implementation of overall current management.

Cumulative Impacts

Past, present, and reasonably foreseeable future actions with the potential to have adverse impacts on visitor use and experience include trail maintenance and repair, military, commercial, private, and fire suppression overflights, Roosevelt elk and mountain goat monitoring flights and other flights associated with vital signs monitoring, and flights associated with radio repeater repair and fire management operations. Trail maintenance would have beneficial impacts on visitor use and experience through the continued provision of a well-maintained trail system. Commercial, military, and private overflights would have adverse impacts on some visitors seeking solitude; however, these impacts would be expected to last for a short duration. Elk monitoring flights, flights associated with other vital signs monitoring, and flights associated with radio repeater repair or fire management operations would have adverse impacts

on visitor use and experience related to the disruption of solitude and natural soundscapes by aircraft noise and the visible presence of aircraft. These impacts would be intermittent and limited in duration, but monitoring flights, in particular, could involve helicopters flying straight-line transects along the contours of the land for several hours at a time, which would be more perceptible to visitors than other types of overflights. Overall, the cumulative impacts of these actions on visitor use and experience would be beneficial, because the intermittent, brief disruptions to visitor use that would be associated with the various types of flights described would be offset by the indefinite benefits to visitor use and experience resulting from repair and maintenance of trails, bridges, and other infrastructure. Alternative A would contribute some beneficial impacts for visitors who would appreciate the opportunity view mountain goats; however, there would be substantial long-term, adverse impacts on most visitors because of access restrictions and trail closures resulting from mountain goat-human interactions. As a result, when the impacts of alternative A are combined with the overall beneficial effects of other past, present, and reasonably foreseeable future actions in the study area, an overall adverse cumulative impact would be expected because the increasing mountain goat population and its adverse effects on visitor use and experience, particularly on visitors who recreate in mountain goat habitat.

Conclusion

Under alternative A, the continued ability to view mountain goats could enhance some visitors' experiences in the park and adjacent national forest. Hunters may experience an increase in hunting success if the continuation of current management contributes to an increase in the mountain goat population in the national forest. An increase in unsafe mountain goat-human interactions could occur with an increase in the mountain goat population. Visitor use and experience would also be affected by noise and temporary area closures associated with nuisance mountain goat management actions and by the unsightly effects of mountain goat wallowing on alpine soils and plant communities. These impacts would continue for an indefinite period and would likely become more frequent as the mountain goat population grows and expands its range. Past, present, and reasonably foreseeable future actions would contribute overall beneficial cumulative impacts. When the impacts of alternative A are combined with the overall beneficial effects of other past, present, and reasonably foreseeable future actions in the study area, an overall adverse cumulative impact would be expected, driven mainly by the increasing goat population and its long-term, adverse effects on visitor use and experience, particularly on visitors who recreate in mountain goat habitat.

Alternative B: Capture and Translocation

Impacts Associated with Staging Areas

Under alternative B, adverse impacts on visitor use and experience would result from noise generated by helicopters, trucks, and other vehicles and equipment operating at staging areas during capture and translocation of mountain goats. Adverse impacts would also result from trail closures and the potential for traffic disruptions. These adverse impacts would be limited to daylight hours during the two separate 2-week management periods during each year of initial management when staging areas would be in use, and would only occur in the areas surrounding whichever two staging areas are in use during a given year. Under alternative B, adverse impacts on visitor use and experience resulting from staging area activities would largely occur during the first 2 years of initial management, during which capture and translocation activities would be most intensive, and to a lesser degree in years 3 to 5.

In any given 2-week management period, staging area activity would affect the area surrounding one staging area on the northern side of Olympic National Park and one staging area in Olympic National Forest on the southern side of the Olympic Mountains. The potential for visitor use impacts near staging areas that are in use, and the intensity of the impacts, would vary by staging area. NPS and USDA Forest

Service would inform the public of potential impacts from staging area activities when initial management actions are ongoing. Notification would also be posted in advance at any campgrounds, trails, or other visitor use areas that could experience temporary closures or other impacts resulting from staging area activities.

The Sweets staging area is located adjacent to the main road accessing the Elwha River Valley (see figure 12). One trail – the Madison Falls Trail – would have the potential to be closed while this staging area is in use; however, the road is also used to access other trails located in the Elwha River Valley, such as the Olympic Hot Springs Trail and the Whiskey Bend Road Trailhead. There would be a need for management personnel to monitor and control visitor traffic along this road during staging activities, and the potential exists for periodic disruptions to visitor traffic from vehicles entering or exiting staging areas or from helicopters taking off and landing. No campgrounds are located near this staging area, and as a result, campers would not be affected by noise from staging activities. Hikers using trails within the Elwha River Valley could experience noise from helicopters taking off from or approaching staging areas. This noise could be audible for up to 0.5 mile from the staging area, and potentially for an even greater distance, likely more than a mile, depending on which flight path the helicopters are following at a given time.

The Hurricane staging area is in the Hurricane Hill Trailhead parking lot, a paved parking area accessed via Hurricane Hill Road approximately 1 mile beyond the Hurricane Ridge Visitor Center (see figure 3 in chapter 2). Use of this staging area would require closure of the Hurricane Hill Trail, a day use only trail, for the duration of staging activities. Trails intersecting with Hurricane Hill Trail may also experience temporary closures. There may also be some potential for vehicle traffic to and from the staging area to affect traffic levels on Hurricane Hill Road. Additionally, Hurricane Hill Road would be closed between picnic area A and picnic area B during staging activities, as a result, picnic area A would remain open to visitors but picnic area B would be closed. Noise from helicopters taking off and landing would be audible to visitors at the Hurricane Ridge Visitor Center. Noise from the Hurricane staging area would carry into wilderness, although the noise from trucks and equipment would be expected to dissipate over a relatively short distance likely not to exceed 0.25 mile. Noise from helicopters on the ground would be audible for a greater distance, likely slightly more than 0.5 mile. Noise from helicopters taking off and landing would be audible for a greater distance, likely exceeding one mile, into wilderness; however, the duration of impacts and the points at which helicopters would be most audible would depend on the flight path taken at a given point in time.

The Deer Park staging area is in a more remote area than either the Sweets or the Hurricane staging area. Therefore, while the nature of the impacts would be the same as described for other staging areas, the potential for impacts on visitor use could be less. The Deer Park staging area is in a location where access to the area immediately surrounding the staging area is easily controlled; therefore, it is anticipated that the extent of closures would be limited. Other nearby trails or visitor use areas would not likely need to be closed unless mountain goat-human interaction concerns are identified. The road to the staging area is more narrow and winding than the roads to the Sweets or Hurricane staging areas, but is also less heavily traveled. As a result, impacts on visitor traffic are not generally anticipated, but it could become necessary to control or restrict traffic near the staging area to allow vehicles to enter or exit the staging area or allow helicopters to land or take off. Visitors use the road network around the Deer Park staging area for daytime and overnight access to wilderness, and noise generated by activities at the staging area would carry into wilderness in the same manner as described for the Hurricane staging area, potentially affecting overnight wilderness users. Visitors to Olympic National Forest may also be impacted by activities at the Deer Park staging area due to the connectivity between the national forest's Deer Ridge Trail and the park's Deer Park Campground, a 5-mile hike. There is a primitive campground adjacent to the Deer Park staging area, where campers would be impacted by noise from vehicles, equipment, and helicopters during daylight hours if this staging area is used.

The Mt. Ellinor staging area is located on national forest land in the Upper Ellinor Trailhead parking lot (figure 13). If this staging area is used, the trailhead parking area would need to be closed during operations, since much of the parking area would be taken up with operational needs. Trails to Mt. Ellinor and Mt. Washington originating at this point would likewise be closed if and when this staging area is used. In addition, it is likely that the trail system originating at Big Creek Campground and accessing areas around Mt. Ellinor would need to be closed as well. Big Creek Campground, which is located less than 2 miles from the staging area, would remain open. Because of its proximity to the staging area, campers at Big Creek Campground would likely experience helicopter noise during days when helicopters would be operating; however, helicopter managers would attempt to select flight paths that would minimize these impacts on the greatest extent possible and the Mt. Ellinor staging area would not be used during the July management period or during the fall. Noise originating at the Mt. Ellinor staging area would likely carry for some short distance into the Mount Skokomish Wilderness, although given that the main trails accessing the wilderness within the immediate vicinity of the trailhead would be temporarily closed, there would likely be few wilderness visitors impacted by noise originating from the staging area.

The Hamma Hamma staging area is located on national forest land in the southeastern corner of the Olympic Mountains, and is an old gravel pit that is often used today as a recreational shooting range (figure 14). Located at a lower elevation than other staging areas, this staging area is also farther from wilderness than the other staging areas. The area would be closed to public access while in use for helicopter-based management activities. The road used to access the Hamma Hamma staging area is used to access a number of trailheads, including the Lena Lakes Trail, and would also need to be closed periodically. Hamma Hamma staging area is located approximately 0.75 mile away from both the Lena Lakes Campground, the Hamma Hamma Campground and the Hamma Hamma Cabin. Helicopters would be audible to campers if this staging area is used, but helicopter managers would select flight paths that would minimize impacts on the greatest extent possible.

After the conclusion of initial management activities, one to two of the staging areas would be used to support helicopter flights during maintenance activities. Maintenance activities would occur when goats re-occur in areas of high human use and/or increase in population. These activities would occur as early as 5 to 15 years after the initial management, every 5 to 10 years, and lasting 10 to 12 days per operation. Mountain goat surveys would also continue to be needed every 4 to 6 years, for 6 days, lasting 4 to 5 hours per day. It is anticipated that impacts on visitor use and experience from maintenance activities at staging areas would be similar to the initial management activities.

Impacts Associated with Capture and Translocation Activities in Mountain Goat Habitat

Under alternative B, initial capture and translocation efforts, as well as longer-term maintenance efforts, would require temporary closure of areas within the immediate vicinity of capture and translocation activities. A high percentage of visitors to Olympic National Park and Olympic National Forest engage in hiking, wildlife viewing, and other activities that take place in mountain goat habitat; therefore, closures, which affect these activities, would have adverse impacts on visitor use and experience. Closure of park facilities and main roads is not expected under alternative B except as described for staging areas. In addition to area closures, visitors would be subjected to noise from helicopters engaged in capture and translocation activities. The maximum duration of adverse impacts on visitor use and experience during initial management activities would be for one full 2-week management period, twice per year, but during high visitor use periods in mid- to late July and late August to mid-September. Noise impacts from capture and translocation activities would be experienced for up to 8 hours each day during each 2-week period, while closures would be in effect around the clock for up to the full duration of each management period. Closures would be implemented through restrictions on backcountry permits in advance, and

would be enforced during management operations by NPS staff, who would patrol closure areas during daylight hours. Olympic National Forest staff would implement and enforce national forest closures using their own policies and procedures. The geographic extent of adverse noise impacts on visitors would be larger than the closure areas because helicopter noise could be perceptible by visitors up to as far as about 3 miles away from the flight path, flying at 500 feet AGL. Adverse visitor use impacts specifically related to area closures would extend only to the immediate area of the capture operations. Visitors would not be subjected to the fullest possible extent of adverse impacts from helicopter noise, because this would occur when helicopters are operating at lower elevations and slower speeds over areas that would be closed to the public. Visitors camping or hiking in areas that are in close proximity to flight paths could experience noise from helicopter overflights multiple times over an 8-hour period; however, helicopters would be moving through the area rapidly and at high elevations. As a result, the duration of noise exposure for visitors from an individual flight would likely not last more than a few minutes.

Specific helicopter flight paths and area closures for alternative B are unknown. Generally, adverse impacts on visitor use and experience from helicopter flights could be possible anywhere within mountain goat range in the park or the national forest. Helicopters would generally take the most efficient routes to and from staging areas, most often flying over passes (e.g., Upper Cat Pass, Long Pass, and Boulder Creek Pass) and down river valleys such as the Elwha River Valley. However, specific flight paths would be determined by weather (cloud layers and winds) and associated operating safety considerations. Capture operations would be planned and closure areas identified six months in advance, and, for Olympic National Park, closures would be coordinated with the park's Wilderness Information Center. As a result, visitors would be able to identify areas where disturbances from capture operations may be likely, and would have opportunities to plan in advance to avoid these areas.

Capture operations could potentially take place in any area of Olympic National Park and Olympic National Forest that is within occupied mountain goat range; however, these operations would be most likely to take place in areas where higher levels of visitor use overlap with high densities of mountain goats. These areas include, but would not be limited to: High Divide, Hurricane Hill, Klahhane Ridge, Mount Olympus, Crystal Peak, Chimney Peak, and Lake of the Angels. Similarly, all areas of the Olympic National Forest where there is occupied mountain goat habitat, within both wilderness and non-wilderness areas, could potentially experience temporary closures of some duration. These may include, but would not be limited to: the Mt. Ellinor/Mt. Washington area; The Brothers/Lena Lakes area; Mt. Jupiter; Buckhorn Wilderness/Mt. Townsend; and Wonder Mountain Wilderness. Similar to the park, areas which receive high visitor use would be prioritized. Additionally, these impacts would be experienced by frontcountry recreational visitors in the Olympic National Forest outside of wilderness, as the park and forest are connected through recreational infrastructure and users.

Following the cessation of initial management activities, likely after 3 to 5 years, the frequency and duration of maintenance activities and thus the adverse impacts on visitor use and experience related to area closures and helicopter noise would decrease greatly. It is anticipated that intermittent maintenance activities would take place to remove mountain goats that have returned to areas of higher visitor use and are accessible to capture. The potential frequency and duration of maintenance activities would be influenced by the mountain goat population size, distribution of mountain goats relative to visitor use on the landscape, available funding and personnel, and other management considerations. It is anticipated that adverse impacts on visitor use from maintenance activities at staging areas would be similar to the initial management activities described, but would likely be far less frequent and shorter in duration. Following completion of initial management activities, there would be some continued potential for adverse impacts on visitor use and experience from mountain goat encounters and nuisance mountain goat management activities. However, beneficial impacts on visitor use and experience would result from the reduction of the mountain goat population and the associated reduction in the probability of conflicts between mountain goats and humans and reduction in the frequency of area closures related to

management of nuisance mountain goats. For visitors whose experience is enhanced by the ability to view mountain goats, minimal adverse impacts would result because while the mountain goat population would be reduced, there would still be a population present to view. Overall, the impacts of alternative B would be primarily beneficial once initial management actions have been completed and the mountain goat population is reduced, adverse impacts from maintenance activities become only periodic, and the probability of adverse impacts related to mountain goat conflicts is reduced.

Cumulative Impacts

Past, present, and reasonably foreseeable future actions with the potential to contribute to cumulative impacts on visitor use and experience under alternative B are the same as those described for alternative A. As detailed in the analysis of cumulative impacts under alternative A, the impacts of these actions on visitor use and experience would be both adverse and beneficial, but the overall cumulative impacts would be beneficial. Alternative B would contribute adverse impacts on visitor use and experience during initial management activities related to noise, traffic disruptions, and area closures near staging areas as well as adverse impacts from helicopter noise and area closures in the backcountry. These adverse impacts would become infrequent and intermittent during maintenance activities, and the reduction in population resulting from initial management would have primarily beneficial impacts as a result of decreased mountain goat-human interactions and decreased frequency in access restrictions due to the reduced mountain goat population. Assuming maintenance continues and the mountain goat population remains low, when the primarily beneficial impacts of alternative B are combined with the effects of other past, present, and reasonably foreseeable future actions in the study area, an overall beneficial cumulative impact would be expected. Alternative B would contribute a minimal beneficial increment to the overall cumulative impacts because a sizeable population of goats could remain in the park.

Conclusion

Under alternative B, visitors using areas of the park and national forest near staging areas would likely be adversely affected by noise from helicopters, vehicles, and equipment operating at the staging areas, along with the potential for trail closures or traffic disruptions. Visitors to the backcountry would be adversely affected by area closures and helicopter noise. These intense impacts would take place in areas immediately surrounding staging areas and within mountain goat habitat, and would only occur during two 2-week management periods per year during months of the year that experience high visitor use, but would be limited to the initial management phase. Following initial management and with maintenance to keep the mountain goat population relatively low, visitors would benefit from the reduced probability of conflicts with mountain goats and reduced probability of access restrictions due to nuisance mountain goat management activities. As described in the cumulative impacts analysis for alternative A, past, present, and reasonably foreseeable future actions would contribute overall beneficial cumulative impacts. Assuming the population increases over time and maintenance is performed to keep the mountain goat population low, alternative B would contribute impacts that would be primarily beneficial to the overall cumulative effects, but minimal compared to alternatives C and D because a sizeable population of mountain goats could remain in the park.

Alternative C: Lethal Removal

Impacts Associated with Staging Areas

Under alternative C, adverse impacts on visitor use and experience resulting from activities at staging areas during initial management activities would be similar to those described for alternative B, because the same five possible staging areas would be used, a subset of one staging area in the north and one in the south would be used during any given management period in mid- to late July and late August to mid-

September, and the same duration and timing would apply for helicopter-based initial management actions under both alternatives. There may be fewer traffic-related impacts at staging areas under alternative C relative to alternative B, since translocation of mountain goats would not be occurring; the only vehicles entering and exiting staging areas would be those necessary to transport helicopter crews and provide helicopter support. In addition, the impacts would be shorter in overall duration under alternative C, since the greater efficiency of lethal removal versus capture would likely enable helicopter-based lethal removal operations to cease after 3 years. Most helicopter-based activity would occur in years 2 and 3. Use of staging areas would therefore be reduced because maintenance activities would be more infrequent and shorter in duration than alternative B.

Impacts Associated with Lethal Removal Activities in Mountain Goat Habitat

During initial management under alternative C, helicopter-based lethal removal actions to remove mountain goats from the park and adjacent national forest lands would have impacts on visitor use and experience that would be largely similar to those described for alternative B. The potential exists for more intense noise-related impacts if helicopter-based operations are taking place in areas that have not been closed to visitors; however, such areas would (by definition) be remote and difficult to access on foot, and the likelihood of visitors being near lethal removal actions in these areas would be extremely low. Ground-based lethal removal activities during portions of the year when helicopter-based management is not taking place could also result in adverse impacts on visitor use and experience, because management personnel would be entering backcountry areas of the park and national forest on foot to lethally remove additional mountain goats with high-powered rifles. Gunshots could be audible for some visitors at distances up to 0.8 mile, although the noise from gunshots would be instantaneous and intermittent. There would be no area closures associated with ground-based lethal removal; however, visitors would be notified of ongoing ground-based lethal removal activities through interpretive signage and by way of the park's backcountry permitting process.

It is expected that at least 90% of the mountain goat population would be removed under alternative C, and most would occur through initial management activities. Thus, following the conclusion of initial management activities, maintenance activities would consist of infrequent and opportunistic ground-based and aerial lethal removal intended to remove the small number of mountain goats remaining on the landscape. Impacts from maintenance activities, when these activities are ongoing, would be similar to the impacts described for ground-based lethal removal during the initial management period. Beneficial impacts on visitor use and experience, from the substantial reduction in the mountain goat population and the associated reduction in the potential for visitors to encounter mountain goats or to be inconvenienced by area closures related to the presence of nuisance mountain goats, would begin to be evident immediately upon conclusion of initial management. Adverse impacts would result for those visitors who place value on viewing mountain goats. The availability of mountain goats for hunters on national forest land would rapidly decrease, which could constitute an adverse effect for some visitors; however, the mountain goat hunt on the Olympic Peninsula is intended not to be sustainable (Harris pers. comm. 2015b). It is expected that maintenance activities would be infrequent and of short duration. Depending on the success of the initial operation, maintenance activities may not be needed at all, or may not be needed for 5 to 15 years following the cessation of initial management. During maintenance activities, the use of staging areas may still be necessary but limited to two staging areas. Upon the cessation of lethal removal activities, visitors would have the opportunity to experience the alpine and subalpine ecosystems of the Olympic Mountains in a more native state without an exotic wildlife species present, and without the potential for negative encounters with nuisance mountain goats or access restrictions related to nuisance mountain goat management activities. As a result, impacts on visitor use and experience under alternative C would be adverse in the short term, but beneficial over the long term for an indefinite duration and more pronounced than under alternative B.

Cumulative Impacts

Past, present, and reasonably foreseeable future actions with the potential to contribute to cumulative impacts on visitor use and experience under alternative C are the same as those described for alternative A. As detailed in the analysis of cumulative impacts under alternative A, the impacts of these actions on visitor use and experience would be both adverse and beneficial, but the overall cumulative impacts would be beneficial. Alternative C would contribute adverse impacts on visitor use and experience during initial management activities related to noise, traffic disruptions, and area closures near staging areas as well as adverse impacts from helicopter noise, firearm noise, and area closures in the backcountry and wilderness areas. Adverse impacts during maintenance activities would be limited to infrequent and intermittent firearm noise in backcountry and wilderness areas. The eventual removal of the mountain goat population in the Olympic Mountains would have some adverse impacts on visitors who wish to view mountain goats, but largely would have beneficial impacts on visitor use and experience as a result of the removal of an exotic species, decreased unsafe mountain goat-human interactions, and cessation of access restrictions related to nuisance mountain goat management. When the impacts of alternative C are combined with the effects of other past, present, and reasonably foreseeable future actions in the study area, an overall beneficial cumulative impact would be expected. Alternative C would contribute a noticeable beneficial increment to the overall cumulative impacts in the long term, once management actions cease.

Conclusion

Under alternative C, visitors using areas of the park and national forest near staging areas would likely be adversely affected by noise from helicopters, vehicles, and equipment operating at the staging areas, along with the potential for trail closures or traffic disruptions. Visitors to the backcountry would be adversely affected by area closures, helicopter noise, and firearm noise. These intense impacts would be limited to areas immediately surrounding staging areas and within mountain goat habitat, and only occur during two 2-week management periods per year during the 3- to 5-year initial management phase. Following initial management, visitors would be subjected to intermittent firearm noise. Visitors would benefit indefinitely from the removal of mountain goats, which would remove any potential for conflict with mountain goats and any need for access restrictions due to nuisance mountain goat management activities, in addition to removing an exotic species from the ecosystem. Past, present, and reasonably foreseeable future actions would contribute mainly beneficial cumulative impacts. Alternative C would contribute a noticeable beneficial increment to the overall cumulative effects, which would be beneficial in the long term, once management activities cease.

Alternative D: Combination of Capture and Translocation and Lethal Removal (Preferred Alternative)

Impacts Associated with Staging Areas

Under alternative D, adverse impacts on visitor use and experience resulting from activities at staging areas during initial management activities would be similar to those described for alternatives B and C, but likely would take place for up to 4 or 5 years because this alternative would first concentrate on capture and translocation, followed by a switch to lethal removal when capture and translocation become impractical. As a result, impacts on visitor use during the first 2 to 3 years would be most similar to those described for alternative B, while the impacts on visitor use during the final 2 years of initial management would be most similar to those described for alternative C. During maintenance activities, the use of some staging areas may still be necessary, as similar to alternative C, because maintenance activities would involve intermittent lethal removal of mountain goats.

Impacts Associated with Capture, Translocation, and Lethal Removal Activities in Mountain Goat Habitat

During the first 1 to 2 years of initial management under alternative D, the impacts on visitor use would be largely identical to those described for alternative B where mountain goats are live-captured. Although not likely during the first couple of years, some potential may exist for lethal removal to also take place in remote areas where mountain goats are difficult to capture. In such a scenario, possible impacts on visitor use and experience would be similar to those described for lethal removal under alternative C. It is anticipated that the transition to primarily lethal removal would begin after the second capture operation in year 2 of initial management. At that point, the impacts on visitor use would become more characteristic of a combination of those described for alternative B and alternative C. During the fourth and fifth years of initial management, the impacts on visitor use and experience would be similar to those described for lethal removal under alternative C. These impacts would affect visitors using areas surrounding staging areas or within mountain goat habitat and would be limited to two 2-week management periods per year during the initial management phase.

Although the overall duration of initial management under alternative D would be the longest among the action alternatives, maintenance activities would be the same as those described for alternative C. Also, the number of mountain goats ultimately removed would be roughly the same as under alternative C and adverse impacts would result for those visitors who place value on viewing mountain goats. As with alternative C, it is expected that maintenance activities would be infrequent and of short duration. Depending on the success of the initial operation, maintenance activities may not be needed at all, or may not be needed for 5 to 15 years following the cessation of initial management. During maintenance activities, depending on the location of remaining mountain goats, the use of staging areas may still be necessary and would also happen during two 2-week management periods per year. Beneficial impacts on visitor use and experience are similar to those described for alternative C and would be evident upon conclusion of initial management, and following the conclusion of maintenance activities, long-term, beneficial impacts on visitor use and experience would occur indefinitely.

Cumulative Impacts

Past, present, and reasonably foreseeable future actions with the potential to contribute to cumulative impacts on visitor use and experience under alternative D are the same as those described for alternative A. As detailed in the analysis of cumulative impacts under alternative A, the impacts of these actions on visitor use and experience would be both adverse and beneficial, but the overall cumulative impacts would be beneficial. Alternative D would contribute adverse impacts on visitor use and experience that would be similar to those described for alternative B during the first 2 to 3 years of initial management activities and similar to those described for alternative C for the final 2 years of initial management. The eventual removal of the mountain goat population in the Olympic Mountains would have adverse impacts on some visitors, but largely beneficial impacts on visitor use and experience, identical to those described for alternative C. When the impacts of alternative D are combined with the effects of other past, present, and reasonably foreseeable future actions in the study area, an overall beneficial cumulative impact would be expected. Alternative D would contribute a noticeable beneficial increment to the overall cumulative effect, which would be beneficial in the long term, once management activities cease.

Conclusion

Under alternative D, visitors using areas of the park and national forest near staging areas would likely experience intense adverse impacts from helicopter noise, vehicles, and equipment operating at the staging areas, along with the potential for trail closures or traffic disruptions. Visitors to the backcountry and wilderness areas would be adversely affected by area closures, helicopter noise, and firearm noise.

Visitors would experience the majority of these intense impacts during the two 2-week management periods per year in the first 5 years of initial implementation of the alternative, and would experience impacts on a lesser and decreasing extent during possible continued maintenance activities, which could occur between 5 to 15 years after initial implementation. Visitors would benefit indefinitely from the removal of mountain goats, which would eliminate any potential for conflict with mountain goats and any need for access restrictions due to nuisance mountain goat management activities, in addition to removing an exotic species from the ecosystem. Past, present, and reasonably foreseeable future actions would contribute overall beneficial cumulative impacts. Alternative D would contribute a noticeable beneficial increment to this, which would result in overall long-term, beneficial cumulative impacts.

VISITOR AND EMPLOYEE SAFETY

The NPS *Management Policies 2006* states that, "while recognizing that there are limitations on its capability to totally eliminate all hazards, the Service …will seek to provide a safe and healthful environment for visitors and employees." The policies also state, "the Service will reduce or remove known hazards and apply other appropriate measures, including closures, guarding, signing, or other forms of education" (NPS 2006, section 8.2.5.1).

The safety of both park visitors and NPS employees could be affected by implementation of any of the alternatives. Impacts on visitor and employee safety would be related to the probability of being involved in a negative mountain goat-human interaction, the use of firearms, and the potential for accidents that could result from implementation of the actions proposed under each alternative. The purpose of this impact analysis is to identify the level of impact that implementing each of the proposed alternatives would have on the safety of visitors and employees on the Olympic Peninsula.

Methods and Assumptions

The analysis of impacts on visitor and employee safety considers risks to NPS staff and the general public that are associated with mountain goat-human encounters, as well as the potential safety risks associated with the mountain goat management activities proposed under each alternative. Impacts for this resource topic were analyzed using information provided by NPS staff familiar with current mountain goat management within the project area and the types of population reduction activities proposed under each alternative. Analysis also considered the types and level of visitor use taking place in areas where mountain goat-human encounters could take place.

Analysis Period. For the analysis of impacts on visitor and employee safety, it is expected that the majority of impacts related to the action alternatives would occur within the first 5 years of project implementation since most management activities would be expected to occur within this time frame. However, impacts on visitor and employee safety from goats, or the removal of goats, would continue in goat habitat, or previously-used goat habitat, over the life of this plan.

Analysis Area. The area of analysis for impacts of the alternatives on visitor and employee safety includes Olympic National Park and adjacent portions of Olympic National Forest.

Duration and Type of Impacts. The analysis of the duration and type of impacts on visitor and employee safety under each alternative was based on the following issue statements:

- **Issue Statement.** The presence of habituated and salt-conditioned mountain goats on the Olympic Peninsula can present threats to visitor and employee safety.

- **Issue Statement.** Management operations associated with the capture or lethal removal of mountain goats may involve the use of helicopters within steep, uneven terrain, which could present a threat to employee safety.

Analysis of Impacts on Visitor and Employee Safety in Olympic National Forest. For the analysis of impacts on visitor and employee safety, it is assumed that the range of potential actions associated with mountain goat management activities under each of the action alternatives would be similar on Olympic National Forest land as it would be for the park, although mountain goat management operations would be concentrated in the park because most of the mountain goat population resides there. Therefore, the types of impacts would be similar for management activities occurring in the park and Olympic National Forest, though would be expected to occur less frequently in the national forest.

Alternative A: No Action

Impacts Associated with Management Activities in Mountain Goat Habitat

There would be potential under alternative A for injuries to NPS and USDA Forest Service employees during mountain goat management actions such as monitoring, aversive conditioning/hazing, animal marking, lethal removal of hazardous mountain goats, and other mountain goat management activities. It should be noted that in general, the park and adjacent national forest are safe places for employees to work, although there are inherent risks associated with certain job tasks. The likelihood of an employee's exposure to these risks would increase significantly in the event that the agency's work safety protocols were not followed. Actions associated with mountain goat management could at times involve the use of helicopters through steep, uneven, high elevation terrain as well as the use of firearms in backcountry areas, which would present additional safety risks, though the overall use of helicopters for management activities would be infrequent. The potential for employee accidents and injuries would be mitigated through proper training of staff and adherence to safety protocols identified in the Olympic National Park *Mountain Goat Action Plan* (appendix A). Employee safety risks would persist in the long term; however, because mountain goats would remain in the Olympic Mountains indefinitely. Additionally, the continued growth of the mountain goat population and potential expansion of distribution in the long term would be likely to increase the need for aversive conditioning and lethal removal activities, which could increase risks to employee safety. Though the likelihood of impacts on employee safety would be considered small, alternative A could result in adverse effects on employee safety that would persist indefinitely and become more likely as the mountain goat population increases.

The continued presence of mountain goats in Olympic National Park and adjacent areas of Olympic National Forest under alternative A would result in a long-term visitor safety risk because the potential would remain for negative interactions between humans and mountain goats. Although there are certain inherent risks associated with the park and national forest, overall these lands are safe places for visitors to enjoy. Similar to employees, the likelihood of visitors' exposure to these risks would increase significantly in the event visitors do not abide by agency safety precautions. Educational materials would continue to be distributed to the public at NPS and NFS visitor facilities. NPS and USDA Forest Service would continue to conduct outreach to visitors regarding mountain goat safety and proper reporting of mountain goat interactions. Trail closures and access restrictions would be implemented as necessary in the event of a conflict between a mountain goat and a visitor. All of these actions would somewhat mitigate the potential for adverse impacts on visitor safety, but would not eliminate it. Over time, the increase of the mountain goat population and potential expansion of mountain goat distribution would offset the beneficial effects of outreach, education, and access restrictions in mountain goat habitat. Though the likelihood of impacts on visitor safety would be considered small, alternative A would have an overall adverse impact on visitor safety because the potential for human conflicts with mountain goats

would persist indefinitely, especially when visitors recreate in mountain goat habitat, and become more likely as the mountain goat population increases.

Cumulative Impacts

Past, present, and reasonably foreseeable future actions with the potential to impact visitor and employee safety include trail maintenance, Roosevelt elk monitoring flights and other flights associated with vital signs monitoring, and flights associated with radio repeater repair and fire management operations. Trail maintenance would have beneficial impacts on visitor and employee safety by providing a well-maintained trail system and correcting potentially unsafe trail conditions as they occur. Flights associated with elk monitoring, other vital signs monitoring, radio repeater repair, and fire management operations would present a slight risk of catastrophic adverse impacts on employee safety related to accidents involving the use of aircraft; however, these would be minimized by proper pilot training and appropriate flight safety protocol for both pilots and park staff conducting elk monitoring. With the exception of the potential for accidents resulting from helicopter use, overall, the positive impact of park management actions, past, present, and reasonably foreseeable future actions would result in beneficial impacts on visitor and employee safety. Alternative A would have adverse impacts on visitor and employee safety due to the increased likelihood for human conflicts with mountain goats, which could increase impacts as the mountain goat population increases over time. Although the park is generally a safe place to recreate, overall adverse cumulative impacts would occur under alternative A because of the risk related to potential exposure to increased numbers of mountain goats in alpine and subalpine areas.

Conclusion

On the occasions when management activities would occur, there would be potential under alternative A for injuries to NPS and USDA Forest Service employees during mountain goat management actions such as monitoring, aversive conditioning/hazing, animal marking, lethal removal of hazardous mountain goats, and other mountain goat management activities. Actions associated with mountain goat management could at times involve the use of helicopters through steep, uneven, high elevation terrain as well as the use of firearms in backcountry areas, which would present additional safety risks. The potential for employee accidents and injuries would be mitigated through proper training of staff and adherence to safety protocols identified in the Olympic National Park *Mountain Goat Action Plan* (appendix A) and other agency directives. Employee safety risks would persist in the long term; however, because mountain goats would remain in the Olympic Mountains indefinitely. Additionally, the continued growth of the mountain goat population and its potential expansion and distribution in the long term would likely increase the need for aversive conditioning and lethal removal activities, which could increase exposure and the level of risk to employee safety. As a result, alternative A could result in adverse effects on employee safety.

Under alternative A, the continuation of existing management in mountain goat habitat, and the continued presence of a mountain goat population in Olympic National Park and Olympic National Forest would result in the ongoing potential for negative interactions between visitors and mountain goats to occur. These risks would persist indefinitely, and with the continued growth of the mountain goat population, could become substantial for visitors who recreate in mountain goat habitat. Although the park is generally a safe place to recreate, an overall adverse cumulative impact would occur under alternative A because of the contribution of risk due to potential exposure to increased numbers of mountain goats in alpine and subalpine areas.

Alternative B: Capture and Translocation

Impacts Associated with Staging Areas

NPS, USDA Forest Service, and WDFW employees, as well as NPS-approved contractors, would be utilizing various types of vehicles and equipment at the staging areas, including trucks and helicopters, and also handling live animals. All of these activities would generate some potential for employee injury; however, it is expected that all personnel involved in activities at staging areas would have the proper experience, training, and personal protective equipment necessary to minimize the probability that an injury would occur. Staging areas have been selected because they are located in areas that would facilitate safe helicopter access and landing. Skilled animal capture experts that are approved by the Office of Aviation Safety would be contracted to complete capture operations. Although capture operations would not be completed by NPS employees; for the purposes of NEPA analysis, contractors are considered to be the same as NPS employees. NPS personnel would follow US Department of the Interior Office of Aircraft Safety guidelines for helicopter use and qualified helicopter managers would be on site to assist in site safety and logistics. A project-specific safety plan would be required, and personnel trained in first aid would be present on location. Overall, activities at staging areas under alternative B could result in adverse impacts on employee safety during the 3 to 5 years over which initial management activities would take place; however, the probability of such adverse impacts would be considered low with the incorporation of safety mitigations.

Impacts Associated with Capture and Translocation Activities in Mountain Goat Habitat

Under alternative B, trails and campgrounds would generally remain open to the public in wilderness, backcountry, and frontcountry areas as long as management personnel determine it is safe to do so; as a result, mountain goat capture operations during initial management would have the potential to result in impacts on visitor safety if visitors are present in areas where capture operations are taking place. In order to mitigate this risk, areas where concentrated capture operations are ongoing would be closed for up to the full duration of a 2-week management period. These areas would be likely to include backcountry and wilderness areas with a high density of mountain goats and high levels of visitor use, such as High Divide, Hurricane Ridge, Lake of the Angels, Lena Lakes, and Mt. Ellinor, among other areas. Closure areas would be identified and closures would be coordinated with the park's Wilderness Information Center six months in advance. NPS would notify the public through public outreach, signage, and online notices regarding closures and potential visitor safety impacts. In addition, some trails that originate in frontcountry areas but may be used to access backcountry areas where capture activities could take place, such as the Hurricane Hill Trail, the Mt. Ellinor Trail, the Lena Lakes Trail, or the trail network originating at Big Creek Campground may be closed to the public if capture activities are ongoing in those areas. NPS staff would patrol public areas to ensure compliance with closures and public safety advisories. Information regarding mountain goat management activities would be available at visitor centers and posted on the park's website to inform the public of mountain goat management actions. As a result of these mitigating actions, the probability of adverse impacts on visitor safety from capture operations under alternative B is considered to be low. Following the cessation of initial capture operations, a reduced number of mountain goats would remain on the landscape because capture operations under alternative B would not be able to remove the entire mountain goat population. As a result, there would be a remaining, albeit reduced, probability that visitors could encounter nuisance mountain goats and an associated continued safety risk for visitors.

Adverse impacts on employee safety could result during capture operations from potential injuries (kicks, bites, stabbing with horns) that may occur during handling of live mountain goats during capture. Capture

and translocation of mountain goats within the park and adjacent areas of Olympic National Forest would be carried out only by qualified, properly trained NPS and WDFW employees and contractors. These personnel would apply safety training and awareness measures designed to reduce safety risks, including adherence to safety protocols outlined in the Olympic National Park *Mountain Goat Action Plan* (appendix A). Appropriate personal protective equipment would be used, and a job hazard analysis and project-specific safety plans would be implemented for all on-the-ground activities related to capture and translocation of mountain goats. The potential for adverse impacts would thereby be reduced. Likewise, there would be a continued employee safety risk during maintenance activities associated with capture of additional mountain goats, as well as aversive conditioning/hazing, animal marking, lethal removal of hazardous mountain goats, and other mountain goat management activities.

Helicopter-based capture operations would present some risk of accidents or injuries to employees and contractors during capture and translocation efforts. If an accident occurred, the adverse impact on employee safety could be substantial; however, the likelihood of an accident occurring is considered to be minimal. Aerial capture operations would be carried out by only highly trained personnel and contractors approved by the US Department of Interior Office of Aviation Services, and be required to observe proper safety protocols and use proper personal protective equipment. Equipment would be well-maintained and helicopter flights would only take place during favorable weather conditions. In addition, an aviation safety plan would be developed and implemented for each 2-week management period and a safety briefing would be performed for each specific flight. As a result, the risk of accident or injury during helicopter-based capture operations and the associated adverse impacts on employee safety would be minimized.

In the long term, assuming that management under alternative B is successful in achieving and maintaining a reduced population size, the potential for hazardous interactions between park visitors and mountain goats would be reduced, reducing the potential for adverse impacts on visitor safety and resulting in beneficial impacts when compared to existing conditions. The frequency with which park or USDA Forest Service employees would need to engage in aversive conditioning, hazing, and other activities used to manage conditioned and/or aggressive mountain goats would also decrease with a decline in the mountain goat population, which would result in decreased potential for adverse impacts, and thus result in beneficial impacts, on employee safety. While maintenance activities would be necessary indefinitely to maintain the mountain goat population at a reduced level, these activities would be expected to take place on an increasingly infrequent basis. Therefore, the potential for adverse impacts on employee safety would remain indefinitely, but it would be greatly reduced relative to the visitor and employee safety risks during initial reduction activities.

Cumulative Impacts

Actions with the potential to contribute to cumulative impacts under alternative B would be the same as those described under the cumulative impacts analysis for alternative A, and would be mainly beneficial due to the positive effects of ongoing park management activities. Alternative B would contribute direct, adverse impacts on employee safety related to activities at staging areas and capture efforts in the backcountry; these would be mitigated through the implementation of required safety planning, training and equipment, as described. If maintenance activities continue indefinitely, the potential for adverse impacts on visitor and employee safety would be reduced due to the reduction in the mountain goat population and associated reduction in potential safety risks over time. However, the potential for the mountain goat population to rebound under alternative B leaves open the possibility of an increased risk of adverse impacts on visitors and employees in the future. Overall, the effects of past, present, reasonably foreseeable future actions would be beneficial to visitor and employee safety. When factoring in the impacts on visitor and employee safety under alternative B that would occur if the mountain goat population could be maintained at a low level, alternative B would contribute a small beneficial increment

to these overall beneficial cumulative impacts because a sizable mountain goat population would remain in the park.

Conclusion

The capture and translocation of mountain goats under alternative B would entail some risks to employee safety associated with operation of equipment and handling of mountain goats at staging areas, but with the incorporation of required safety planning, training, aviation safety plans, and proper equipment, the probability of such impacts would be considered low. While this increased short-term risk to visitor and employee safety would occur, the reduction of the mountain goat population over time would reduce the potential for visitor safety risks during encounters with mountain goats, and would also reduce the need for employees to engage in aversive conditioning and hazing activities over time, lowering employee safety risk. Alternative B would reduce, but would not eliminate, the probability of adverse impacts on visitor and employee safety, and thus the beneficial impacts of alternative B would not be as pronounced as those under alternatives C and D. The potential for the mountain goat population to rebound under alternative B if maintenance cannot be continued would result in an increased probability of adverse impacts in the future, similar to alternative A. Indirect, adverse impacts on visitor safety from the increased presence of mountain goats, and direct, adverse impacts on employee safety from the continued need for capture and translocation activity could be expected. When factoring in the impacts on visitor and employee safety under alternative B that would occur if the mountain goat population could be maintained at a low level, alternative B would contribute a small beneficial increment to the overall beneficial cumulative impacts.

Alternative C: Lethal Removal

Impacts Associated with Staging Areas

Impacts associated with flights and access of personnel and equipment to staging areas under alternative C would be similar to those described for alternative B; however, there would be no potential impacts associated with the handling of mountain goats and the duration of staging activities would likely be intensive for only 2 years, as opposed to 3 to 5 years under alternative B.

Impacts Associated with Lethal Removal Activities in Mountain Goat Habitat

Impacts of alternative C on visitor safety would be largely the same as those described for alternative B during helicopter-based lethal removal operations. Enforcement of temporary area closures by NPS staff, along with public outreach regarding mountain goat management activities, would be expected to eliminate the risk of injury to visitors. Following the implementation of lethal removal efforts, impacts on visitor safety under alternative C would be beneficial due to the removal of mountain goats from the Olympic Mountains and the elimination of the potential for conflicts between visitors and mountain goats.

Under alternative C, the use of helicopters and fixed-wing aircraft would create the potential for adverse impacts on employee safety similar to those described for alternative B. There is added potential for adverse impacts on the safety of NPS employees during lethal removal activities because of the use of firearms, although the overall risk to operators is less than with capture operations. If an accident involving a firearm were to take place, the impact could be severely injurious or life-threatening. The use of firearms would be limited in timing, duration, and location. Furthermore, employees would be required to adhere to substantial safety precautions. Project-specific job hazard analysis and safety plans would be implemented, including aviation safety plans for each individual flight. Proper training and personal protective equipment would be required for all employees taking part in lethal removal operations. As a

result, it is expected that adverse impacts on the safety of NPS employees, including contractors, during initial management activities and maintenance activities would be minimized.

Overall, the implementation of proposed management actions under alternative C could result in adverse impacts on employee safety, but with the incorporation of the safety planning, training and equipment requirements described, the probability of these impacts occurring is considered low. Adverse impacts on employee safety would diminish as the mountain goat herd is reduced and eventually eliminated, and the increasingly reduced need for additional mountain goat management actions would have beneficial impacts on employee safety. Likewise, the potential for encounters between visitors and dangerous mountain goats would diminish and eventually disappear over time, resulting in beneficial impacts on visitor safety.

Cumulative Impacts

Actions with the potential to contribute to cumulative impacts under alternative C would be the same as those described in the analysis of alternative A. These actions would result in overall beneficial impacts on visitor and employee safety. During initial management activities, alternative C would contribute potential adverse impacts related to activities at staging areas, as well as potential substantial adverse safety impacts related to the use of helicopters, fixed-wing aircraft, and firearms. These impacts would be mitigated through the incorporation of the safety planning, training and equipment requirements. After the completion of lethal removal activities, alternative C would have beneficial impacts from the elimination of mountain goats as a visitor and employee safety threat. Overall, cumulative impacts on visitor and employee safety under alternative C would be beneficial over the long term. Alternative C would contribute a noticeable beneficial increment to overall beneficial cumulative impacts.

Conclusion

Lethal removal activities under alternative C would involve the use of vehicles and equipment, including helicopters, at staging areas, resulting in potential for short-term adverse employee safety impacts during the two 2-week management periods per year of initial management. These would be minimized through the incorporation of mitigation measures and the implementation of operational safety plans. Area closures would be implemented and enforced in order to reduce impacts on visitor safety in areas where lethal removal is ongoing. The lethal removal of mountain goats and the eventual reduction of the population to zero would eliminate the potential for mountain goat-visitor conflicts in the long term and would also eliminate the need for employees to manage mountain goats, thereby eliminating associated safety impacts. Lethal removal of mountain goats under alternative C would thus result in long-term, beneficial impacts on visitor and employee safety compared to alternative A, which would be more pronounced than those under alternative B and essentially the same as alternative D. Overall, cumulative impacts on visitor and employee safety under alternative C would be beneficial over the long term. Alternative C would contribute a noticeable beneficial increment to overall beneficial cumulative impacts.

Alternative D: Combination of Capture and Translocation and Lethal Removal (Preferred Alternative)

Impacts Associated with Staging Areas

Impacts on employee and visitor safety at staging areas under alternative D would consist of a combination of those described for alternatives B and C; however, impacts would take place over 5 years.

Impacts Associated with Capture, Translocation, and Lethal Removal Activities in Mountain Goat Habitat

Potential impacts on employee and visitor safety under alternative D would be more similar to those described for alternative B over the first 2 to 3 years of initial management and similar to those described for alternative C during the final 2 years. The probability of impacts on visitor safety would be considered low throughout the entire initial management phase under alternative D because areas where active capture or lethal removal activities are taking place would be closed to visitors. Management activities in mountain goat habitat would result in potential substantial adverse impacts on employee safety due to risks associated with the use of helicopters, fixed-wing aircraft, and firearms, as well as on-the-ground handling of live mountain goats. The incorporation of safety planning, training and equipment requirements as described for alternatives B and C, including aviation safety plans for each flight, would be expected to minimize the potential for these adverse impacts to occur. Similar to alternative C, alternative D would have long-term, beneficial impacts on both visitor and employee safety because it would eventually reduce the mountain goat population to zero, which would eliminate the potential for adverse visitor and employee safety impacts related to the presence of mountain goats on the landscape.

Cumulative Impacts

Actions with the potential to contribute to cumulative impacts under alternative D would be the same as those described for alternative A. These actions would result in overall long-term, beneficial impacts on visitor and employee safety. Actions associated with alternative D would create the potential for some short-term, adverse impacts on employee safety during the 5 years of initial management, but following completion of management actions would have long-term, beneficial impacts on visitor and employee safety due to the elimination of the mountain goat population. Overall, cumulative impacts on visitor and employee safety under alternative D would be beneficial. Alternative D would contribute a noticeable beneficial increment to overall beneficial cumulative impacts.

Conclusion

Capture and translocation and lethal removal activities under alternative D would involve the use of vehicles and equipment, including helicopters, at staging areas, resulting in potential for short-term adverse employee safety impacts during the two 2-week management periods per year of initial management. The probability of adverse impacts would be minimized through the incorporation of mitigation measures and the implementation of operational safety plans. Capture and lethal removal operations in backcountry and wilderness areas would involve the operation of helicopters, while capture operations would involve the handling of live animals and lethal removal would involve the use of firearms. Both would create potential for substantial employee safety impacts, but with the incorporation of the safety planning, training and equipment requirements, the probability of such impacts would be considered low. Area closures would be implemented and enforced in order to minimize impacts on visitor safety in areas where capture and lethal removal are ongoing. The eventual reduction of the population to zero would eliminate the potential for mountain goat-visitor conflicts and would also eliminate the need for employees to manage mountain goats, thereby eliminating associated safety impacts. The eventual reduction of the mountain goat population in the Olympic Mountains to zero under alternative D would thus result in long-term, beneficial impacts on visitor and employee safety, similar to alternative C and exceeding benefits provided by alternative B. Overall, cumulative impacts on visitor and employee safety under alternative D would be beneficial. Alternative D would contribute a noticeable beneficial increment to overall beneficial cumulative impacts.

PART TWO – IMPACTS ON RESOURCES AND VALUES OF THE NORTH CASCADES NATIONAL FORESTS

Part Two of this chapter analyzes the beneficial and adverse impacts that would result from implementing "Alternative B, Capture and Translocation" or "Alternative D, Capture and Translocation and Lethal Removal" considered in this draft plan/EIS. "Alternative A, No Action" and "Alternative C, Lethal Removal" would not affect the North Cascades national forests because those alternatives would not involve the translocation of mountain goats.

Cumulative Impact Scenario

Ongoing and reasonably foreseeable future projects or plans in the North Cascades national forests, and the surrounding region if applicable, were identified to provide the cumulative impact scenario. The geographic area of analysis for cumulative impacts varies slightly by affected resource, and includes elements on NFS lands, as well as actions on adjacent lands that impact NFS lands.

For the purposes of conducting the cumulative effects analysis, Mt. Baker-Snoqualmie and Okanogan-Wenatchee National Forests identified the following projects, plans, or actions described according to the resource potentially affected. Table 20 identifies the resources or values that may be affected by these actions.

TABLE 20. PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIONS AND POTENTIAL RESOURCES AFFECTED IN THE NORTH CASCADES NATIONAL FORESTS

Past, Present, and Reasonably Foreseeable Future Action	Impact Topic					
	Wilderness Character	Wildlife, Fish and Special-Status Species	Vegetation	Threatened or Endangered Species	Visitor Use and Experience	Visitor and Employee Safety
Forest Vegetation Management		X	X	X		
Mining		X		X		
Ongoing Trail Maintenance	X	X	X	X	X	X
Ongoing Road Maintenance		X		X	X	X
Invasive Plant Management		X	X	X		
Special Use Permit Issuance	X	X		X	X	
Fisher Reintroduction	X	X	X		X	
State Authorized Hunting		X		X		
Commercial, Military, and Private Overflights	X	X		X	X	

Forest Vegetation Management. Forest vegetation management activities include timber harvest, fuels management, thinning, restoration, and special forest products collection. There are multiple forest vegetation management projects in each district of the Okanogan-Wenatchee National Forest as well as one to two vegetation management projects in the Mt. Baker-Snoqualmie National Forest each year.

Mining. Ongoing mining operations on NFS lands in the North Cascades national forests include the following:

- Purple Hope Mine (Mt. Baker-Snoqualmie National Forest) – Operations include extraction, blasting, packing, and flying material off site.
- Over 200 small-scale mining claims across both national forests; operations include suction dredging, panning, prospecting, test pit exploration, and mineral and geothermal exploration projects.

Ongoing Trail Maintenance. Ongoing trail maintenance projects include logout, tread, and drainage structure maintenance on existing trail systems throughout both national forests.

Ongoing Road Maintenance. Ongoing road maintenance projects include minor erosion damage repair, brushing, and surface and drainage structure maintenance of existing road systems in both national forests.

Invasive Plant Management. Invasive plant management activities include hand-pulling, mowing, and herbicide application to existing and newly discovered weed populations in both national forests.

Special Use Permit Issuance. USDA Forest Service issues special use permits for a number of different types of uses in both national forests, including outfitter guide use, road-use, communication towers, recreational events, and other types of activities. This includes both multiple year permits and future annual permits.

Fisher Reintroduction. WDFW and NPS plan to restore the Pacific fisher (*Martes pennanti*) to the Mt. Baker-Snoqualmie National Forest. Once fishers are released into the national forest, it is likely that future monitoring could include camera stations placed in wilderness areas and aerial monitoring flights, up to once a week, from small fixed wing aircraft**.**

State Authorized Hunting. WDFW licenses recreational hunting within the state of Washington. Hunting (public as well as tribal) occurs in both the Mt. Baker-Snoqualmie and Okanogan-Wenatchee National Forests. Hunting that could contribute to cumulative impacts would include seasons that overlap proposed mountain goat release activities.

Commercial, Military, and Private Overflights. Overflights of the project area by military, commercial, and private aircraft would continue throughout the lifetime of this plan/EIS and beyond. These flights increase the audible noise within the North Cascades national forests and may result in impacts on resources including wilderness, wildlife, and visitor use and experience.

WILDERNESS CHARACTER

Methods and Assumptions

Potential impacts on designated wilderness areas in the North Cascades national forests were evaluated based on the qualities of wilderness character, which was described in “Chapter 3: Affected Environment.” Actions associated with releasing mountain goats at seven designated release sites in three wilderness areas (Alpine Lakes Wilderness, Glacier Peak Wilderness, and Henry M. Jackson Wilderness) could impact the wilderness character of these areas. Activities that may impact wilderness character could include the release of mountain goats to augment or reestablish current populations; use of

helicopters to mobilize personnel, equipment, and to transport mountain goats; and the temporary installation of salt blocks at release sites.

Analysis Period. For the analysis of impacts on wilderness character, it is expected that the majority of impacts would occur within the first 2 years of project implementation, during which activities associated with releasing mountain goats would probably occur. However, mountain goats from the Olympic Peninsula would continue to be captured and translocated from the Olympic Peninsula to the North Cascades national forests during years 3 to 5 with decreasing frequency, as long as it is still safe and feasible to capture mountain goats and there are areas remaining to receive mountain goats. The presence of released mountain goats, and their contributions to increasing current populations, would last beyond the duration of the project.

Analysis Area. The area of analysis of impacts of alternatives on wilderness character includes areas of the Alpine Lakes Wilderness, Glacier Peak Wilderness, and Henry M. Jackson Wilderness in the Mt. Baker-Snoqualmie and Okanogan-Wenatchee National Forests that are potentially used as habitat by mountain goats. Additionally, the area of analysis for the action alternatives includes staging areas that could be used to conduct mountain goat management activities. Although located outside of designated wilderness, some staging areas are in close proximity to wilderness areas and could affect wilderness character with noise.

Duration and Type of Impacts. The analysis of the duration and type of impacts on wilderness character under each alternative is based on the following issue statement:

- **Issue Statement.** Potential activities associated with the translocation of mountain goats to the North Cascades national forests, including the use of aircraft to transfer mountain goats from staging areas to release sites, could result in impacts on wilderness character.

Alternative A: No Action and Alternative C: Lethal Removal

Under alternatives A and C, no mountain goat translocation actions would occur in the North Cascades national forests. Thus, there would be no impacts on the wilderness character of the three wilderness areas in North Cascades national forests because no mountain goats would be released. Because there would be no impacts from the alternatives, there would be no cumulative impacts.

Alternative B: Capture and Translocation and Alternative D: Combination of Capture and Translocation and Lethal Removal (Preferred Alternative)

Under alternatives B or D, activities would be conducted in three wilderness areas in the North Cascades national forests. Under either of these alternatives, the activities in the North Cascades national forests would be the same. Approximately 230 mountain goats (of 325 to 375 total) would be released across seven release sites (out of 12 total) in areas of the Alpine Lakes, Henry M. Jackson, and Glacier Peak wilderness areas (see table 1 and figure 7 in chapter 2).

Impacts Associated with Translocation of Mountain Goats

Untrammeled. Moving mountain goats from the Olympic Peninsula into wilderness areas of the North Cascades national forests would constitute a manipulation of components and processes of the ecosystem in the wilderness areas receiving mountain goats, which would affect the untrammeled quality of the wilderness areas. Mountain goats are indigenous to the release areas, and proposed translocation patches

were identified in part because mountain goats previously occupied those habitats, but populations of mountain goats in these areas are now low or non-existent. The USDA Forest Service policy for wildlife management in wilderness allows for reintroduction of native species "only if the species was once indigenous to an area and was extirpated by human induced events (FSM 2323.33a). Reintroductions shall be made in a manner compatible with the wilderness environment."

Manipulating mountain goat behavior by placing salt blocks at the release sites, although temporary, would also affect the untrammeled quality of wilderness character. In order to minimize the effect on the untrammeled quality, the salt blocks would be designed to minimize or completely avoid leaching of salt into the ground and surrounding environment (see figure 6 in chapter 2) and would be removed approximately 1 year after installation. Under alternatives B and D, radio collars would be placed on mountain goats at staging areas outside of wilderness. Since the animals would be collared outside of wilderness, the act of collaring would not be considered a trammeling action.

Natural. Alternatives B and D would enhance the natural character of the wilderness areas in the North Cascades national forests. In accordance with Forest Service Manual 233.33a, these alternatives would increase the likelihood of successful reintroduction of mountain goats in the Glacier Peak, Henry M. Jackson, and Alpine Lakes wilderness areas. Mountain goats are indigenous to these areas, and are the predominant large herbivore in alpine communities of these wilderness areas. Throughout much of the North Cascades national forests, mountain goat populations currently remain small and isolated. The natural quality of these wilderness areas would be enhanced by augmentation of existing mountain goat populations and reintroduction of mountain goats where they are completely absent. Reintroducing mountain goats to high-quality habitat patches historically occupied by mountain goats, but where populations are low or non-existent, would help to reestablish those populations and ensure the long-term integrity of the natural character of these wilderness areas.

Undeveloped. Alternatives B and D would result in negative impacts on the undeveloped quality of wilderness character due to use of helicopters to mobilize personnel and equipment and release mountain goats, as well as temporary installation of fencing and salt blocks at release sites. Release of mountain goats would be accomplished through approximately 108 helicopter trips in Alpine Lakes Wilderness with an estimated total flight time of 1,260 minutes, 126 helicopter trips in Glacier Peak Wilderness with an estimated total flight time of 1,852 minutes, and 40 helicopter trips in Henry M. Jackson Wilderness with an estimated total flight time of 200 minutes. In addition, helicopters would be used to transport personnel and equipment (e.g., fencing) to and from release sites. Motorized or mechanical transport may be permitted if it is impossible to do the approved reintroduction by nonmotorized methods. The use of such motorized equipment is required for reintroducing mountain goats in the North Cascades national forests, although it would affect the untrammeled quality of wilderness character in these areas.

Salt blocks would be one-time installations that would be removed approximately 1 year after installation by ground crews hiking into the wilderness areas. The presence of salt would temporarily alter the undeveloped nature of wilderness but this impact would be very limited. Only one salt block would be used at each wilderness release site. The salt blocks would be placed in a small tub that would not be visible to most wilderness visitors, and the salt would be buried under snow for much of the winter months. Any remaining salt the following summer would be removed and all components of the bait site taken down and removed from the wilderness.

Upon release of collared mountain goats in wilderness, the presence of collars would adversely impact the undeveloped quality of the wilderness character for the duration of the presence of the collar. However, the collars would allow wildlife managers to collect data that is critical to successful implementation of alternatives B and D and, ultimately, the recovery of mountain goats in wilderness areas where they are

indigenous. Successful recovery of mountain goats has a long-term positive effect on the natural quality of wilderness character.

Should crews need to camp at the release sites inside wilderness areas, they would practice Leave-No-Trace techniques so that there would be no evidence remaining of their presence.

Temporary fencing would be placed at the release sites to hold mountain goats before releasing them. Fencing materials would only be present in wilderness at a release site on the day of a release, and all fencing materials would be removed at the conclusion of release operations. No fencing materials would remain in wilderness outside of days when release activities take place.

Opportunities for Solitude or Primitive and Unconfined Recreation. Some visitors may have their experience of solitude degraded by the presence of a helicopter under alternatives B and D. Some visitors may see or hear helicopters flying over wilderness and hovering to release the sling loads or drop off equipment and personnel, and may encounter mountain goat management personnel. There would be no lasting impact on opportunities for solitude beyond the three to four days required at each site for mountain goat releases. However, due to the remote nature of the release sites, anyone in the area would have a higher expectation of solitude than visitors who have spent less effort to access a portion of one of these wilderness areas on a less remote trail; therefore, their experience may be negatively impacted to a greater degree.

The use of helicopters to facilitate this project would be short-term and would seek to minimize disturbance during times when public use levels are highest and by limiting operations to two 2-week periods per year. Personnel would be at the release sites to assist with unloading mountain goats from the sling. No more than six crew members are expected to be present at a release site at any given time. The transportation of mountain goats would be focused on one site at a time so that only one location would be affected by helicopter disturbance at any given time. No single release site is expected to be impacted for more than a few days, or up to a week depending on weather. The locations in which opportunities for solitude would be negatively impacted by helicopters or encounters with personnel would be small relative to the overall size of these wilderness areas.

There could be negative short-term effects to opportunities for primitive and unconfined recreation. Although no trail closures are anticipated at release sites within wilderness, proposed staging areas outside of wilderness may require temporary closures that could limit access to certain trails in wilderness. The Curry Gap Trailhead accesses sites in the Henry M. Jackson Wilderness. Access to this trailhead could be interrupted as the road would be closed intermittently by a flagger during helicopter landing and takeoff. This staging area would be used for two separate release sites so the intermittent closures could extend for up to 2 weeks. Traffic would still be able to pass through during operations but could experience approximately 15-minute wait times during helicopter loading at the staging area. Curry Gap Trailhead gets light use, and there are alternate trails that can be used in that area which access the same high country. The majority of trailheads and trails within the Alpine Lakes, Glacier Peak, and Henry M. Jackson wilderness areas would remain open and access would be unaffected by implementation of alternatives B or D.

At the time of designation of the Alpine Lakes, Glacier Peak, and Henry M. Jackson wilderness areas, one of the opportunities for primitive and unconfined recreation was the opportunity for a high-quality hunt of mountain goats. This was a unique opportunity afforded hunters until recent decades. There was also a greater opportunity for wilderness visitors to see mountain goats throughout their range than is currently available. Restoration of the mountain goat population would afford visitors to these wilderness areas a better chance of seeing one of the iconic animals in the North Cascades national forests and may allow for resumption of a mountain goat hunt in the future.

Cumulative Effects

Actions with the potential to affect wilderness character that could overlap in time and space with the mountain goat release activities proposed under alternatives B and D include commercial, military and private overflights, special use permits, fisher reintroduction and trail maintenance. The spatial context of the cumulative effects analysis covers the proposed release sites within the Glacier Peak, Alpine Lakes, and Henry M. Jackson wilderness areas and extends within earshot and viewing distance of these sites.

Commercial, military, and private overflights can occur throughout the North Cascades national forests at any given time. It is possible that a commercial, military, or private flight could occur at the same time and in close proximity to helicopter use for mountain goat release in the Glacier Peak, Alpine Lakes, or Henry M. Jackson wilderness areas. Overlapping flights near locations where mountain goats are being released could be heard and seen by nearby visitors. Helicopter use would occur for no longer than a week at any given site. Impacts from overlapping flights during a given week could have a short-term, adverse impact on opportunities for solitude and the undeveloped quality of wilderness character of that specific wilderness.

There are several outfitter guides with special use permits in the Glacier Peak and Alpine Lakes Wilderness. There are no outfitter guides in the Henry M. Jackson Wilderness. Most outfitter guide activities occur outside of the proximity of the release sites. A few groups have activities taking place in close proximity of some release sites. If an outfitter guide was operating while mountain goat release activities were taking place, helicopter activity could have a negative impact on opportunities for solitude. This impact would be limited in scope and time, and project design criteria would reduce the potential of overlapping activities, as outfitter operating plans would be modified to ensure that guiding activities would not overlap with flight times.

Fisher reintroduction would not take place within wilderness areas, but would occur over the course of several years in proximity to the Glacier Peak, Alpine Lakes, or Henry M. Jackson Wilderness Areas in the Mount Baker-Snoqualmie National Forest. A schedule for reintroduction, as well as specific locations have not yet been determined. Helicopter or small fixed-wing airplane flights associated with monitoring reintroduced fishers could constitute a trammeling activity in wilderness, but would enhance the natural quality of wilderness character in these areas, and could also have adverse effects on the undeveloped quality and opportunities for solitude within wilderness. These effects would be short-term, and would depend on the methods used for relocation. Project design criteria would reduce the potential for overlapping activities by requiring WDFW to coordinate the timing of releases with USDA Forest Service staff and providing early notification of planned activities to the public.

Routine trail maintenance is conducted throughout both national forests as the need arises and funding is available. There are no specific projects or closures planned for the trails and trailheads affected by this ongoing maintenance. Adverse impacts on opportunities for solitude could result if trail crews conduct work in the vicinity of the staging and release sites during release activities. Project design criteria would reduce the potential for overlapping activities and management conflicts by requiring that WDFW coordinate timing of releases with USDA Forest Service staff and provide early notification of planned activities to the public.

Cumulative effects resulting from mountain goat release in the Glacier Peak, Alpine Lakes, and Henry M. Jackson wilderness areas in alternatives B and D would be limited in scope in terms of their impacts on wilderness character. The release of mountain goats using helicopters and reintroduction of fishers would have a negative, short-term impact on the undeveloped quality of wilderness character, although the method of fisher reintroduction has not yet been identified. Opportunities for solitude could also be impacted if visitors see or hear reintroduction activities. Impacts on the undeveloped quality and

opportunities for solitude would last during the time frame of the release itself, when motorized equipment is used and personnel are working in a specific location. Reintroduction activities would be short in duration, and project design criteria would reduce the potential for overlapping activities and management conflicts making cumulative effects limited in scope.

Reintroduction of species into wilderness areas has a broader impact on wilderness character. In addition to mountain goats, the possibility of helicopter flights within wilderness for monitoring reintroduced fishers in the North Cascades national forests would impact the untrammeled quality of wilderness in these areas. While these activities would lead to trammeling, the natural quality of wilderness character would be enhanced by reintroducing and augmenting indigenous species in these areas and moving the ecosystems towards their historical ecological condition. Overall, there are both beneficial and adverse cumulative impacts on the various wilderness qualities of the project area, and alternative B or D would add a small adverse increment due to the temporary disturbance during translocation operations taking place for a few weeks at a time over a few years, but a substantial long-term benefit to the natural quality of wilderness from the reintroduction and augmentation of a native species that had historically been present.

Conclusion

Alternatives B and D would result in short-term, adverse impacts on the untrammeled and undeveloped characters of wilderness as well as opportunities for solitude. There would also be a long-term, beneficial impact on the natural quality of wilderness character. Short-term impacts on the untrammeled quality would result from human interference with natural processes inside the Alpine Lakes, Glacier Peak and Henry M. Jackson wilderness areas as a result of the mountain goat relocation. The reintroduction of mountain goats would also have a short-term, adverse impact on the undeveloped qualities of wilderness and opportunities for solitude as a result of helicopter flights and crews supporting the relocation/reintroduction efforts in wilderness. The natural quality of wilderness would be improved over the long term as a result of the mountain goat relocation as this would move these ecosystems towards their historical ecological condition. Overall, there are both beneficial and adverse cumulative impacts on the various wilderness qualities of the project area, and alternative B or D would add a small adverse increment due to the temporary disturbance during translocation operations taking place for a few weeks at a time over a few years, but a substantial, long-term benefit to the natural quality of wilderness from the reintroduction and augmentation of a native species that had historically been present.

Forest Plan Consistency

All alternatives would meet the Alpine Lakes Management Plan and Forest Plan standards and guidelines for wilderness, and would therefore be consistent with the Mt. Baker-Snoqualmie, Okanogan, and Wenatchee Forest Plans (USDA 1989, 1990a, 1990b), as amended.

Use of motorized equipment (e.g., helicopters) in wilderness is permissible when it is necessary to meet the minimum requirements for administration of the wilderness area, and “may be permitted if: a) a delivery or application problem necessary to meet wilderness objectives cannot be resolved within reason through the use of non-motorized methods; or b) an essential activity is impossible to accomplish by non-motorized means because of such factors as time or season limitations, safety, or other material restrictions” (USDA 1989). The need for using helicopters to implement this project was considered in the USDA Forest Service Olympic Mountain Goat Management Plan Minimum Requirements Analysis for Activities in the Mt. Baker-Snoqualmie and Okanogan-Wenatchee National Forests (appendices E and F).

WILDLIFE, INCLUDING SENSITIVE AND MANAGEMENT INDICATOR SPECIES

Methods and Assumptions

Potential impacts on wildlife, including sensitive and management indicator species, were evaluated based on resource expert knowledge and professional judgement, review of literature, anticipated locations for management activities, and the issues identified in chapter 1. Management actions associated with mountain goat restoration activities could impact other wildlife species as a result of the use of aircraft or other vehicles and equipment during release of mountain goats. Sensitive species, special-status species, and management indicator species present in the North Cascades national forests that could be affected are listed in appendix H. For each species, the national forest where the species is present, the presence of suitable habitat, and whether the habitat would be affected is listed. Additionally, an effects determination has been made for each species to comply with the USDA Forest Service requirement to complete a biological evaluation for USDA Forest Service special-status species.

Analysis Period. For the analysis of impacts on wildlife, it is expected that the majority of impacts would occur within the first 2 years of project implementation, during which activities associated with releasing mountain goats would probably occur. However, mountain goats from the Olympic Peninsula would continue to be captured and translocated from the Olympic Peninsula to the North Cascades national forests during years 3 to 5 with decreasing frequency, as long as it is still safe and feasible to capture mountain goats and there are areas remaining to receive mountain goats.

Analysis Area. The area of analysis of impacts of alternatives on wildlife includes the release areas in the Mt. Baker-Snoqualmie and Okanogan-Wenatchee National Forests that are potentially used as habitat by mountain goats. Additionally, the area of analysis for the action alternatives includes staging areas that could be used to conduct mountain goat management activities.

Duration and Type of Impacts. The analysis of the duration and type of impacts on wildlife under each alternative is based on the following issue statement:

- **Issue Statement.** Management activities associated with the use of staging areas and release sites for the translocation of mountain goats (including site preparation and any aircraft or vehicular traffic to and from sites), would have the potential to impact wildlife, including sensitive and management indicator species.

Alternative A: No Action and Alternative C: Lethal Removal

Under alternatives A and C, no mountain goat translocation actions would occur in the North Cascades national forests area. Thus, there would be no impacts on wildlife in the Mt. Baker-Snoqualmie or Okanogan-Wenatchee National Forests, including USDA Regional Foresters Sensitive species and management indicator species, because no mountain goats would be released there. Because alternatives A and C would not contribute any impacts, there would be no cumulative impacts.

Alternative B: Capture and Translocation and Alternative D: Combination of Capture and Translocation and Lethal Removal (Preferred Alternative)

Direct and indirect effects from the proposed translocation of mountain goats to the North Cascades national forests include disturbance to vegetation and trampling due to increased mountain goat population abundance over the long term, as well as short-term effects from the proposed management activities that include human presence related to helicopter landing and release of mountain goats. The proposed action under alternatives B and D does not propose any permanent change in the types of activities already occurring in the North Cascades national forests, nor would it modify existing habitats. Therefore, impacts on wildlife from augmenting existing mountain goat populations would be minimal. The USDA Forest Service Regional Forester Sensitive species and management indicator species present in the North Cascades forests that could be affected are listed in appendix H. For each species, the national forest where the species is present, the presence of suitable habitat, and whether the habitat would be affected is listed. Additionally, an effects determination has been made for each species. Only those species expected to be impacted are further discussed.

Impacts Associated with Translocation of Mountain Goats

Impacts on Regional Forester Sensitive Species

This document serves as the biological evaluation completed for the USDA Forest Service Regional Forester Sensitive wildlife species. Sensitive wildlife species present in the North Cascades national forests are listed in appendix H. For each species, the national forest where the species is present, the presence of suitable habitat, and whether the habitat would be affected is listed. Additionally, an effects determination has been made for impacted species and for all sensitive species in appendix H.

Potential impacts resulting from the proposed alternatives on gray wolf, a Regional Forester Sensitive species in the Okanogan-Wenatchee National Forest, and wolverine, a Regional Forester Sensitive species in the Mt. Baker-Snoqualmie and Okanogan-Wenatchee National Forests, are discussed in the "Threatened or Endangered Species" section.

Mountain Goat. Mountain goat is both a sensitive species and management indicator species in the North Cascades national forests. Alternatives B and D would not affect mountain goat habitat but could disturb individuals near release sites. Mountain goats could be temporarily displaced or caused to flee due to the helicopter use and human presence. Augmenting the mountain goat populations is expected to be a beneficial effect to the viability of this species across the North Cascades national forests through increased genetic diversity and enhanced demographic vigor to depleted populations. The proposed actions may impact individuals, but is not likely to cause a trend toward federal listing or a loss of population viability.

Harlequin Duck. Alternatives B and D would not affect harlequin duck habitat but could disturb individuals near staging areas. Harlequin ducks could be temporarily displaced or caused to flee due to the helicopter use and human presence. There would be no change in habitat components, and the proposed actions may impact individuals, but would not be likely to cause a trend toward federal listing.

Impacts on Management Indicator Species

Management indicator species present in the North Cascades national forests are listed in appendix H. For each species, the forest where the species is present, the presence of suitable habitat, and whether the

habitat would be affected is listed. Additionally, an effects determination has been made for impacted species and for all management indicator species in appendix H.

Mule Deer. Alternatives B and D would not affect mule deer habitat but could disturb individuals at staging and release sites in the Okanogan-Wenatchee National Forest. Deer could be temporarily displaced or caused to flee due to the helicopter use and human presence. There would be no change to mule deer habitat components, and the proposed actions would not contribute toward a negative trend in viability.

Elk. Alternatives B and D would not affect elk habitat but could disturb individuals at staging and release sites. Elk could be temporarily displaced or caused to flee due to the helicopter use and human presence. There would be no change in habitat components, and the proposed actions would not contribute toward a negative trend in viability.

Cumulative Effects

Present and ongoing USDA Forest Service actions that could overlap in time and space with the mountain goat management activities and have potential to contribute to cumulative effects to management indicator species and other wildlife under alternatives B and D include forest vegetation management actions, mining, trail and road maintenance, special use permit actions, and fisher restoration plan actions. Other projects with the potential to affect wildlife species include recreational hunting and overflights of the project area by military, commercial, and private aircraft.

Mountain goat and harlequin duck, mule deer and elk, and other wildlife could be temporarily displaced due to the presence of staff and noise generating activities associated with forest vegetation management, mining, trail maintenance, state authorized hunting, and commercial, military, and private overflights.

Ongoing mining could have impacts on mountain goats sensitive or management indicator species, or other wildlife that are nearby. Any overlap between these activities would likely be limited to a few weeks per summer season where helicopters being used to deliver and remove supplies and ore.

Hunting could result in localized adverse effects to sensitive or management indicator species and other wildlife through mortality (if a targeted species) or by causing them to flee as a result of human presence. Because hunting would be small in scale, intermittent, and short-term in duration, effects to management indicator species would be minimal.

Overflight activities related to military, commercial, and private aircraft would produce sound, which could cause sensitive or management indicator species and other wildlife to flee their existing habitat for short periods of time if flights are made at low altitude. These types of flights would be infrequent and adverse impacts would be short-term and minimal.

Alternatives B and D would contribute very limited impacts from disturbance, primarily related to helicopter use, and would have no long-term impacts, although the re-establishment of mountain goats as part of the ecosystem would result in improved long-term ecosystem health. Based on the scope and endurance of the activities, only an immeasurable contribution to cumulative impacts is expected from alternatives B and D, and overall cumulative impacts on wildlife, considering all actions in the cumulative impact scenario, would be mainly adverse.

Conclusion

Impacts from alternatives B and D to wildlife including USDA Forest Service sensitive and management indicator wildlife species may exist during preparation and use of staging areas and release sites, as some individuals would be displaced and disturbed, but these effects would be limited to a small area and for short periods during management actions. Aircraft and other equipment noise at staging areas and throughout the mountain goat range could disrupt regular wildlife behavior on a short-term basis, lasting only a few minutes to a few hours at any given site. Alternatives B and D would contribute very limited impacts from disturbance and would have no long-term, adverse impacts and a long-term benefit of augmenting the native mountain goat population, and so would contribute only an immeasurable contribution to cumulative impacts, which would be overall mainly adverse.

Forest Plan Consistency

All alternatives would meet the Mt. Baker-Snoqualmie, Okanogan, and Wenatchee Forest Plan standards and guidelines for USDA Forest Service Sensitive species, and would therefore be consistent with the Mt. Baker-Snoqualmie, Okanogan, and Wenatchee Forest Plans (USDA 1989 1990a, 1990b), as amended.

VEGETATION

Management actions associated with mountain goat restoration activities could impact non-sensitive or non-special status vegetation species as a result of staging area preparation as well as vehicle and equipment use during release of mountain goats. No special-status species or management indicator species are present in the staging or release sites in the North Cascades national forests.

Methods and Assumptions

Potential impacts on vegetation were evaluated based on resource expert knowledge and professional judgment and anticipated locations for mountain goat management activities. Staging areas would be located in previously disturbed areas, and a minimal amount of brushing (removal of trees and brush) and minor tree clearing would be required at all staging areas.

Analysis Period. For the analysis of impacts on vegetation, it is expected that the majority of impacts would occur primarily in the short term, during active management activities, with vegetation recovering over time. The majority of impacts would occur within the first 2 years of project implementation, during which activities associated with releasing mountain goats would probably occur. However, mountain goats from the Olympic Peninsula would continue to be captured and translocated from the Olympic Peninsula to the North Cascades national forests during years 3 to 5 with decreasing frequency, as long as it is still safe and feasible to capture mountain goats and there are areas remaining to receive mountain goats. Impacts on vegetation resulting from the translocated mountain goats (browsing, grazing, trampling, and wallowing) would occur in the long term, but were not included as an issue for analysis because it is not expected that these would exceed natural impacts of a native species.

Analysis Area. The area of analysis of impacts of alternatives on vegetation includes staging areas that could be used to conduct mountain goat management activities, and the release areas in the Mt. Baker-Snoqualmie and Okanogan-Wenatchee National Forests.

Duration and Type of Impacts. The analysis of the duration and type of impacts on vegetation under each alternative is based on the following issue statement:

- **Issue Statement.** Translocation activities would require removal of brush and small trees at staging areas and could result in the crushing of vegetation at landing locations.

Alternative A: No Action and Alternative C: Lethal Removal

Under alternatives A and C, no mountain goat translocation actions would occur in the North Cascades national forests area. Thus, there would be no impacts on vegetation in the Mt. Baker-Snoqualmie or Okanogan-Wenatchee National Forests because no mountain goats would be released there. Current conditions and trends associated with rare plants in the project area would continue, as outlined in "Chapter 3: Affected Environment." Because alternatives A and C would not contribute any impacts, there would be no cumulative impacts.

Alternative B: Capture and Translocation and Alternative D: Combination of Capture and Translocation and Lethal Removal (Preferred Alternative)

Impacts Associated with Translocation of Mountain Goats

Vegetation can be negatively affected by vehicle and helicopter movement and/or associated or related activities. Effects can be caused by, but not limited to, direct injury, solar exposure alteration to remaining vegetation, hydrologic pattern alteration or soil alteration from ground disturbance during clearing, microclimate alteration, and/or invasive species introduction. The degree of effects is relative to where a plant population occurs in relation to disturbing activities. In addition, the extent and duration of the effects may influence the magnitude of impacts. Some ground disturbing activities such as clearing of brush and small trees at staging areas, and human foot traffic and helicopter skids impacting ground and plants at release sites are expected to occur. These impacts are expected to be of limited impact in scope and duration and, therefore, would not create measurable direct or indirect effects to vegetation.

Cumulative Effects

Other past, present and reasonably foreseeable future actions that could affect vegetation near staging and release locations include forest vegetation management actions, trail maintenance, and invasive plant management. USDA Forest Service vegetation management projects such as fuels management, thinning, restoration, and special forest products collection could have adverse impacts on vegetation in the short term, but would also have long-term benefits from restoration of disturbed areas and promotion of natural conditions. Ongoing trail maintenance projects would result in adverse effects along areas that are cleared for existing trail system, but impacts would be very limited in area and duration as vegetation would regrow in disturbed areas, and some previously disturbed areas would be revegetated. Invasive plant management activities would reduce weed populations in both national forests. Alternatives B and D would contribute very limited impacts in both scope and duration from disturbance to vegetation from helicopter skids and foot traffic and would have no long-term impacts. Based on the scope and endurance of the activities, only an immeasurable contribution to cumulative impacts is expected from alternatives B and D, and overall cumulative impacts on vegetation, considering all actions in the cumulative impact scenario, would be mainly beneficial.

Conclusion

Impacts from alternatives B and D to vegetation may occur during preparation and use of staging areas and release sites, because some vegetation would need to be removed and may be more exposed to changes in environmental conditions or be crushed by foot traffic or helicopter skids, but these effects

would be limited to a small area and for short periods during management actions. Based on the scope and endurance of the activities, only an immeasurable contribution to cumulative impacts is expected from alternatives B and D, and overall cumulative impacts on vegetation, considering all actions in the cumulative impact scenario, would be mainly beneficial.

Forest Plan Consistency

All alternatives would meet Forest Plan standards and guidelines regarding vegetation, and would therefore be consistent with the Mt. Baker-Snoqualmie, Okanogan, and Wenatchee Forest Plans (USDA 1989, 1990a, 1990b), as amended.

All alternatives would meet the Mt. Baker-Snoqualmie, Okanogan, and Wenatchee Forest Plan standards and guidelines for special-status plants, and would therefore be consistent with the Mt. Baker-Snoqualmie, Okanogan, and Wenatchee Forest Plans (USDA 1989, 1990a, 1990b), as amended.

THREATENED OR ENDANGERED SPECIES

In compliance with the requirements of USDA Forest Service Manual (FSM) 2630.3., FSM 2670-2671, FSM 2672.4, FSM W.O. Amendments 2600-95-7, and the ESA of 1973, actions and programs authorized, funded, or carried out by the NFS are required to assess a project's potential to affect federally listed species.

Methods and Assumptions

Potential impacts on federally listed threatened and endangered species were evaluated based on resource expert knowledge and professional judgment, review of literature, anticipated locations for management activities, and the resource-specific issues identified in chapter 1. General assumptions for impacts on federal threatened and endangered species are described below.

This document serves as the NEPA assessment of impacts and as the biological assessment completed for federally listed species (federal endangered, threatened, or candidate) that could be impacted by mountain goat management actions. Federally listed species present in the North Cascades national forests that could be affected are listed in appendix H. For each species, the national forest where the species is present, the presence of suitable habitat, and whether the habitat would be affected is listed. Additionally, an effects determination has been made for each species below.

The terminology used by USFWS for implementing section 7 consultation under the ESA is described in the "Methods and Assumptions" subsection of "Threatened or Endangered Species" section for the Olympic Peninsula area (Part One).

Analysis Period. For the analysis of impacts of the alternatives B and D to federal threatened and endangered species in the North Cascades national forests, it is expected that the majority of impacts within staging areas would occur within the first 2 years of project implementation since most mountain goat translocations would be expected to occur within this time frame. However, impacts may continue to occur during years 3 to 5, with decreasing frequency, as long as it is still safe and feasible to capture mountain goats on the Olympic Peninsula and there are areas remaining to receive mountain goats in the North Cascades national forests.

Action Area. As described for the Olympic Peninsula, the action area in the North Cascades national forests includes all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action. The action area in the North Cascades national forests is the

project area including staging and release areas within NFS lands, and in areas immediately surrounding the project area.

Duration and Type of Impacts. The analysis of the duration and type of impacts on federal threatened and endangered species under each alternative was based on the following issue statement:

- **Issue Statement.** Management activities associated with the use of staging areas and release sites for the translocation of mountain goats, such as the use of aircraft, would have the potential to impact threatened or endangered species, or designated critical habitat.

Analysis of Impacts on Threatened or Endangered Species in the Mt. Baker-Snoqualmie National Forest and the Okanogan -Wenatchee National Forest. There are nine staging areas identified for use. Six staging areas are located in the Mt. Baker-Snoqualmie National Forest, one is located in the Okanogan -Wenatchee National Forest, and two are located off NFS lands. Impacts discussed below associated with the preparation and use of staging areas on NFS lands would apply to the wildlife within and surrounding the staging areas.

The effect determination made by the USDA Forest Service for ESA-listed threatened and endangered wildlife species and designated critical habitat on NFS lands in the North Cascades national forests can also be found in appendix H. Potential effects to NFS identified special-status or sensitive species are described, as applicable, in the section "Wildlife and Wildlife Habitat, including Special-Status Species."

Alternative A: No Action and Alternative C: Lethal Removal

Under alternatives A and C, no mountain goat translocation actions would occur in the North Cascades national forests area. Thus, there would be no impacts on ESA-listed threatened or endangered plant or animal species in the Mt. Baker-Snoqualmie or Okanogan-Wenatchee National Forests because no mountain goats would be released there. Current conditions and trends associated with ESA-listed plants and animals would continue, as described in "Chapter 3: Affected Environment." Because alternatives A and C would not contribute any impacts, there would be no cumulative impacts.

Alternative B: Capture and Translocation and Alternative D: Combination of Capture and Translocation and Lethal Removal (Preferred Alternative)

Impacts Associated with Translocation of Mountain Goats

Grizzly Bear

The project area is within the North Cascades Grizzly Bear Recovery Zone, although no known individuals are known to currently reside within it. There is suspected to be a small number of bears in the North Cascades national forests. Alternatives B and D would not affect grizzly bear habitat but could disturb individual bears near staging and release sites. Grizzly bears could be temporarily displaced or caused to flee due to the helicopter use and human presence. Overall effects of helicopter flights or human presence would have localized, short-term impacts on any grizzly bear nearby. There would be no change in habitat components but because proposed mountain goat translocation activities could temporarily disturb an unknown grizzly bear, the effects determination under alternative B and D is *may affect, but not likely to adversely affect* grizzly bear.

Canada Lynx

Under alternatives B and D, the overall effects of helicopter flights would likely have little to no impact on the North Cascades Ecosystem lynx population. Currently lynx and its habitat are not known to occur near staging or release sites. If lynx dens became active within 0.25-mile of helicopter staging areas or release sites, the localized noise of the helicopter could lead to litter abandonment and/or juvenile mortality if conducted during the denning period (May 1 to August 31) or temporary displacement of individuals, which would result in short-term adverse impacts on lynx (USDA 2013). Furthermore, based on professional judgement, the timing of helicopter activity (mid- to late July and late August to mid-September) it is unlikely that den abandonment would occur. However, given the potential for short-term disturbance to some individuals, the effects determination is *may affect, but not likely to adversely affect* Canada lynx under alternatives B and D.

Gray Wolf

Alternatives B and D would not affect gray wolf habitat but could disturb individual wolves near staging or release sites. Wolves could be temporarily displaced or caused to flee due to the helicopter use and human presence. Overall effects of helicopter flights or human presence during the late denning season would have localized, short-term impacts on any wolves nearby. There would be no change in habitat components. In the long term, the additional mountain goats could become prey for some individual wolves. Due to the potential for short-term disturbances related to mountain goat translocation activities, the effects determination under alternative B and D is *may affect, but not likely to adversely affect* the gray wolf.

Northern Spotted Owl

Alternatives B and D would not affect northern spotted owl habitat, but could disturb unknown nesting birds near the following staging areas in the Mt. Baker-Snoqualmie National Forest:

- *Comprehensive Environmental Response, Compensation, and Liability Act* Site
- Forest Road 49
- Green Mountain Horse Pasture
- Irene Creek Rock Pit

The proposed action could adversely affect nesting northern spotted owls in the early breeding season (March 1 through July 15), due to noise disturbance and human activity. Adverse effects from noise disturbance during the early nesting season are of concern due to the potential to interrupt optimal nest selection, or incubation success. However, since activity would not start until early July, the overlap with the early nesting season would be limited to a few days if one of these staging areas is used before July 15. The individual sites exposed to disruptive activities are small (2.7 to 5.8 acres per site), and the duration of the exposure is expected to be brief (several hours up to one day) at any one location (e.g., use of helicopters and human presence). In total, up to 18.5 acres of suitable nesting habitat could be impacted by noise disturbance and human activity. Thus, individual sites present a relatively low risk to spotted owls due to the limited area exposed to noise and visual disturbance, and the short duration of the activities.

In addition, to minimize noise disturbance and rotor wash effects, helicopter flight paths will be at least 500 feet above suitable habitat. Also, if any individual northern spotted owl is observed during project

operations, a USDA Forest Service wildlife biologist would be notified and measures to minimize or eliminate harassment would be applied.

Due to the limited area exposed to noise and visual disturbance, and the short duration of the activities, proposed actions at these four staging areas are *not likely to adversely affect* northern spotted owls under these alternatives. This action would not contribute to a negative trend in the viability of this management indicator species in the forest.

Northern Spotted Owl Critical Habitat

There would be no impact on nesting, roosting, foraging, or dispersal habitat or primary constituent elements of designated critical habitat for northern spotted owl. Therefore, alternatives B and D would have *no effect* on designated northern spotted owl critical habitat.

Marbled Murrelet

Alternatives B and D would not affect marbled murrelet habitat but could disturb unknown nesting birds near the following staging sites in the Mt. Baker-Snoqualmie National Forest:

- *Comprehensive Environmental Response, Compensation, and Liability Act* Site
- Forest Road 49
- Green Mountain Horse Pasture
- Irene Creek Rock Pit

The proposed action could adversely affect nesting marbled murrelet during the breeding season (April 1 through September 23), due to noise disturbance and human activity. Adverse effects from noise disturbance during the nesting season are of concern due to the potential to interrupt optimal nest selection, feeding attempts, or incubation success. The individual sites exposed to disruptive activities are small (2.7 to 5.8 acres per site). In total, up to 18.5 acres of suitable nesting habitat could be impacted by noise disturbance and human activity.

In addition, to minimize noise disturbance and rotor wash effects, helicopter flight paths will be at least 500 feet above suitable habitat. Also, if any individual marbled murrelet is observed during project operations, a USDA Forest Service wildlife biologist would be notified and measures to minimize or eliminate harassment would be applied. However, because proposed actions could disturb unknown nesting birds near staging sites, the effects determination is *may affect, likely to adversely affect* marbled murrelet under alternatives B and D.

Marbled Murrelet Critical Habitat

There would be no impact on nesting habitat or primary constituent elements of critical habitat for marbled murrelet within designated critical habitat. Therefore, this alternative would have *no effect* on designated marbled murrelet critical habitat.

Wolverine

Alternatives B and D would not affect wolverine habitat but could disturb individuals at staging and release sites. Wolverine could be temporarily displaced or caused to flee due to the helicopter use and human presence. Overall effects of helicopter flights or human presence would have localized, short-term

impacts on any wolverine nearby. There would be no change in habitat components. Although the proposed actions may impact individuals, they are not likely to cause a trend toward federal listing or a loss of population viability. However, due to the potential for short-term disturbances to some individuals, the effects determination under alternatives B and D is *may affect, but not likely to adversely affect* wolverine.

Cumulative Effects

Present and ongoing USDA Forest Service actions that could overlap in time and space with proposed mountain goat management activities and have potential to contribute to cumulative impacts on federally threatened or endangered species under alternatives B and D include: forest vegetation management, mining, trail and road maintenance, fisher reintroduction, state authorized hunting, and commercial, military, and private overflights. Any federal projects would be required to reduce impacts on federally listed or proposed species to the extent possible in compliance with the ESA. Non-federal projects with the potential to affect these species include recreational hunting and overflights of the project area by military, commercial, and private aircraft.

Proposed fisher reintroductions could occur in the Mt. Baker-Snoqualmie National Forest in the coming years, although a schedule for reintroduction and specific locations have not yet been determined. Impacts from fisher reintroduction on federally threatened or endangered species were determined in the *Mount Rainier National Park and North Cascades National Park Service Complex Fisher Restoration Plan/EIS* (NPS 2014b), which were given as *may affect, but not likely to adversely affect* grizzly bear, Canada lynx, gray wolf, marbled murrelet, and northern spotted owl. Fisher have been known prey upon owls and murrelet; however, impacts on each of these species from fisher reintroduction would be “negligible” and “unlikely to occur” (NPS 2014b). USDA Forest Service vegetation management projects could have both beneficial and adverse impacts on federally listed species depending on whether they create opportunities to enhance habitat for certain species.

Ongoing mining could have impacts on mountain goats that are nearby. Any overlap between these activities would likely be limited to a few weeks per summer season where helicopters being used to deliver and remove supplies and ore. Hunting could result in localized adverse effects to federally listed species by causing them to flee as a result of human presence. Because hunting would be small in scale, intermittent, and short-term in duration, effects to federally listed species would be minimal.

Overflight activities related to military, commercial, and private aircraft would produce sound, which could cause federal threatened and endangered wildlife species to flee their existing habitat for short periods of time if flights are made at low altitude. These types of flights would be infrequent.

Alternatives B and D would contribute very limited adverse effects to the northern spotted owl and marbled murrelet from disturbance, primarily related to helicopter use, and would have no long-term impacts. Effects to other federally listed species are not expected to be adverse. Staging areas and the release sites would consider the proximity of federally listed species habitat and avoid those areas to the extent possible. Based on the scope and endurance of the activities, only an immeasurable contribution to cumulative effects is expected from activities disturbing nesting northern spotted owls and marbled murrelets. Overall cumulative impacts on endangered and threatened species, considering all actions in the cumulative impact scenario, would be adverse.

Conclusion

Effects from alternatives B and D to federally listed or proposed species may exist during preparation and use of staging and release areas. Aircraft and other equipment noise at staging areas and throughout the

mountain goat range could disrupt regular wildlife behavior on a short-term basis, lasting only a few minutes to a few hours at any site.

Section 7 Determination Summary

Marbled murrelet may be adversely affected if noise disturbance occurs during the nesting season, if unknown birds near the staging sites are disturbed. This would result in a *may affect, likely to adversely affect* determination. Northern spotted owls may be affected by noise disturbance during the late part of their early nesting season. However, individual nest sites would present a relatively low risk during the early nesting season due to the limited area exposed to noise and visual disturbance, and the short duration of the activities. Based on the limited exposure to disturbance, the determination is *may affect, but not likely to adversely affect* for northern spotted owls.

There would be no impact on nesting habitat or primary constituent elements of critical habitat for either northern spotted owl or marbled murrelet within designated critical habitat.

As described in the analysis, effects to grizzly bears, Canada lynx, gray wolves, and wolverines are not expected to be adverse, resulting in a *may affect, but not likely to adversely affect* determination for each.

Based on the determination for marbled murrelet, formal consultation with the USFWS is required. Informal consultation is also required for *may affect, but not likely to adversely affect* determinations for northern spotted owl, grizzly bear, Canada lynx, gray wolf, and wolverine. The information presented in this plan/EIS serves as the biological assessment for these federally threatened species.

Forest Plan Consistency

All alternatives would meet the Mt. Baker-Snoqualmie, Okanogan, and Wenatchee Forest Plan standards and guidelines for federally listed species, and would therefore be consistent with the Mt. Baker-Snoqualmie, Okanogan, and Wenatchee Forest Plans (USDA 1989 1990a, 1990b), as amended.

VISITOR USE AND EXPERIENCE

Alternative A: No Action and Alternative C: Lethal Removal

Under alternatives A and C, no mountain goat translocation actions would occur in the North Cascades national forests area. Thus, there would be no impacts on visitor use and experience in the Mt. Baker-Snoqualmie or Okanogan-Wenatchee National Forests because no mountain goats would be released there. Current conditions and trends associated with visitor use in the project area would continue, as outlined in “Chapter 3: Affected Environment.” Because there would be no impacts from the alternatives, and there would be no cumulative impacts.

Alternative B: Capture and Translocation and Alternative D: Combination of Capture and Translocation and Lethal Removal (Preferred Alternative)

Methods and Assumptions

To assess impacts on visitor use and experience from releasing mountain goats in the North Cascades national forests, the current types of visitor uses occurring at staging areas, release sites, and adjacent

areas that may be impacted by noise/visuals related to mountain goat management activities, as well as areas where mountain goats may be encountered in the future after they are released were considered. Based on this information, the potential effects of implementing alternatives B and D on visitor use and experience were analyzed. Additionally, the potential for impacts on visitor use and experience that could be attributable to the effects of the alternatives on the soundscape was analyzed.

Analysis Period. For the analysis of impacts on visitor use and experience, it is expected that the majority of impacts within staging areas would occur within the first 2 to 3 years of project implementation, during which most mountain goat translocation would be expected to occur.

Analysis Area. The area of analysis for impacts of the alternatives on visitor use and experience includes the portions of the North Cascades national forests where mountain goat staging and release sites and associated management activities overlap with visitor use.

Duration and Type of Impacts. The analysis of the duration and type of impacts on visitor use and experience under each alternative was based on the following issue statement:

- **Issue Statement.** Management activities associated with the use of staging areas and release sites for the translocation of mountain goats could result in impacts on visitor use and experience due to temporary trail, trailhead, and road closures, as well as the sight and sound of helicopters near areas of high recreational visitor use.
- **Issue Statement.** The translocation of mountain goats to the North Cascades national forests could benefit visitor use and experience by providing an increased opportunity to view native wildlife and possibly increase mountain goat hunting opportunities in the future.

Impacts Associated with Translocation of Mountain Goats

Potential impacts on recreation were considered in the identification of staging and release sites to reduce impacts on visitor use, where feasible. It is not possible to predict the exact number of days or the sequence of days (e.g., consecutive days or every other day) that each release site would be used, because it is not known how many mountain goats would be captured and ready for transport on any given day. However, to translocate 20 to 40 mountain goats per release site, it is assumed that 3 to 5 separate days of work would be required per site. Mountain goat releases would be performed during two separate 2-week management periods (mid- to late July and late August to mid-September) each year for both of the 2 years of expected activity (summers of 2018 and 2019). Weather complications or other issues could cause project activities to extend into a third season, but may extend up to 5 years if necessary. Typically, only one release site would be used at a time so that any impacts on visitor use resulting from project activities would be very localized, and short-term.

Impacts on the visitor use and experience within the North Cascades national forests from the translocation of mountain goats would be mainly beneficial in the long term. Mountain goat populations are low or nonexistent in the areas where mountain goats would be released. These sites are relatively remote and only a small portion of national forest visitors are likely to encounter mountain goats during their visit. Larger populations of mountain goats in the national forests could benefit the long-term viability of local mountain goat populations, which would benefit activities such as wildlife viewing and, potentially after a number of years, hunting.

There would be some short-term, adverse effects to the visitor use and experience as a result of management activities associated with transporting and releasing mountain goats. Some visitors may not mind these impacts, while others may be annoyed by the noise and sight of the activities. These effects

would include temporary trail, trailhead, and road closures, described in detail below, as well as impacts related to the sight and sound of a helicopter near popular recreation areas.

Trail, Road, or Trailhead Closures

None of the release sites are located on or adjacent to system trails or developed recreation sites, although sites such as Kaleetan and Upper White Chuck are in close proximity. All proposed staging areas are accessible by motor vehicle and some are located at trailheads or recreation sites (see table 1 in chapter 2). Where proposed staging areas occur at sites accessible to the public, temporary closures of nearby roads and trails would likely be implemented to ensure public and aviation safety. Closures are expected to be relatively limited in duration, ranging from intermittent road closures with a traffic flagger to temporary area closures lasting one day or up to a week. Advance notification of closures would be posted at trailheads and on the Mt. Baker-Snoqualmie and Okanogan-Wenatchee National Forest websites. Anticipated temporary closures to public access during proposed activities in the North Cascades national forests under this draft plan/EIS include:

- **Curry Gap Trailhead/Bald Eagle Outhouse.** The FSR 49 staging area would occupy a wide section of NFS Road 4920. The road would be closed intermittently by a flagger during helicopter landing and takeoff. The closure would affect access to the Bald Eagle/Curry Gap Trailhead. This staging area would be used for two separate release sites, Cadet Lake Ridge and Upper White Chuck Basin, so the intermittent closures could extend for up to 2 weeks. Curry Gap Trailhead gets light use and there are alternate trails that can be used in that area which access the same high country.
- **Irene Creek Rock Pit.** This staging area would use an existing rock pit on NFS Road 1650. Heavy equipment would be used to clear rock from a landing area within the pit. National forest visitors would not be impacted with the use of this site. An alternate staging site would be an open area along NFS Road 1650 near the rock pit. The road provides access to the Bear Lake Trail. In the event the roadside location is used, NFS Road 1650 and the Bear Lake Trailhead would be closed intermittently during flight operations between Irene Creek staging area and the Snowking Meadow release site in the Tommy Thompson translocation patch. Traffic control flaggers would stop traffic during helicopter sling loading and unloading (approximately 15 minutes at a time) for the duration of staging operations at this site (approximately 1 week). Bear Lake Trail receives very low visitor use.
- **Independence Lake Trailhead.** This staging area would require the trailhead be closed during operations at the staging area. Visitor use would be impacted but use of the trailhead is relatively low compared to other staging areas considered for use.

Noise or Visual Impacts

In addition to the direct effects to forest visitors from site closures associated with the staging areas, the noise and sight of helicopter flights that would occur over several years during translocation operations would likely be notable from several popular hiking trails and camping areas:

- The White Chuck Basin release site is located over a half mile away from the Pacific Crest National Scenic Trail and popular climbing trails near Red Pass and White Chuck Glacier. Disturbance to visitors on the trails would be limited to occasional noise and visual disturbance from helicopter use during release operations. Approximately 736 minutes of flight time over the course of a few days would be required for helicopter trips between the Curry Gap staging area and White Chuck Basin release site.

- Although there are no trails in the Buckindy release area, hikers to Green Mountain Lookout would likely have their experience affected by the presence of a helicopter during flights between the Green Mountain Pasture staging area and the Buckindy release site. A helicopter may be seen and heard during the trips to and from the release area. This noise and potential sight disturbance would be limited to an estimated 480 minutes of flight time over the course of a few days.
- Kaleetan Peak is one of the most popular summit climbs in the Snoqualmie Pass area. Use of the Kaleetan Lake Trail and at Kaleetan Lake has increased dramatically in recent years. While no trail closures would be necessary, campers at Kaleetan Lake and climbers on Kaleetan Peak would have their experience affected by seeing and hearing helicopters either at low levels above their camps or below them from the summit of Kaleetan Peak. This noise disturbance would be limited to an estimated 288 minutes of flight time over the course of a few days.
- The Chikamin release area is located just west and below Chikamin Ridge. This site is only a few kilometers from the Pacific Crest National Scenic Trail but is sufficiently distant from the trail that hikers would not be directly impacted although they might see or hear the helicopter while en route. Estimated total flight time between the Alpental staging area and Chikamin release site is 468 minutes, likely spread over several days.
- The Vesper Sperry release site is near the popular Headlee Pass Trail, but is not visible from the trail. Hikers may see or hear the helicopter from the summit area of Vesper Peak, a popular destination for many visitors. These effects would be limited to an estimated 383 minutes of flight time over the course of a few days.
- The Tower Mountain release site consists of three potential areas near Squad Car, Nugget, and Snowy Lakes, which range from about ¼ mile to over 2 miles from the Pacific Crest National Scenic Trail. The Snowy Lakes are a major recreation destination along the Pacific Crest National Scenic Trail and a popular camping destination for recreationists in the area. Hikers may see or hear helicopters from the Pacific Crest National Scenic Trail during relocation efforts; however, the estimated total flight time between the Swamp Creek staging area and the Tower Mountain release site would be limited to 320 minutes over the course of several days.

Cumulative Effects

Actions with the potential to affect the visitor use and experience that could overlap in time and space with the mountain goat release activities include road and trail maintenance, special permit issuance, fisher reintroduction, and commercial, private, and military overflights. The spatial context of the cumulative effects analysis covers the proposed release sites in the North Cascades National Forests and extends within earshot and viewing distance of these sites.

No current or reasonably foreseeable future road or trail maintenance activities are known that would impact the specific trails, trailheads, or roads affected by this plan. However, road and trail maintenance occurs across both forests as the need arises so there is potential for some maintenance activities to occur in areas affected by the mountain goat release activities. These maintenance activities typically have negligible impacts on visitor use and seldom require closures. Project design criteria would reduce the potential for overlapping activities and management conflicts by requiring that WDFW coordinate timing of releases with USDA Forest Service staff and provide early notification of planned activities to the public.

There are outfitter guides in the North Cascades National Forests who operate within the vicinity of staging areas and release sites and several guides operate in the Glacier Peak and Alpine Lakes Wilderness. Groups with activities that take place during the time frame of the proposed activities could be impacted by activities associated with the staging and release of the mountain goats. If an outfitter

guide was operating while mountain goat release activities were taking place, closures could inhibit normal operations, or activities could occur within hearing and viewing range of helicopter activity. Closures would not impact outfitter guides operating in wilderness, but could have a negative impact on visitor access and use. Overall, impacts on outfitter guides would be limited in scope and time, and project design criteria would reduce the potential of overlapping activities, as outfitters' operating plans would have little to no overlap with guiding activities if this overlap would have an adverse impact on outfitting and guiding operations. Fisher reintroduction is proposed in the Mount Baker-Snoqualmie National Forest in several years. A schedule for reintroduction as well as specific locations have not yet been determined. Methods of reintroduction could also have adverse effects on visitor use and experience because of the noise associated with the operations and possible closures. These effects would be short-term, and would depend on the methods used for relocation. Effects to visitors outside of wilderness would be minimal, although there would be a very small potential to view release activities. Project design criteria would reduce the potential for overlapping activities by requiring WDFW to coordinate the timing of releases with USDA Forest Service staff and providing early notification of planned activities to the public.

Commercial, military, and private overflights can occur throughout the North Cascades national forests at any given time. It is possible that a commercial, military, or private flight could occur at the same time and in close proximity to helicopter use for mountain goat release in the North Cascades national forests as well as in the Glacier Peak, Alpine Lakes, or Henry M. Jackson wilderness areas. Overlapping flights near locations where mountain goats are being released could be heard and seen by nearby visitors. Helicopter flight time at each release sites would total approximately 3 to 12 hours and flights would take the most direct paths to and from staging areas in an attempt to have a minimal impact on visitors. Impacts from overlapping flights during a given week could have a negative, short-term impact on visitor experience. Overlapping flights and impacts from flights would be limited to the few weeks in the summer when helicopters are used to relocate mountain goats.

Overall, there would be both adverse and beneficial impacts on visitor use and experience, with many differing components of experience, use, and access affected by various actions over different time periods. However, alternative B or D would add a small adverse increment due to the temporary disturbance (effects of closures, noise, visual disturbance) during translocation operations taking place for a few weeks at a time over a few years, but a substantial long-term benefit from the reintroduction and augmentation of mountain goats that results in the opportunity to view and experience that species in its native habitat.

Conclusion

Visitor use and experience may be temporarily affected by the presence of helicopters and personnel involved in the mountain goat transfer and releases activities. The largest impact would be due to short-term closures associated with staging and release activities. The public and outfitter guides would be notified in advance of which recreational areas would be affected by project activities and trails and trailheads would be posted in advance of any closures or other project-related activities. Some visitors may not mind these impacts, while others may be annoyed by the noise and sight of the activities. Overall, however, these activities would occur over a short time frame. In addition, the augmentation or reintroduction of the mountain goat population could improve wildlife viewing opportunities in the long run in these areas. In the short term, during limited stretches of time, there would be intermittent adverse impacts on visitors in specific locations during relocation and reintroduction activities. Design criteria would ensure that as few activities overlapped in time as possible, and in the long run, these activities could improve experience by providing new opportunities for wildlife viewing for some visitors. Overall, there would be both adverse and beneficial impacts on visitor use and experience, and alternatives B or D would add a small adverse increment due to the temporary disturbance (effects of closures, noise, visual

disturbance) during translocation operations taking place for a few weeks at a time over a few years, but a substantial long-term benefit from the opportunity to view and experience mountain goats in their native habitat.

Forest Plan Consistency

All alternatives would meet the Mt. Baker-Snoqualmie, Okanogan, and Wenatchee Forest Plan standards and guidelines for recreation and visitor use, and would therefore be consistent with the Mt. Baker-Snoqualmie, Okanogan, and Wenatchee Forest Plans (USDA 1989, 1990a, 1990b), as amended.

VISITOR AND EMPLOYEE SAFETY

Methods and Assumptions

The analysis of impacts on visitor and employee safety considers risks to personnel involved with the mountain goat translocation activities as well as safety considerations related to interactions between mountain goats and the public. Impacts for this resource topic were analyzed based on information provided by USDA Forest Service and WDFW staff familiar with mountain goat distribution, abundance, and behavior in the North Cascades national forests. The analysis also considered the type and intensity of visitor use and recreation activities near the staging and release areas.

Analysis Period. It is expected the risks associated with translocation activities would be limited to the 2 to 3-year window in which capture and release activities would occur. The analysis window for risks and impacts associated with human-mountain goat encounters extends into the foreseeable future.

Analysis Area. The area of analysis for impacts of the alternatives on visitor and employee safety includes the staging and release areas in the North Cascades national forests as well as suitable mountain goat habitat connected to the release areas.

Duration and Type of Impacts. The analysis of the duration and type of impacts on visitor and employee safety under each alternative was based on the following issue statements:

- **Issue Statement.** The translocation of habituated or salt-conditioned mountain goats to the North Cascades national forests, and their future population growth, could present a threat to visitor and employee safety.
- **Issue Statement.** Management operations associated with the translocation of mountain goats may involve the use of helicopters within steep, uneven terrain, which could present a threat to visitor and employee safety.

Alternative A: No Action and Alternative C: Lethal Removal

Under alternatives A and C, no mountain goat translocation actions would occur in the North Cascades national forests area. Thus, there would be no impacts on visitor and employee safety in the Mt. Baker-Snoqualmie or Okanogan-Wenatchee National Forests because no mountain goats would be released there. Current conditions and trends associated with visitor and employee safety in the project area would continue, as outlined in “Chapter 3: Affected Environment.” Because there would be no impacts from the alternatives, there would be no cumulative impacts.

Alternative B: Capture and Translocation and Alternative D: Combination of Capture and Translocation and Lethal Removal (Preferred Alternative)

Impacts Associated with Translocation of Mountain Goats

Translocation of mountain goats to the North Cascades national forests may affect employee and public safety in two ways: 1) through the potential for increased human-mountain goat interactions; and 2) risks associated with staging and release activities. As described below, negligible impacts are expected to visitor and employee safety within the North Cascades national forests from the translocation of mountain goats.

The behavior of wildlife can be unpredictable, and any individual wild animal can pose a safety danger to humans. Because of their sharp horns, any mountain goat can potentially be dangerous. Translocating additional mountain goats to the North Cascades national forests could increase the frequency of mountain-goat human interactions in that area because of the increase in the number of individual mountain goats present. However, because those portions of the North Cascades national forests that currently have mountain goat populations present have not resulted in substantial negative interactions between humans and mountain goats, augmentation of the population is not expected to significantly increase the risk of such interactions. Additionally, to further reduce the potential for habituated mountain goats to become conditioned goats, mountain goats from certain areas on the Olympic Peninsula assumed to be habituated to human presence (Hurricane/Klahhane Ridge, Lake of Angels, Seven Lakes Basin, Mt. Ellinor, and The Brothers) would not be translocated to high recreational use areas in the North Cascades national forests.

Activities at staging and release areas could affect visitor safety if visitors are present in staging and release areas during mountain goat translocation operations. Therefore, staging and release areas where translocation operations are ongoing would be closed as necessary to mitigate the risk to public safety (up to the full duration of a 2-week management period). Closure areas would be identified and the public would be notified of closures in advance of operations. USDA Forest Service and WDFW would provide advance notice to the public through public outreach, signage, and online notices regarding closures and potential visitor safety impacts. As a result of these mitigating actions, the probability of adverse impacts on visitor safety from capture operations under alternatives B and D is considered to be low.

Staging and release areas were selected because they are located in areas that would facilitate safe helicopter access and landing. WDFW personnel and contractors would follow relevant aircraft safety guidelines for helicopter use areas and qualified helicopter managers would be on site to assist in site safety and logistics. Overall, activities at staging areas under alternatives B and D could result in risks to personnel safety; however, the probability of adverse impacts would be considered low with the incorporation of safety mitigations.

Personnel involved with transferring mountain goats during staging and release operations could be injured by the mountain goats (e.g., through kicks, bites, stabbing with horns). To mitigate this risk, transfer and release of mountain goats would be carried out only by qualified, properly trained WDFW employees and contractors. These personnel would apply safety training and awareness measures designed to reduce safety risks, including adherence to safety protocols. Employees would use appropriate personal protective equipment, and job hazard analysis and project-specific safety plans would be implemented for all on-the-ground activities related to capture and translocation of mountain goats. Thereby, the potential for adverse impacts on employee safety would be minimized.

Helicopter-related operations would present some risk of accidents or injuries to employees and contractors during release efforts. If an accident occurred, the adverse impact on personnel safety could be substantial; however, the likelihood of an accident occurring is considered to be minimal. Personnel taking part in helicopter-based operations would be highly trained and qualified, and required to observe proper safety protocol and use proper personal protective equipment. Equipment would be well-maintained and helicopter flights would only take place during favorable weather conditions. In addition, an aviation safety plan would be developed and implemented for each specific flight. As a result, the risk of accident or injury during helicopter-based capture operations and the associated adverse impacts on employee safety would be minimized.

Cumulative Effects

Ongoing and reasonably foreseeable future actions with the potential to impact visitor and employee safety include road and trail maintenance, and other administratively necessary flights associated such as those proposed for monitoring reintroduced fishers. Routine road and trail maintenance would have beneficial impacts on visitor and employee safety by providing a well-maintained road and trail system and correcting potentially unsafe road and trail conditions as they occur. Helicopter flights related to fisher restoration activities would present some risk of adverse impacts on personnel safety related to accidents involving the use of helicopters; however, these would be minimized by proper pilot training and appropriate flight safety protocol for both pilots and other personnel involved.

Overall, when the adverse effects of alternatives B or D are combined with the effects of other ongoing and reasonably foreseeable future activities, there would be an overall adverse cumulative impact that is mainly due to an increase in the risk to personnel safety related to helicopter use. The cumulative effect to safety related to helicopters is not measurable, but is nevertheless expected to be relatively small.

Conclusion

Alternatives A and C would not affect visitor and employee safety in the North Cascades national forests. Mountain goat translocation under alternatives B and D would pose some risk to employee and public safety associated with operations and handling of mountain goats at staging and release areas, as well as potential for human-mountain goat interactions following translocation. An increase in the size and distribution of mountain goat populations in the North Cascades national forests could adversely affect employee and public safety because of the risk that mountain goats would become conditioned to human presence and negative mountain goat-human interactions would increase. However, this adverse impact on safety would be minimal, because augmentation of the population is not expected to significantly increase the risk of such interactions. Risks associated with translocation operations would be mitigated through incorporation of safety planning, training, and equipment including aviation safety plans.

Forest Plan Consistency

All alternatives would meet Forest Plan standards and guidelines relevant to visitor and employee safety, and would therefore be consistent with the Mt. Baker-Snoqualmie, Okanogan, and Wenatchee Forest Plans (USDA 1989, 1990a, 1990b), as amended.

UNAVOIDABLE ADVERSE IMPACTS

The NPS is required to consider if the alternative actions would result in impacts that could not be fully mitigated or avoided (US Department of Interior NEPA regulations section 46.415).

The following discussion describes the potential for unavoidable adverse impacts by alternative. Impacts for alternatives B and D refer to impacts on both the Olympic Peninsula and the North Cascades national forests, while the discussion for alternatives A and C only apply to the Olympic Peninsula.

Alternative A: No Action

Under alternative A there would be unavoidable adverse impacts on wilderness due to the continued presence of an exotic species in a natural system. Wildlife and wildlife habitat, vegetation, threatened or endangered species, soils, and archeological resources would be adversely affected as mountain goats would continue to forage, wallow, trample, and trail destroying vegetation (including special-status species), wildlife habitat, soils, and archeological resources. As the mountain goat population increases, and as mountain goats become increasingly habituated and conditioned to seek salts from humans, adverse impacts on visitor use and experience and visitor and employee safety could increase.

Alternative B: Capture and Translocation

Under alternative B, there would be unavoidable adverse impacts on mountain goats on the Olympic Peninsula as the population is captured and moved out of the area. Management activities may result in unavoidable casualties of individual mountain goats, resulting in adverse impacts. Capture and translocation of mountain goats in wilderness would adversely affect the untrammeled and undeveloped qualities of wilderness character and temporarily disrupt opportunities for solitude in the short term, but would enhance the natural quality of wilderness character over the long term in both project areas. Unavoidable short-term, adverse impacts would occur during initial management activities to the acoustic environment and to resources such as wilderness character, wildlife, visitor use, and possibly some special status species in both project areas from the noise and disturbance of helicopters, crews, and vehicles needed to carry out the capture and transfer. If the federally listed northern spotted owl and marbled murrelet are nesting near staging areas in the North Cascades national forests, temporary adverse effects would occur but it is not expected to adversely affect the species in the long term. Assuming maintenance continues and the mountain goat population is reduced, long-term, adverse impacts on the Olympic Peninsula to wildlife and wildlife habitat, vegetation, threatened or endangered species, soils, and archeological resources from mountain goats would be eliminated. As the mountain goat population decreased, impacts on visitor use and experience and visitor and employee safety resulting from mountain goats and mountain goat management activities would be eliminated.

Alternative C: Lethal Removal

Unavoidable impacts related to short-term disruption of the operations under alternative C would be similar to those discussed under alternative B, but occur only on the Olympic Peninsula since alternative C does not involve any transfer of mountain goats to the North Cascades national forests. However, unavoidable impacts on mountain goats would be severe as mountain goats on the Olympic Peninsula would be lethally removed.

Alternative D: Combination of Capture and Translocation and Lethal Removal (Preferred Alternative)

Unavoidable impacts under alternative D would be similar to those discussed under alternative B for both project areas. However, as discussed under alternative C, unavoidable impacts on mountain goats would be severe as some mountain goats on the Olympic Peninsula would be lethally removed.

SUSTAINABILITY AND LONG-TERM MANAGEMENT

According to the World Commission on Environment and Development, "sustainable development is that which meets the needs of the present without compromising the ability of future generations to meet their needs." For each alternative considered in a NEPA document, considerations of sustainability must demonstrate the relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity. This is described below for each alternative. The NPS must consider if the effects of the alternatives involve tradeoffs of the long-term productivity and sustainability of resources for the immediate short-term use of those resources. It must also consider the effects of the alternatives over the long term, without causing adverse environmental effects for future generations (NEPA section 102(c)(iv)).

Alternative A: No Action

Alternative A would trade long-term productivity for short-term use of natural resources in the Olympic Mountains. The mountain goat population would continue to grow over time and this increasing population would continue to forage, wallow, trample, and trail at the expense of the long-term productivity and sustainability of the vegetation, wilderness character, wildlife and wildlife habitat, threatened or endangered species, soils, and archeological resources. The increasingly habituated mountain goat population would also continue at the expense of the long-term sustainability of visitor use and experience and visitor and employee safety.

Alternatives B, C, and D

Under all action alternatives, there would be a short-term commitment of human resources and short-term impacts on wilderness character, wildlife, threatened or endangered species, visitor use and experience, and visitor and employee safety during active mountain goat management activities. The short-term use and disruption to resources, and the reduction in the mountain goat population on the Olympic Peninsula, would result in protection of the long-term productivity of the Olympic Mountain's vegetation, wilderness character, wildlife and wildlife habitat, and threatened or endangered species and the sustainable use of park resources, and, under alternatives B and D, would support the long-term reintroduction or augmentation of a native species in its historic habitat in the North Cascades national forests.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

The NPS must consider if the effects of the alternatives cannot be changed or are permanent (that is, the impacts are irreversible). The NPS must also consider if the impacts on resources would mean that once gone, the resource could not be replaced; in other words, the resource could not be restored, replaced, or otherwise retrieved (NEPA section 102(c)(V)).

Alternative A: No Action

Under alternative A, continued wallowing, trampling, and trailing behaviors by mountain goats could result in irreversible or irretrievable impacts on sensitive alpine and subalpine soils, sensitive vegetation species (including endemic species), and unidentified archeological resources if no actions are taken to reduce mountain goat numbers on the Olympic Peninsula and impacts become severe over time. Irreversible impacts on vegetation in alpine and subalpine communities could impact wildlife species by altering habitat that these species rely on.

Alternatives B, C, and D

Alternatives B, C, and D have the potential to result in irreversible impacts during initial reduction activities similar to those impacts described for the no-action alternative. Some soils, vegetation, and archeological resources in alpine and subalpine areas could be irreversibly affected by mountain goat wallowing, trampling, and trailing; however, these impacts would be less than those attributable to alternative A. Under all action alternatives, there would be long-term and substantial impacts on the mountain goat population on the Olympic Peninsula, because it would be greatly reduced or eliminated, but this would not be an irreversible or irretrievable impact because it would be possible, albeit not desired, to reintroduce mountain goats to the Olympic Peninsula.

Chapter 5:

Consultation and Coordination

CHAPTER 5: CONSULTATION AND COORDINATION

The *National Environmental Policy Act* (NEPA) regulations require an "early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action" (40 CFR 1501.7). This section describes the consultation that occurred during development of this *Mountain Goat Management Plan / Environmental Impact Statement* (plan/EIS), including consultation with scientific experts and other agencies. This chapter also includes a description of the public involvement process.

HISTORY OF PUBLIC INVOLVEMENT

The public involvement activities for this plan/EIS fulfill the requirements of NEPA and its implementing regulations.

The Scoping Process

The National Park Service (NPS) divides the scoping process into two parts: internal scoping and external or public scoping. Internal scoping involved discussions among NPS staff regarding the purpose of and need for management actions, issues, management alternatives, mitigation measures, the area of analysis, appropriate level of documentation, available references and guidance, and other related topics.

Public scoping is the early involvement of interested and affected public in the environmental analysis process. The public scoping process helps ensure that people have an opportunity to comment and contribute early in the decision-making process. For this plan/EIS process, project information was distributed to individuals, agencies, and organizations early in the scoping process, and people were given opportunities to express concerns or views and to identify important issues or alternatives.

Taken together, internal and public scoping are essential elements of the NEPA planning process. The following sections describe the various ways scoping was conducted for this plan/EIS.

Internal Scoping

A two-day internal scoping teleconference was held on February 19 and March 13, 2014, to discuss the development of a mountain goat management plan for Olympic National Park. During the 2-day meeting, NPS staff identified the purpose of and need for action, management objectives, issues and impact topics, and preliminary alternative approaches. A subsequent agency coordination meeting was held on July 2, 2014, at Olympic National Park headquarters, attended by regional and local managers, planners, ecologists and wildlife biologists with NPS, US Department of Agriculture (USDA) Forest Service, and Washington Department of Fish & Wildlife (WDFW). Cooperating agency status and the public scoping process were also discussed.

Public Scoping

To determine the scope of issues to be analyzed in depth in this plan/EIS, public scoping was conducted in the summer of 2014. The public scoping process began on July 21, 2014, with the publication of a Notice of Intent in the *Federal Register* (FR) (FR, Volume 79, Number 139). In addition to the Notice of Intent, preliminary information regarding the plan/EIS was provided to the public and other interested parties through a press release (sent to 53 media outlets and approximately 100 interest groups, partners, or individuals) and a public scoping letter (sent to 101 interested individuals and organizations). These

announcements notified the public of public scoping open houses and of the opportunity to provide comments on the plan/EIS process.

The public scoping comment period was open for a total of 60 days between July 21, 2014, and September 19, 2014. During this time, three public scoping open houses were held at the following locations:

- August 11, 2014: Seattle Public Library, Seattle, Washington
- August 12, 2014: Olympic National Forest Headquarters, Olympia, Washington
- August 13, 2014: Port Angeles Public Library, Port Angeles, Washington

A total of 55 people attended the three meetings (10 people attended the meeting in Seattle, 5 people attended the meeting in Olympia, and 40 people attended the meeting in Port Angeles).

At each meeting, the NPS, WDFW, and USDA Forest Service provided handouts that included information about the background of the project, the proposed purpose and need, the proposed plan objectives, the preliminary alternative concepts, the NEPA process, and information on how to comment, including directing comments to the NPS Planning, Environment, and Public Comment (PEPC) website. This information was also displayed on boards at each meeting venue. Park staff were available to answer questions and provide additional information to open house attendees. Attendees were also welcome to submit any written comments they had brought with them into the provided boxes. Comment forms could also be taken home and mailed at a later time.

Approximately 2 weeks prior to the end of the comment period (on September 18, 2014), the NPS issued a second press release to 169 media outlets, interested groups, and interested individuals reminding the public of the opportunity to review the preliminary draft documents and to provide comments and suggestions.

Nearly 100 pieces of correspondence were received during the public scoping comment period. Following the public scoping period, the NPS reviewed all public comments and a Comment Analysis Report was developed to compile and correlate similar public comments into a format useable by the decision-makers and the planning team. The Comment Analysis Report provides assistance in organizing, clarifying, and addressing technical information pursuant to NEPA regulations and in identifying the topics and issues to be evaluated and considered throughout the planning process. All scoping comments were considered to be important and useful guidance in the plan/EIS process.

Public Review of the Draft Plan/EIS

The NPS published the notice of availability for the draft plan/EIS in the *Federal Register* (82 FR 140) on July 24, 2017. Upon publication of the Notice of Availability of the draft plan/EIS in the *Federal Register*, a news release was provided to the 53 media outlets who received the news release announcing the Notice of Intent in July 2014. Notice and instructions on to how access and comment on the draft plan/EIS was provided to the media, interested individuals, tribes, organizations, and other potential stakeholders via the NPS and USDA Forest Service standard mailing/distribution lists. The NPS and USDA Forest Service also contacted local government officials, congressional offices, and state legislators (in cooperation with the WDFW) to notify them of the availability of the draft plan/EIS. The draft plan/EIS was also posted online at the NPS PEPC website. The NPS hosted four public open house meetings to discuss the proposed draft plan/EIS for managing mountain goats in Olympic National Park. This list shows the times and locations of these meetings, as well as the number of attendees at each meeting.

- Monday, August 14, 2017: Olympic National Forest Supervisor's Office, 1835 Black Lake Boulevard SW, Olympia, Washington, 5:00 pm–7:00 pm PST; 35 people attended.
- Tuesday, August 15, 2017: Olympic National Park Visitor Center, 3002 Mount Angeles Road, Port Angeles, Washington, 6:00 pm–8:00 pm PST; 75 people attended.
- Wednesday, August 16, 2017: Everett Public Library Auditorium 2702 Hoyt Avenue, Everett, Washington, 5:00 pm–7:00 pm PST; 5 people attended.
- Thursday, August 17, 2017: Seattle Public Library (Douglass-Truth Branch), 2300 Yesler Way, Seattle, Washington, 5:00 pm–6:00 pm PST; 6 people attended.

A total of 2,311 pieces of correspondence were received during the public comment period (July 24, 2017 through October 10, 2017). Agency responses to all substantive public concerns raised during the public review period for the draft plan/EIS are provided in appendix J.

AGENCY CONSULTATION

USDA Forest Service

In accordance with a memorandum of understanding between NPS, the USDA Forest Service, and WDFW, dated August 11, 2015, the USDA Forest Service is a cooperating agency for this plan/EIS process. The USDA Forest Service has participated in internal planning meetings, including the alternatives development meeting, reviewed project deliverables, and has contributed to the development of this plan/EIS in describing the affected environment and addressing potential impacts that may result from NPS actions in Olympic National Forest. The USDA Forest Service provided separate discussion of the background for the purpose and need related to receiving mountain goats in the North Cascades national forests, along with description of the affected environment and analysis of the potential impacts that may result from that action. The USDA Forest Service will continue to participate to ensure that impacts to National Forest System (NFS) property or resources associated with project alternatives are properly analyzed and adequately described throughout the remaining phases of the NEPA process and into project implementation.

Washington Department of Fish & Wildlife

In accordance with the aforementioned memorandum of understanding between NPS, the USDA Forest Service, and WDFW, WDFW is a cooperating agency for this plan/EIS process and has participated in internal planning meetings, including the alternatives development meeting. WDFW has contributed to the development of this plan/EIS by sharing their in-depth knowledge and experience in mountain goat management in Washington State. WDFW will continue to participate throughout the remaining phases of the NEPA process by providing technical expertise and support related to issues for which WDFW has management authority or expertise.

US Fish and Wildlife Service

As described in the section “Threatened or Endangered Species” in chapter 3, there are federally listed species and designated critical habitat in the vicinity of the project area. As a result, in accordance with section 7 of the *Endangered Species Act* of 1973 (ESA), the NPS will seek US Fish and Wildlife Service (USFWS) concurrence with the determinations presented in chapter 4 regarding potential effects on federally listed species. During public scoping, a letter was sent to the USFWS, Washington Fish and Wildlife Office, initiating informal consultation.

During follow-up correspondence via phone between the park and USFWS, USFWS confirmed receipt of the Notice of Intent and indicated that they will provide response upon review of the plan/EIS (Miller pers. comm. 2016b). Also, to ensure that proposed management activities would not occur adjacent to occupied northern spotted owl or marbled murrelet habitat, or suitable nesting habitat for marbled murrelet, all potential staging areas were evaluated during a January 2016 field trip by several wildlife biologists with the NPS, WDFW, and USDA Forest Service (Happe et al. 2016). Another field trip occurred on November 4, 2016, attended by wildlife biologists with USDA Forest Service and USFWS, in order to specifically evaluate the habitat suitability for northern spotted owl and marbled murrelet at Hamma Hamma and Mt. Ellinor staging areas, in the Olympic National Forest (Piper pers. comm. 2016b). A copy of the draft plan/EIS was provided to the USFWS on March 30, 2017, along with a request for review and concurrence on the stated determination of effect for threatened or endangered species. Consultation will be complete prior to issuing a decision.

Washington State Historic Preservation Office

A letter was sent to the Washington State Department of Archeology and Historic Preservation in October, 2014, announcing the Notice of Intent to prepare this plan/EIS. A subsequent letter and accompanying map were sent to the Washington State Department of Archaeology and Historic Preservation on September 16, 2016, requesting concurrence with the area of potential effect used in the analysis of potential effects on cultural resources. The Department of Archaeology and Historic Preservation responded on September 20, 2016, expressing concurrence with the proposed area of potential effect as detailed in the letter and associated map.

In accordance with section 106 of the *National Historic Preservation Act*, further consultation with the Department of Archaeology and Historic Preservation concerning the potential impacts to cultural resources was initiated by the NPS and USDA Forest Service during public and agency review of the plan/EIS. A copy of the plan/EIS was provided to the Department of Archaeology and Historic Preservation in July 2017 along with a request for review and concurrence on the determination of effect stated in the plan/EIS document. No response was received.

TRIBAL TREATIES AND CONSULTATION

Tribal Treaties. The park recognizes that the tribes' relationship to lands in the park have endured for thousands of years, and park staff continue to work with tribes to ensure that sites of traditional importance are preserved and protected. Park staff strive to create and maintain positive, productive, government-to-government relationships with these tribes (NPS 2008a).

Tribal Consultation. The appropriate level of tribal government has been consulted during the development of this plan/EIS. During public scoping and release of the draft plan/EIS, letters were sent to 16 tribes, including the eight federally recognized tribes having association with the Olympic Peninsula (Lower Elwha Klallam Tribe, Jamestown S'Klallam Tribe, Port Gamble S'Klallam Tribe, Skokomish Indian Tribe, Quinault Indian Nation, Hoh Tribe, Quileute Nation, and Makah Tribe). Following expression of interest in the plan/EIS process by the Skokomish Indian Tribe, a formal government-to-government meeting was held on May 27, 2015. During this meeting, the Skokomish Indian Tribe indicated their support for the removal of mountain goats from the Olympic Peninsula. The park also met with the eight affiliated tribes during their annual Tribal Memorandum of Understanding meetings. At the time of the meetings, tribal representatives expressed that they had no objections with actions being considered in the plan/EIS (Miller pers. comm. 2016b). Copies of the September 6, 2016, letter to the Department of Archaeology and Historic Preservation were also forwarded by NPS to the tribes listed

above. One tribe, the Jamestown S'Klallam Tribe, responded with a letter on September 20, 2016, concurring with the NPS determination of the area of potential effect.

During review of the draft plan/EIS, the NPS received responses from three tribes. The Nisqually Indian Tribe thanked the NPS for the opportunity to review and had no further information or concerns regarding the project. The Muckleshoot Indian Tribe Wildlife Program recommended selection of alternative D and requested collaring or ear-tagging mountain goats with radio transmitters as well as a provision to allow helicopter landing in designated wilderness to investigate marked-animal mortalities. The Muckleshoot Indian Tribe Wildlife Program requested analysis regarding predators, specifically cougars, in the release areas, and requested that all tribes should be eligible to receive carcasses if animals die during the translocations process. The tribe also requested that tribal members should be considered to assist in lethal removal efforts. The Sauk-Suiattle Tribe replied, noting support of alternative B and opposed alternative C. The Sauk-Suiattle Tribe offered to assist translocation efforts near Darrington, Washington.

LIST OF RECIPIENTS OF THE FINAL PLAN / ENVIRONMENTAL IMPACT STATEMENT

Upon publication of the Notice of Availability of the final plan/EIS in the *Federal Register*, notice will be provided to interested individuals, organizations, and media via email or postcard announcing the availability of the plan for public viewing. The plan will be available on the NPS Planning, Environment, and Public Comment website (http://parkplanning.nps.gov/olymgoat). Copies of the final plan/EIS will be provided to cooperating and consulting agencies. A limited number of hardcopies will be available for viewing at park headquarters.

This final plan/EIS will be made available for public inspection for a 30-day no-action period, which begins with the publication of the US Environmental Protection Agency's Notice of Availability in the *Federal Register*. After the 30-day no-action period, a record of decision (ROD) will be prepared that will document approval of the plan, select the alternative to be implemented, and set forth any stipulations required for implementation.

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United States Department of Agriculture Forest Service		
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Washington Department of Fish & Wildlife		
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References, Glossary, and Index

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GLOSSARY

adverse: a change that moves the resource away from a desired condition or detracts from its appearance or condition.

aversive conditioning: application of negative reinforcement aimed at behavior modification of a specific animal(s) using hazing techniques on a consistent basis. Examples may include shouting, throwing of rocks, and the use of, noise making devices (e.g., cracker shells).

aesthetic/esthetic value: value of a property based on its appearance.

analysis area: Olympic National Park, Olympic National Forest, Mt. Baker-Snoqualmie National Forest, and Okanogan-Wenatchee National Forest.

backcountry: a part or parts of a park or forest beyond main developed use areas and generally not accessible to vehicular travel. Backcountry is characteristically of primitive or wilderness nature, of considerable dimensions, and accessible, if at all, only by horse or foot trails or in some cases by unimproved roads.

beneficial: a change in the condition or appearance of the resource that moves the resource toward a desired condition.

biodiversity: diversity among and within plant and animal species in an environment.

capture: the actions associated with taking mountain goats captive prior to translocation.

conditioned: describes mountain goat behavior defined by any one or more of the following: has sought and obtained non-natural foods, destroyed property, displayed aggressive (non-defensive) behavior toward humans, or become overly familiar with humans.

conservation: those measures of park management directed toward perpetuating park resources unimpaired for the enjoyment of present and future generations.

critical habitat: specific geographic areas designated under the *Endangered Species Act* by the US Fish and Wildlife Service (US FWS) for federally listed threatened or endangered species, whether occupied by listed species or not, that are determined to be essential for the conservation and management of listed species, and that have been formally described in the *Federal Register*.

cumulative impact: the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions.

delisted: the removal of a species from the federal lists of endangered and threatened wildlife and plants.

developed area: roads, parking areas, picnic areas, frontcountry campgrounds, concessions and administrative facilities, residences and/or adjacent lands.

dispatch: to quickly and humanely euthanize an animal.

ecosystem: a system, or a group of interconnected elements, formed by the interaction of a community of organisms with their environment.

endemic species: a species of organism that exists only in one geographic area.

ethnographic resources: landscapes, objects, plants and animals, or sites and structures that are important to a people's sense of purpose or way of life.

exotic: those species that occupy or could occur directly or indirectly as the result of deliberate or accidental human activities. Exotic species are also commonly referred to as nonnative, alien, or invasive species. Because an exotic species did not evolve in concert with the species native to the place, the exotic species is not a natural component of the natural ecosystem at that place.

frontcountry: areas near well-developed trails, sites with picnic tables, areas proximate to ranger stations and/or visitor centers, and designated campgrounds (i.e., those with fireplaces, water pumps, and/or bathrooms).

guided recreation: activities or sports where individuals participate under the direction of an experienced guide.

habitat destruction: the process by which natural habitat is damaged or destroyed to such an extent that it no longer is capable of supporting the species and ecological communities that naturally occur there.

habituated: mountain goat behavior that includes one or more of the following circumstances: has become accustomed to frequenting developed areas, backcountry campgrounds, trails or roadsides, but has retained its natural foraging behavior. Habituated mountain goats have not necessarily become overly familiar with humans, but are comfortable in the presence of humans.

herbivory: the consumption by an animal of plants or plant-like organisms.

intensity: the severity or magnitude of an impact. The Council on Environmental Quality (CEQ) identifies ten factors to be considered in evaluating the intensity of an impact.

interpretive activity/program: an activity that presents the inspirational, educational, and recreational values of the parks in such ways that visitors may derive the utmost in understanding, appreciation, and enjoyment from their experience.

interspecific competition: a form of competition between members of different species inhabiting the same ecological area.

invasive species: those species that are not only nonnative, but also negatively impact the environment.

lethal removal: the use of lethal population control methods, including culling, poisoning, public hunting, or other means to reduce and/or eliminate a population of wildlife.

management action: any action taken by management that directly affects mountain goats and/or the public. This includes, but is not limited to: preparation of staging areas, mountain goat capture, mountain goat translocation, mountain goat release, trail closures, or campground closures.

management indicator species: plant and animal species, communities, or special habitats selected for emphasis in planning, and which are monitored during forest plan implementation in order to assess the effects of management activities on their populations and the populations of other species with similar habitat needs which they may represent.

natural wilderness: an area that shows minimal effects of modern civilization upon the ecological systems and their biological and physical components. A natural wilderness comprises landforms, soils, waterways, habitats, species, and terrestrial food webs that are largely intact in their natural state and not influenced by human activities and external threats.

nonnative species: those species that have been introduced into new areas that have not historically been part of their native range.

Olympic Peninsula: the geographic area in western Washington that contains the Olympic Mountains, where exotic mountain goats require management on federal lands within Olympic National Park and Olympic National Forest. It is bounded on the west by the Pacific Ocean, on the north by the Strait of Juan de Fuca, and the east by Hood Canal, which is the western lobe of Puget Sound.

North Cascades national forests: the combined geographic area encompassed by the Mt. Baker-Snoqualmie National Forest and the Okanogan-Wenatchee National Forest, the two national forest units where release sites for translocated mountain goats would be located.

noxious weed: a plant that when established is highly destructive, competitive, or difficult to control by cultural or chemical practices

ozone: a colorless, odorless reactive gas comprised of three oxygen atoms.

park visits: a term preferred (rather than "visitation") to express the concept of the volume of public entry and use of the parks or of the number of people coming to the parks. Similar to forest visits.

permit: a special written permission by National Park Service (NPS) or US Department of Agriculture (USDA) Forest Service authorizing access to specific remote, wilderness areas and the backcountry.

predation: a relation between animals in which one organism captures and feeds on others.

public scoping: the early involvement of the interested and affected public in the environmental analysis process.

record of decision: a concise decision document that contains a statement of the decision, identification of all alternatives considered, identification of the environmentally preferable alternative, a statement as to whether all practical means to avoid or minimize environmental harm from the alternative selected have been adopted (and if not, why they were not), and a summary of monitoring and enforcement where applicable for any mitigation (40 CFR 1505.2).

region of influence: the physical area that bounds the environmental, sociological, economic, or cultural feature of interest for the purpose of analysis.

regional forester sensitive species: plant and animal species identified by a Regional Forester for which population viability is a concern, as evidenced by significant current or predicted downward trends in population numbers or density; or significant current or predicted downward trends in habitat capability that would reduce the existing distribution of a species.

release site: a remote, designated site on National Forest System (NFS) lands where mountain goats would be released.

restoration: returning a site or area in a park as nearly as possible to the natural condition in which it was before some artificial alteration took place. Also, renewing or bringing back the elements of an existing historic scene, building, or object as nearly as possible to their original form.

riparian: of, relating to, or situated or dwelling on the bank of a river or other body of water.

special-status species: in Washington, these include those species listed as state endangered, state threatened, state sensitive, or state candidate, as well as species listed by the USDA Forest Service that are given extra measures of protection.

species of concern: see special-status species.

staging area: a designated area for landing, takeoff and fueling of helicopters, receiving and handling of mountain goats prior to transport, assembly of management personnel, and storage of equipment during mountain goat management activities.

subalpine: growing on mountains below the limit of tree growth, and above the foothill, or montane, zone.

survey and manage species: these three criteria must be met: (1) species must occur within the Northwest Forest Plan area, or occur close to the Northwest Forest Plan area, and have potentially suitable habitat within the Northwest Forest Plan area; (2) must be closely associated with late-successional or old-growth forest; (3) the reserve system and other Standards and Guidelines of the Northwest Forest Plan do not appear to provide for a reasonable assurance of species persistence.

threatened and endangered species: any species that is listed as threatened or endangered on the USFWS endangered species list and protected by the *Endangered Species Act*.

translocation: to move mountain goats from the Olympic Peninsula to the North Cascades forests.

undeveloped wilderness: an area of undeveloped federal land retaining its primeval character and influence, without permanent improvements or human habitation, with the imprint of man's work substantially unnoticeable.

ungulate: a hoofed mammal. Several species of ungulate occur in the analysis area, including mule deer, mountain goats, bighorn sheep, elk, and moose.

untrammeled wilderness: an area wherein ecological systems and their biological and physical components are autonomous, free from human intervention. Human actions that restrict, manipulate, or attempt to control the natural world within wilderness degrade the untrammeled quality.

watershed: a region or area drained by a river, stream, etc.

wilderness: a wild and undeveloped area where the processes of nature are left undisturbed by humans. The Wilderness Act of 1964 formerly recognizes wilderness as "where the earth and its community of life are untrammeled by man" and certain federal lands meeting that condition have been designated to the National Wilderness Preservation System.

wilderness character: a holistic concept based on the interaction of (1) biophysical environments primarily free from modern human manipulation and impact, (2) personal experience in natural environments relatively free from the encumbrances and signs of modern society, and (3) symbolic meanings of humility, restraint, and interdependence that inspire human connection with nature.

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