

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 and 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.

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.

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.

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

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 may exist with mountain goat management activities (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 and a blue bag system has been put in place for Mt. Olympus. 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. Blue bags used on Mt. Olympus are disposed of in a disposal structure above Glacier Meadows and transported out by helicopter in the fall. 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 mountain 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 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 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 approximately 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 approximately 90% or to 10% 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 drive the population to extinction. 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 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 approximately 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 90% or to 10% 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 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 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 90% of the mountain goat population on the Olympic Peninsula exclusively through lethal removal. There would be few discernible 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 untrammelled, 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 3 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 untrammelled, 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

Untrammelled. 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 untrammelled 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 mountain 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 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

Untrammled. 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. 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 untrammled 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. 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 untrammelled 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 untrammelled, 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

Untrammled. 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 untrammled 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. However, helicopters would not land in wilderness to pick-up and drop-off capture crews and sling mountain goats. 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 untrammled, 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

Untrammled. Alternative D would utilize a combination of capture and translocation and lethal removal tools to reduce the mountain goat population by 90%, which 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 untrammled 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.

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 noticeable 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. These management tools would, however, indirectly benefit recovery of natural conditions in wilderness by eliminating the mountain goat population. The cumulative effects of alternative D would be similar to those in alternatives B and C, and are expected to be adverse. 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 would become unnecessary, which negatively affect the undeveloped quality of wilderness. However, alternative D would have more adverse impacts than alternative C because initial management would last longer. 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; Mancini 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 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. There would be more on-the-ground disturbance over scattered areas from ground-based lethal removal. Because 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 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. 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. 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, but likely occur over a shorter time frame as the number of flights would decrease with decreasing mountain goat population. 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). 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. 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 90% or more, 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]henver 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 approximately 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 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 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 to 4 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 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 90% reduction 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 90% reduction 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 90% 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, and Is 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.

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.



FIGURE 12. SWEETS STAGING AREA

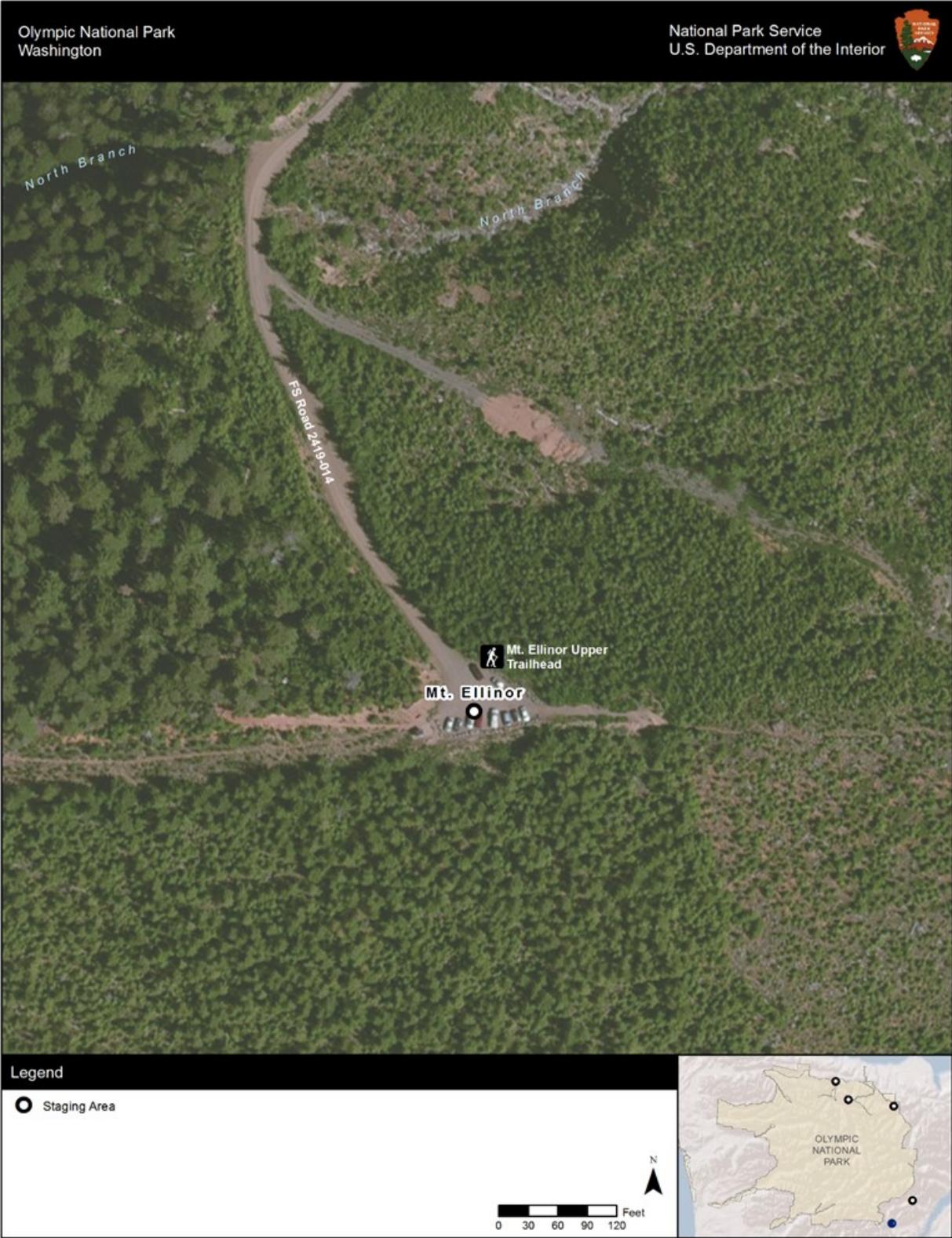


FIGURE 13. MT. ELLINOR STAGING AREA



FIGURE 14. HAMMA HAMMA STAGING AREA

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 B, 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 during the initial management phase. 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 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 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 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. 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 as 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.

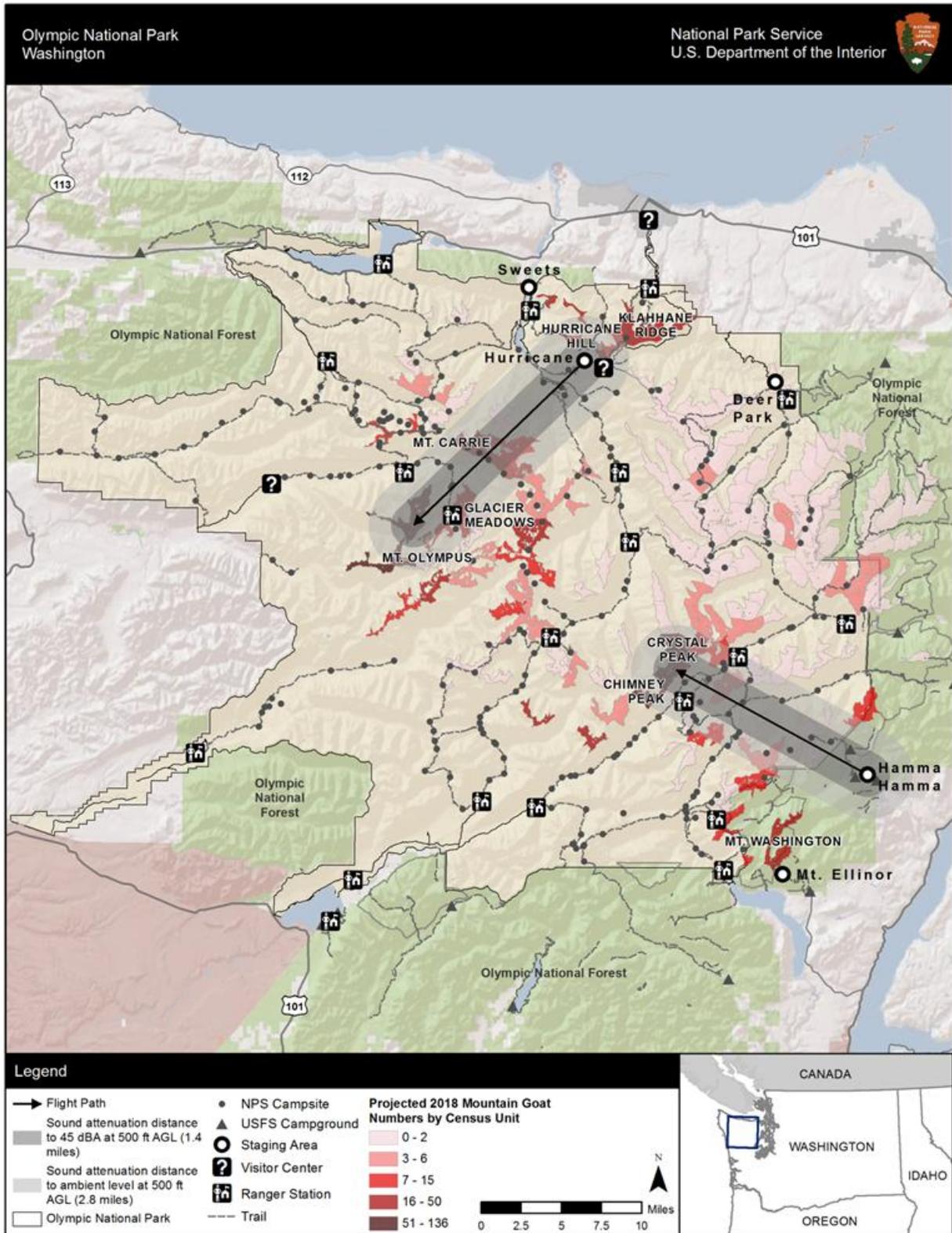


FIGURE 15. REPRESENTATIVE HELICOPTER FLIGHT PATHS AND POTENTIAL IMPACTS ON THE ACOUSTIC ENVIRONMENT OF THE OLYMPIC PENINSULA

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.

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 would be shorter and less frequent and less intense because there would likely be fewer visits to the staging areas. 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 approximately 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 approximately 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. 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 approximately 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 90% reduction or near 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 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 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 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 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 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. Only about 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 does not constitute an undertaking under section 106 of the *National Historic Preservation Act* because there would be no change to the existing conditions.

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 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.

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, approximately 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 front country (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 year, 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 between years 1 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 the approximately 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 could begin at some point during the second or third year 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 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. 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 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.

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.

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	
<i>North Cascades Ecosystem Draft Grizzly Bear Restoration Plan/EIS</i>	X	X		X	X	X
State Authorized Hunting		X		X		
Commercial, Military, and Private Overflights	X	X		X	X	

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.

North Cascades Ecosystem Draft Grizzly Bear Restoration Plan / Environmental Impact Statement. The NPS in cooperation with the USFWS is proposing to restore grizzly bear populations in North Cascades National Park, the Mt. Baker-Snoqualmie National Forest and the Okanogan-Wenatchee

National Forest (NPS 2017b). A draft EIS was released in January 2017. Most (7 of 12) release sites will be in wilderness.

- Project would occur over multiple years, at least 5 up to 20, depending on the alternative.
- Four round trip flights, including landings and takeoffs, per bear would be needed to move personnel and bear. An estimated 5 bears per year would be translocated to Glacier Peak Wilderness, Pasayten Wilderness (Okanogan-Wenatchee National Forest).

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

Untrammled. 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 untrammled 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 untrammled quality of wilderness character. In order to minimize the effect on the untrammled 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.

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.

Crews camping at the release sites inside wilderness areas 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 the *North Cascades Ecosystem Draft Grizzly Bear Restoration Plan/EIS*, 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.

The *North Cascades Ecosystem Draft Grizzly Bear Restoration Plan/EIS* (NPS 2017b) proposes to transfer grizzly bears into the Glacier Peak (Mt. Baker-Snoqualmie National Forest) and Pasayten (Okanogan-Wenatchee National Forest) wilderness areas. The project would use helicopters to deliver personnel and bears to release sites in these wilderness areas. Reintroduction of grizzly bears would constitute a trammeling activity, but would enhance the natural quality of these areas. Helicopter use for the grizzly bear restoration project would have short-term, adverse effects on the undeveloped quality and opportunities for solitude in these wilderness areas. The Pasayten release sites would not overlap with any proposed activities related to mountain goat release in the North Cascades national forests, so there would be no cumulative effects to wilderness character in that wilderness area. There could be some overlap between proposed mountain goat releases and grizzly bear releases in the Glacier Peak Wilderness. The mountain goat releases in wilderness sites would be completed primarily in the first year of implementation, with potential to extend into a second year. The grizzly bear releases would take place over a longer period and are dependent on the availability of bears. Any overlap between these activities would likely be limited to a few weeks in one summer season where helicopters being used to deliver mountain goats, bears, personnel, and equipment could be seen and heard in the Glacier Peak Wilderness.

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 and grizzly bears 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 reintroducing and monitoring grizzly bears and for monitoring reintroduced fishers in the North Cascades national forests would impact the untrammelled 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 untrammled 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 untrammled 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.

Rocky Mountain 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 and grizzly bear 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 Rocky Mountain 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, the *North Cascades Ecosystem Draft Grizzly Bear Restoration Plan/EIS*, state authorized hunting, and commercial, military, and private overflights.

The *North Cascades Ecosystem Draft Grizzly Bear Restoration Plan/EIS* (NPS 2017b) proposes to transfer grizzly bears into the Glacier Peak (Mt. Baker-Snoqualmie National Forest) and Pasayten (Okanogan-Wenatchee National Forest) wilderness areas. The project would use helicopters to deliver personnel and bears to release sites in these wilderness areas. Helicopter use for the grizzly bear restoration project would have short-term effects on sensitive or management indicator species and other wildlife that happen to be in the area. Any overlap between these activities would likely be limited to a few weeks in one summer season where helicopters being used to deliver mountain goats, bears, personnel, and equipment could be seen and heard. 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. 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. If fisher reintroduction is successful, they would have direct impact on their prey, which are typically larger-bodied small rodents such as woodrats, squirrels, and chipmunks. However, as a native species reintroduced to its historic habitat, these impacts would ultimately be ecologically beneficial. USDA Forest Service vegetation management projects could have both beneficial and adverse impacts on management indicator species and other wildlife depending on whether they create opportunities to enhance habitat.

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, 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, not likely to adversely affect* gray wolves.

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:

- Vesper Sperry
- Independence Lake Trailhead
- *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. 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. However, because proposed actions could disturb unknown nesting birds near staging areas, the effects determination is *likely to adversely affect* for 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:

- Vesper Sperry
- Independence Lake Trailhead
- *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. 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 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, 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, the *North Cascades Ecosystem Draft Grizzly Bear Restoration Plan/EIS*, 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.

The *North Cascades Ecosystem Draft Grizzly Bear Restoration Plan/EIS* (NPS 2017b) has recently been published (January 2017) and proposes to transfer grizzly bears into the Glacier Peak (Mt. Baker-Snoqualmie National Forest) and Pasayten (Okanogan-Wenatchee National Forest) wilderness areas. The project would use helicopters to deliver personnel and bears to release sites in these wilderness areas. Helicopter use for the grizzly bear restoration project would have short-term effects on federally listed or proposed species. Any overlap between these activities would likely be limited to a few weeks in one summer season where helicopters being used to deliver mountain goats, bears, personnel, and equipment could be seen and heard. 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

Northern spotted owl and marbled murrelet may be adversely affected if noise disturbance occurs during the nesting season, if unknown nesting birds near the staging sites are disturbed; this would result in a *may affect, likely to adversely affect* determination for each. 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. Therefore, this alternative would have *no effect* on designated critical habitat for these species.

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, not likely to adversely affect* determination for each.

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 would be adverse considering all actions in the cumulative impact scenario.

Based on the *may affect, not likely to adversely affect* determinations for northern spotted owl and marbled murrelet, formal consultation with the USFWS is required, and 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 Alpentel 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, the *North Cascades Ecosystem Draft Grizzly Bear Restoration Plan/EIS*, 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.

The *North Cascades Ecosystem Draft Grizzly Bear Restoration Plan/EIS* (NPS 2017b) has recently been published (January 2017) and proposes to transfer grizzly bears into the Glacier Peak Wilderness. The project would utilize helicopters to deliver personnel and bears to release sites in Glacier Peak Wilderness (Mt. Baker-Snoqualmie National Forest) and the Pasayten Wilderness (Okanogan-Wenatchee National Forest). The helicopter use for the grizzly bear restoration project would have short-term, adverse effects on the visitor use and experience in these wilderness areas. The Pasayten release sites would not overlap with any proposed activities related to mountain goat release in the North Cascades national forests, so there would be no cumulative effects in that wilderness area. There could be some overlap between proposed mountain goat releases and grizzly bear releases in the Glacier Peak Wilderness. The mountain goat releases in wilderness sites would be completed primarily in the first 2 years of implementation, with potential to extend into a third year. The grizzly bear releases would occur over a longer period and are dependent on the availability of bears. Grizzly bear release activities could begin in 2018 as well. Any overlap between these activities would likely be limited to a few weeks in one summer season where helicopters being used to deliver mountain goats, bears, and personnel could be seen and heard in the Glacier Peak Wilderness and vicinity. Grizzly bear reintroduction would enhance the natural quality experienced by visitors, especially those hoping to view a grizzly bear.

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 under the *North Cascades Ecosystem Draft Grizzly Bear Restoration Plan/EIS*. 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 grizzly bear 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 personnel involved in grizzly bear and mountain goat release activities.

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.

