



Chapter 4:

ENVIRONMENTAL CONSEQUENCES



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INTRODUCTION

This “Environmental Consequences” chapter analyzes the beneficial and adverse impacts that would result from implementation of any of the alternatives considered in this *North Cascades Ecosystem Grizzly Bear Restoration Plan / Environmental Impact Statement* (draft plan/EIS). The resource topics presented in this chapter correspond to the descriptions of existing conditions in “Chapter 3: Affected Environment.”

GENERAL METHODOLOGY FOR ASSESSING IMPACTS

The following analysis evaluates direct, indirect, and cumulative impacts on the human environment (physical, natural, cultural, and socioeconomic resources) from the grizzly bear restoration alternatives described in chapter 2. 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) and U.S. Department of the Interior regulations and guidance.

The potential for significant impacts from management activities are assessed and described in each resource topic as applicable.

GENERAL ANALYSIS METHODOLOGY AND ASSUMPTIONS

The interdisciplinary planning team reviewed a substantial body of scientific literature and studies applicable to the North Cascades Ecosystem (NCE) and associated resources. This information augmented observations and documentation gathered by National Park Service (NPS), U.S. Fish and Wildlife Service (FWS), U.S. Forest Service (USFS), and Washington Department of Fish and Wildlife (WDFW) personnel to support the qualitative and quantitative statements presented for each impact topic. When available, the methodology notes other resource-specific data, observations, or studies for each impact topic. The analysis focuses on expected environmental impacts related to the implementation of grizzly bear restoration activities.

Assessing Impacts Using Council on Environmental Quality Criteria

According to the CEQ National Environmental Policy Act (NEPA) regulations (40 Code of Federal Regulations [CFR] 1500–1508), the term “significant” 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 on 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 to 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 draft plan/EIS establishes goals, objectives, and specific implementation actions needed to restore grizzly bears to the NCE. For all action alternatives, the majority of initial management actions would likely occur within 5 to 25 years of implementation, with most of the impacts being greatest during this period. However, this plan would guide land managers into the future, as additional management actions are needed. To understand the potential long-term impacts associated with grizzly bear restoration, the analysis considers actions over the anticipated lifespan of this draft plan/EIS and beyond, during which time impacts could continue periodically. Management may continue into the future without additional NEPA analysis as long as there 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)).

The analysis of alternative B focuses on the primary phase of restoration—the release of up to 10 bears over 2 years with subsequent monitoring. The adaptive management phase of alternative B could include the release of additional bears to achieve an initial population of 25 grizzly bears; however, if pursued, impacts would be similar to alternative C. If the decision is made to repeat the primary phase of alternative B, impacts would be the same as those described for the initial releases.

Analysis Area. The area of analysis generally focuses on the NCE grizzly bear recovery zone as described in the North Cascades Ecosystem Recovery Plan chapter of the FWS *Grizzly Bear Recovery Plan* (FWS 1997). The 6.1 million acre (9,565 square mile) recovery zone includes all of the North Cascades National Park Service Complex (park complex) and most of the adjacent Okanogan-Wenatchee and Mt. Baker-Snoqualmie National Forests, along with small amounts of interspersed state and private land. Impacts are considered either localized (i.e., occurring in limited areas) or widespread (i.e., occurring over the entire area of analysis). For some impact topics, the area of analysis varies slightly and is further defined in those specific topics. References to “the NCE” are assumed to pertain specifically to the recovery zone as described above. Several resource topics also consider impacts in areas outside the NCE related to actions or impacts that may occur if bears move beyond the NCE.

Duration and Type of Impacts. 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 time frame over which impacts are expected to occur. In general, for all alternatives, impacts are considered and analyzed based on whether they would take place during the primary phase of grizzly bear restoration, anticipated to last between approximately 5 and 25 years depending on the action alternative, or whether they would persist beyond the primary restoration phase.

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 in the condition or appearance of the resource that moves the resource away from a desired condition or detracts from its appearance or condition.

Jurisdiction and Compliance

The NPS and FWS are the lead agencies for this planning process, whereas the USFS and WDFW are participating as cooperating agencies. The NPS has jurisdiction over NPS lands; however, the NPS must also consider the impacts of its actions on adjacent lands. The FWS has jurisdiction over the implementation of the *Endangered Species Act* (ESA), including the conservation of listed species such as the grizzly bear. The USFS has jurisdiction over national forest lands, and the lead agencies must coordinate with the USFS to engage in any grizzly bear restoration actions on its land. As such, compliance with all USFS laws, regulations, and policies would be required (see appendix B and appendix C). In addition, the WDFW could be involved with grizzly bear monitoring and maintenance activities, depending on the alternative ultimately selected, and would need to comply with its laws, regulations, and policies as appropriate.

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 each alternative with the impacts of other past, present, and reasonably foreseeable future actions. Therefore, it was necessary to identify other past, ongoing, or reasonably foreseeable future projects and plans within the area of analysis, and if applicable, the surrounding region. Past actions are those that have occurred or have been occurring in the NCE, and reasonably foreseeable future projects are those that are likely to occur within the life of the plan. Following the 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, Connaughton, pers. comm., 2005).

The cumulative impact analysis used the following four steps:

- Step 1 — Identify Resources Affected

Fully identify resources affected by any of the alternatives. These include the resources addressed as impact topics in chapters 3 and 4 (this chapter) of this document.

- Step 2 — Set Boundaries

Identify an appropriate spatial and temporal boundary for each resource. For example, the temporal boundaries extend from when areas were developed for hydroelectric purposes (because the development flooded available grizzly bear habitat) through the life of the plan (limited to those future actions where impacts could be reasonably predicted). The spatial boundary is the NCE unless otherwise described under each resource topic. Some actions located adjacent to but outside the NCE are also listed in order to consider potential future grizzly bear movements.

- Step 3 — Identify Cumulative Action Scenario

Determine which past, present, and reasonably foreseeable future actions to include for each resource. Reasonably foreseeable future actions include those federal and nonfederal activities not yet undertaken, but sufficiently likely to occur, that a reasonable official would take such

activities into account in reaching a decision. These activities include, but are not limited to, activities for which there are existing decisions, funding, or proposals identified. Reasonably foreseeable future actions do not include those actions that are highly speculative or indefinite (43 CFR 46.30).

- Step 4 — Cumulative Impact Analysis

Assess impacts of these other actions plus impacts of each alternative, to arrive at the total cumulative impact of each alternative and each alternatives contribution. This analysis is included for each resource in this chapter.

Past, Present, and Reasonably Foreseeable Actions in the North Cascades National Park Service Complex

Past, present, and reasonably foreseeable future projects or plans within the NCE and, if applicable, the surrounding region were identified through consultation with lead and cooperating agency personnel and through the public scoping process to provide the cumulative impact scenario. Similar to the analysis of impacts of the alternatives, the cumulative impacts analysis focuses on cumulative actions within the area of analysis, but also includes actions within the surrounding region as they apply to specific impact topics.

Impoundments for Hydroelectric Development. The Skagit River Hydroelectric Project, owned and operated by Seattle City Light, is a series of hydroelectric dams and associated impoundments on the Skagit River that has resulted in the inundation of riparian habitat along the river. The Lake Chelan Dam, which raised the level of the lake, has resulted in the inundation of additional wetlands and riparian habitat at the head of the lake. In all, approximately 29,800 acres of riparian habitat, which historically provided important spring foraging habitat for grizzly bears, have been inundated within the park complex.

Ongoing Wildlife Monitoring Efforts. The NPS and WDFW have a number of camera stations in the park complex, some with lures, to track larger carnivores.

Fisher Restoration. The *NPS Fisher Restoration Environmental Assessment* (NPS 2015i) sets out a plan to restore the Pacific fisher to the park complex, reintroducing 80 fishers within 2 years and then tracking fishers with fixed-wing aircraft (telemetry) for 3 years and following up with camera and hair snare monitoring.

Ongoing Trail Maintenance and Repairs. The trail network in the park complex includes a total of approximately 390 miles of trail and 130 backcountry camps, including various types of creek crossings/bridges, drainage structures, trail and camp signs, tent pads, fire grates and pits, wallowa and composting toilets, and hitchrails. A majority of these facilities receive some form of maintenance every year, most of which occurs between May 1 and September 30. Actions associated with this include, among others:

- opening the trail corridor, including brushing and removing fallen trees, debris, and rocks from the trail corridor;
- removing hazard trees near backcountry camps and historic structures; and
- completing minor (200 feet or less) trail relocations due to seasonal changes in the landscape, such as rockslides, erosion, and downed trees.

Some of this work requires helicopter use.

Invasive Plant Management within Wilderness. The *North Cascades National Park Service Complex Invasive Plant Management Plan and Environmental Assessment* (NPS 2012d) calls for invasive plant treatments within wilderness. Some of this work also includes helicopter flights.

Mountain Lakes Restoration (fish removal). The *North Cascades National Park Service Complex Mountain Lakes Fishery Management Plan / Environmental Impact Statement* (NPS 2008a) calls for restoration of mountain lakes through fish removal efforts (gill netting and piscicide use in some lakes). Some of this work also includes helicopter flights. Subsequent legislation (the *North Cascades National Park Service Complex Fish Stocking Act*, 2014) allows for the stocking of fish in selected lakes in the park complex.

Fire Management Operations. NPS fire management operations within the park complex include fire suppression and wildland fire management. Some of this work includes flights by helicopters and fixed-wing aircraft, which would result in noise impacts and could also result in the possible transfer of invasive terrestrial organisms (plant or animal) due to plants or seeds on gear or skids or invasive aquatic organisms via bucket drops.

Ross Lake National Recreation Area General Management Plan. The *Ross Lake National Recreation Area General Management Plan* (GMP) is a programmatic plan that addresses management of front country facilities and visitor use management in Ross Lake National Recreation Area. Actions include a number of possible new trails and relocation of the Thornton Lakes Trailhead to an area outside of wilderness. The Ross Lake GMP also established a long-term policy for grizzly bear core area management for the entire complex.

Stephen Mather Wilderness Management Plan. The *Stephen Mather Wilderness Management Plan* (NPS 1989) is a programmatic plan that addresses visitor use management in the backcountry.

Stehekin River Corridor Implementation Plan (NPS 2013b). The plan analyzed a range of alternatives to respond to the increased magnitude and frequency of flooding in the Stehekin River corridor within Lake Chelan National Recreation Area. The preferred alternative outlined major road reroutes, erosion abatement measures, and a process for private/federal land exchanges to move prioritized private parcels out of the floodplain. The primary action related to this plan with the potential to affect grizzly bears is a 2-mile reroute of the lower Stehekin Valley Road, to remove it from the Stehekin River floodplain and place it upslope. To date, this reroute has not been funded, nor is there any identified funding available for it. The impacts on grizzly habitat would likely be small.

Administrative Flights for Search and Rescue Operations. Administrative overflights for search and rescue operations occur intermittently as needed. These can affect solitude in wilderness areas and also carry a potential risk of invasive plant transmission from landing helicopters in backcountry areas.

Black Bear Management. Ongoing black bear management activities on NPS lands include but are not limited to public outreach and education, placement of signage at visitor centers and trailheads, sanitation measures such as installation of bear-resistant trash receptacles and food lockers at campgrounds, and backcountry food storage requirements. Aversive conditioning and, very rarely, temporary backcountry camp closures are also used in black bear management.

Past, Present, and Reasonably Foreseeable Actions on National Forest Lands

Forest Vegetation Management. Forest vegetation management activities include timber harvest, fuels management, thinning, restoration, and special forest product collection. There are multiple forest

vegetation management projects on each district of Okanogan-Wenatchee National Forest as well as one to two vegetation management projects on Mt. Baker-Snoqualmie National Forest each year.

Cattle and Sheep Grazing. No active allotments are located near potential release areas within the NCE. It is unlikely that USFS would reactivate any vacant allotments if they are near proposed grizzly bear release sites. However, grazing does occur in the NCE along its eastern boundary in Okanogan-Wenatchee National Forest and on private lands.

Motorized Travel Management Projects. For both forests, motorized travel management projects result in a change from a policy of “everything open to motorized use unless designated closed” to “everything closed to motorized use unless designated open.”

Mining. Ongoing mining operations on USFS lands in the NCE include the following:

- Olivine Mine, Mt. Baker-Snoqualmie National Forest. Operations include excavating, blasting, crushing, and hauling of ore; a future plan includes a 10-acre expansion.
- Purple Hope Mine, Mt. Baker-Snoqualmie National Forest. Operations include extraction, blasting, packing, and flying material off site.
- Buckhorn Mine, Okanogan-Wenatchee National Forest (located on east side of Tonasket District outside the recovery zone).
- Over 200 small-scale mining claims across both forests; operations include suction dredging, panning, prospecting, test pit exploration, and mineral and geothermal exploration projects.

Reasonably foreseeable mining operations on USFS lands in the NCE include the following:

- Flagg Mountain Exploratory Drilling on Okanogan-Wenatchee National Forest.
- Mt. Baker Geothermal Consent to lease on Mt. Baker-Snoqualmie National Forest. Consent to lease has been offered to Bureau of Land Management, and it is expected to offer parcels for leasing in 2017.
- Department of Natural Resources and U.S. Geological Survey Geothermal Exploration on Mt. Baker-Snoqualmie National Forest.
- None of these existing or reasonably foreseeable mining operations are near potential grizzly bear release areas. Proposals for new mining operations would be evaluated for their potential to affect the grizzly bear core area or result in disturbances to grizzly bears on a case-by-case basis through the environmental review and permitting process.

Ski Area Expansion Projects. Planned ski area expansion projects on USFS land that could have cumulative impacts on some of the resources considered in this draft plan/EIS include the following:

- Expansion of Nordic ski trails at White Pass Ski Area on Okanogan-Wenatchee National Forest (Naches District, outside the NCE grizzly bear recovery zone).
- Expansion of existing parking lots at Mt. Baker and Stevens Pass Ski Areas on Mt. Baker-Snoqualmie National Forest.

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Mine Cleanup and Abandoned Mine Lands Projects. Ongoing CERCLA mine cleanup projects in the NCE include the following:

- Holden Mine (Okanogan-Wenatchee National Forest);
- Monte Cristo Mine (Mt. Baker-Snoqualmie National Forest);
- Index Shooting Range (Mt. Baker-Snoqualmie National Forest); and
- Cashman Millsite (Mt. Baker-Snoqualmie National Forest).

Reasonably foreseeable future CERCLA mine cleanup projects in the NCE include the following:

- Copper City Mine (Okanogan-Wenatchee National Forest, Naches District, outside the recovery zone); and
- Sunset Mine (Mt. Baker-Snoqualmie National Forest).

Ongoing Trail Maintenance. Ongoing trail maintenance projects include logout, tread, and drainage structure maintenance on existing trail systems throughout both forests.

Ongoing Road Maintenance. Ongoing road maintenance projects include minor erosion damage repair, brushing, and surface and drainage structure maintenance of existing road systems on both forests.

Invasive Plant Management. Invasive plant management activities include hand-pulling, mowing, and herbicide application to existing and newly discovered weed populations on both forests.

Special Use Permit Issuance. USFS issues special-use permits for a number of different types of uses on both forests, including outfitter-guide use, road-use, communication towers, recreational events, and other types of activities. These include both existing multiple year permits and future annual permits.

River/Aquatic Restoration. River and aquatic restoration projects are occurring and planned on most, if not all, districts on both forests. These include fish passage barrier removals, large woody debris additions, side channel reconnection, riparian tree/shrub plantings, dike removals, road decommissioning, and other projects.

Fisher Restoration. The WDFW plans to restore the Pacific fisher (*Martes pennanti*) to Mt. Baker-Snoqualmie National Forest. Once fishers are released into the national forest, it is likely that camera stations would be placed in wilderness areas to monitor fisher populations. Impacts from fisher restoration on national forest lands are expected to be similar to those for fisher restoration on NPS lands.

Mountain Goat Relocation from Olympic National Park. The NPS, in cooperation with the WDFW and the two forests, is proposing to relocate mountain goats from Olympic National Park to suitable habitats on Mt. Baker-Snoqualmie and Okanogan-Wenatchee National Forests. Some of the staging areas proposed for this project could also be used for grizzly bear restoration activities. In addition, some of the release sites on Mt. Baker-Snoqualmie National Forest may be in wilderness.

Domestic/Bighorn Sheep Interaction Environmental Impact Statement. This environmental impact statement (EIS) will provide guidance for revising allotment management plans for all 13 domestic sheep allotments on Okanogan-Wenatchee National Forest, with emphasis on risk of contact between domestic and bighorn sheep and potential for disease transmission.

State Authorized Hunting and Fishing. The WDFW licenses recreational hunting and fishing within the state of Washington. Hunting is prohibited in the park complex but occurs on both Mt. Baker-Snoqualmie and Okanogan-Wenatchee National Forests as well as in the Ross Lake and Lake Chelan National Recreation Areas. Hunting seasons that overlap with proposed grizzly bear restoration activities (i.e., ungulate [deer and elk] and black bear seasons) could contribute to cumulative impacts. Fishing seasons could contribute increased pressure on fish resources as well.

Tribal Hunting, Fishing, and Gathering. A number of tribes conduct hunting, fishing, and gathering occurs on the national forests in accordance with their reserved treaty rights. A number of tribes have a wildlife co-management agreement with the WDFW for hunting species like deer, elk, and mountain goats, among others. Tribal members also harvest fish, like salmon and trout, and plants and berries, like salal and huckleberry.

Other Past, Present, and Reasonably Foreseeable Actions

Interstate 90 Expansion. The reconstruction of Interstate 90 over Snoqualmie Pass will involve an increased number of traffic lanes and construction of over and under-passes for terrestrial and aquatic organisms.

Commercial, Military, and Private Overflights. Overflights of the NCE by military, commercial, and private aircraft would occur throughout the lifespan of this draft plan/EIS. These flights increase the amount of audible noise within the NCE and could result in impacts on park and forest resources including wilderness, wildlife and wildlife habitat, and visitor use and recreational experience.

Cumulative Impact Scenario

Table 8 provides a matrix of the cumulative actions being considered and those resource topics that they could affect.

TABLE 8. CUMULATIVE ACTIONS AND POTENTIAL IMPACTS ON RESOURCES IN THE PROJECT AREA

Cumulative Action	Impact Topic						
	Grizzly Bears	Other Wildlife, Fish,	Wilderness Character	Visitor Use and Recreational Experience	Public and Employee Safety	Socioeconomics	Ethnographic Resources
Actions in the Park Complex							
Impoundments for Hydroelectric Development	X	X		X			X
Ongoing Wildlife Monitoring Efforts	X	X	X				
Fisher Restoration	X	X	X	X			
Ongoing Trail Maintenance and Repairs	X	X	X	X	X		
Invasive Plant Management within Wilderness		X	X				
Mountain Lakes Restoration (fish removal) and Act		X	X	X	X		
Fire Management Operations	X	X	X	X	X	X	
<i>Ross Lake National Recreation Area General Management Plan</i>			X	X			

Cumulative Action	Impact Topic						
	Grizzly Bears	Other Wildlife, Fish,	Wilderness Character	Visitor Use and Recreational Experience	Public and Employee Safety	Socioeconomics	Ethnographic Resources
<i>Stephen Mather Wilderness Management Plan</i>			X	X			
<i>Stehekin River Corridor Implementation Plan</i>	X	X		X	X	X	
Administrative flights for Search and Rescue operations	X	X	X	X	X		
Black Bear Management	X	X	X	X	X		
Actions on National Forest Lands in the NCE							
Forest Vegetation Management	X	X		X		X	X
Cattle and Sheep Grazing	X	X	X	X		X	X
Motorized Travel Management Projects	X	X		X		X	X
Mining	X	X	X	X		X	X
CERCLA Mine Cleanup and Abandoned Mine Lands Projects	X	X	X		X	X	X
Ski Area Expansion Projects	X	X		X		X	X
Forest Plan Updates	X	X	X	X	X	X	
Ongoing Trail Maintenance	X	X	X	X		X	
Ongoing Road Maintenance	X	X		X	X		
Wildfire Suppression	X	X	X	X	X	X	X
Invasive Plant Management		X					
Special Use Permit Issuance	X	X	X	X		X	
River/Aquatic Restoration	X	X		X			X
Fisher Restoration		X					
Mountain Goat Relocation from Olympic National Park		X	X	X			X
<i>Domestic/Bighorn Sheep Interaction EIS</i>	X	X	X			X	
Tribal Hunting, Fishing and Gathering	X	X		X			X
WDFW Actions in the NCE							
State Authorized Hunting and Fishing	X	X		X			
Monitoring Cameras in Park Complex		X	X				
Other Actions							
Interstate 90 Expansion	X	X				X	
Commercial, military, and private overflights	X	X	X	X			

GRIZZLY BEARS

Methods and Assumptions

Potential impacts on grizzly bears are evaluated qualitatively based on expert resource knowledge and professional judgment. In addition, a review of scientific literature was conducted detailing grizzly bear life history, reproductive biology, diet, habitat use, and other aspects of grizzly bear ecology in various ecosystems throughout North America. The analysis also relies on conclusions reached in a 2016 habitat modeling report regarding grizzly bear carrying capacity in the NCE (Lyons et al. 2016).

Analysis Area. The area of analysis for impacts of the restoration activities is the NCE grizzly bear recovery zone as described in the North Cascades Ecosystem Recovery Plan chapter of the FWS *Grizzly Bear Recovery Plan* (FWS 1997). Additionally, the impacts of capture operations on grizzly bears in source areas are analyzed. Finally, the impacts associated with the management of bears that move outside the NCE are also considered.

Issues Analyzed. The analysis of impacts on grizzly bears under each alternative is based on the following issue statements that are identified in chapter 1:

Issue Statement. Any action to restore grizzly bears in the NCE will have a clear and direct impact on the species.

Issue Statement. Long-term adaptive management activities associated with restoration of grizzly bears (including actions associated with additional releases, aversive conditioning, and relocation or removal of conflict grizzly bears), would have an impact on the species.

Alternative A: Continuation of Existing Grizzly Bear Management (No Action)

Under alternative A, options for grizzly bear restoration would be limited. Grizzly bears would not be released into the U.S. portion of the NCE, and instead natural emigration from other populations would be the sole source of new grizzly bears to the region. Grizzly bears would not be prevented from moving into the U.S. portion of the NCE from Canada, and any grizzly bears that did move into the NCE would be fully protected as a threatened species under the ESA.

The NCE is isolated from other grizzly bear populations. The nearest populations to the east are in the Kettle-Granby Grizzly Bear Population Unit (GBPU) in British Columbia and the Selkirk Mountains in Washington, Idaho, and British Columbia. Grizzly bears inhabit the remote areas east of Okanogan River and west of the Kettle-Granby Mountains, but the very limited number of detections indicate that the populations are probably limited to a very small number of animals. With careful management, these highlands may become a suitable linkage zone between the Rockies and the Cascades in the long term, but currently and for the foreseeable future, no population pressures exist in these areas that would cause grizzly bears to expand from the east into the Cascades (Braaten et al. 2013).

The nearest population to the north is composed of a small number of individuals in the Stein-Nahatlatch GBPU in British Columbia (Proctor et al. 2012). Farther to the west, grizzly bears in the Squamish-Lillooet and Garibaldi-Pitt GBPU are likewise not at a population density that would facilitate range expansion into the NCE through dispersal across the major barriers created by Fraser River, the TransCanada Highway, two national railroads, and the high levels of human influence along that corridor (Braaten et al. 2013).

Because of the small number and isolation of NCE grizzly bears, they are believed to be at significant risk of eventual extirpation (North Cascades Grizzly Bear Recovery Team 2004). Biological consensus is that grizzly bears in the NCE will not recover on their own and need some form of human intervention to achieve reproduction and eventual recovery (North Cascades Grizzly Bear Recovery Team 2004; Braaten et al. 2013).

Source Population. Under alternative A, no grizzly bears would be removed from grizzly bear source areas for translocation into the NCE. As a result, no impacts on grizzly bear source populations would occur.

Capture, Release, and Monitoring. Under alternative A, existing management practices would continue, but no new management actions would be implemented beyond those available at the outset of the grizzly bear planning process. No active releases of grizzly bears or their subsequent monitoring would occur. Therefore, no impacts on grizzly bears from capture, release, and monitoring efforts would occur under alternative A.

Cumulative Impacts

Present and ongoing NPS actions with the potential to result in cumulative impacts on grizzly bears include ongoing wildlife monitoring efforts, fisher restoration, ongoing trail maintenance and repairs, invasive plant management within wilderness, mountain lakes restoration and fish stocking per the *North Cascades National Park Service Complex Fish Stocking Act*, fire management operations, the *Stehekin River Corridor Implementation Plan*, and administrative flights for search and rescue operations and other purposes. Present and ongoing USFS actions with the potential to result in cumulative impacts on grizzly bears include forest vegetation management, cattle and sheep grazing, motorized travel management projects, mining, CERCLA mine cleanup and abandoned mine lands projects, ski area expansion projects, forest plan updates, ongoing trail maintenance, ongoing road maintenance, wildfire suppression, invasive plant management, special-use permit issuance, and river and aquatic restoration projects. Other projects with the potential to affect grizzly bears include the Interstate 90 expansion and recreational and tribal hunting.

Ongoing NPS wildlife monitoring efforts and fisher restoration would have little impact on grizzly bears, if present, because most of the activity related to these actions would be non-intrusive, and most impacts would result from human presence engaged in these activities. Invasive plant management within NPS wilderness would have beneficial impacts on grizzly bears, if present, by enhancing native habitat. NPS fire management operations would have beneficial impacts on grizzly bears because they would provide opportunities for habitat enhancement. Finally, the *Stehekin River Corridor Implementation Plan* could have adverse impacts because the reroute of roads and other features of the plan could affect native vegetation and reduce the amount of available habitat for bears.

USFS forest vegetation management projects could have both beneficial and adverse impacts on grizzly bears depending on whether they create opportunities to enhance habitat for certain species. Cattle and sheep grazing on USFS lands could have adverse impacts on grizzly bears if conflicts with grizzly bears occur. Beneficial impacts on grizzly bears could occur from decommissioning roads for a variety of reasons unrelated to grizzly restoration actions in or near sensitive habitat. CERCLA mine cleanup and abandoned mine lands projects on USFS lands would have beneficial impacts on grizzly bears through restoration of habitat. However, ski area expansion projects on USFS lands could have adverse impacts on grizzly bears because the clearing of land could disturb and fragment additional habitat. USFS wildfire suppression efforts could have both beneficial and adverse impacts on grizzly bears because they could reduce the threat of catastrophic wildfires and result in the production of early seral conditions and associated food sources.

The expansion of Interstate 90 could have beneficial impacts on grizzly bears through the creation of wildlife underpasses and overpasses that increase opportunities for dispersal. Recreational and tribal hunting could result in disturbance related to human presence and the potential for mortality related to shooting over misidentification of grizzly bears as black bears. For example, studies in the Greater Yellowstone Ecosystem (GYE) demonstrated that grizzly bear survival was negatively affected by the presence of ungulate (e.g., deer and elk) hunting and the presence of roads and rural development, which occurred more often as bears shifted to lower elevations in search of food (Schwartz, Haroldson, and White 2010). Higher survival was found in bears living in areas closed to hunting and secure from development. It is likely that these factors would similarly affect grizzly bear survival in the NCE.

Overall, ongoing and reasonably foreseeable future activities would have both beneficial and adverse impacts on grizzly bears if present. The decision to not actively restore grizzly bears under alternative A would result in adverse impacts on grizzly bears both if present in the NCE, as well as throughout their range. The eventual loss of grizzly bears from the NCE would continue to put pressure on the species, reducing the likelihood of achieving recovery under the ESA. Although cumulative actions may provide benefits to grizzly bear habitat, the existing very low estimate of bears in the NCE and the decision under alternative A not to restore them would contribute substantially to overall adverse cumulative impacts on grizzly bears.

Conclusion

The implementation of alternative A would not result in any direct short-term, adverse impacts on grizzly bears in the NCE. The tentative restoration goal of 200 grizzly bears in the U.S. portion of the NCE would not be achieved under alternative A because grizzly bears in the NCE would not recover to a sustainable population on their own. Given the extremely small number of bears in adjacent habitat in British Columbia and the pressures from human encroachment, it is extremely unlikely that bears would move into the NCE. In addition, the decision to not actively restore bears to the NCE would, over the long term, result in the species being extirpated. Although action to maintain core habitat and survey for grizzly bears in the NCE would continue, little benefit would be provided because of the very small number of bears potentially present. Grizzly bear source populations would not be affected under alternative A because no grizzly bears would be removed. Furthermore, there would be no impacts associated with capture, release, and monitoring under alternative A because active restoration would not occur. Overall, ongoing and reasonably foreseeable future activities would have both beneficial and adverse impacts on grizzly bears, but the existing very low estimate of bears in the NCE and the decision under alternative A not to restore them would contribute substantially to overall adverse impacts on grizzly bears. Alternative A would not avoid the permanent loss of grizzly bears in the NCE or enhance or contribute to overall grizzly bear recovery.

Alternative B: Ecosystem Evaluation Restoration

Alternative B would release up to 10 grizzly bears over the first 2 years of initial restoration activities, monitor those bears for 2 years and then make a determination on the release of additional bears. Depending on the outcome of monitoring, managers could decide to repeat the initial release and continue monitoring or transition to alternative C. If managers decided to move toward implementation of alternative C during the adaptive management phase of this alternative, the impacts would coincide with those described for alternative C, below.

Alternative B focuses on identifying optimal release sites through monitoring to promote higher reproduction, less emigration from restoration areas, and fewer human encounters for translocated grizzly bears in subsequent releases, so it is reasonable to assume that the survival rate under this alternative would be at the higher end of the given range (2%–4%).

Capture, Release, and Monitoring. Restoration of grizzly bears into the NCE would require their capture and transport from other areas, and some level of mortality is expected among the translocated grizzly bears. However, every effort would be taken to minimize capture and transport-related mortalities. The North Cascades Grizzly Bear Recovery Team (British Columbia 2004) estimates that approximately 2% of the grizzly bear population in the NCE would be lost to human-caused mortality each year, including mortalities associated with restoration activities.

Under alternative B, there is a possibility of grizzly bear mortality during capture and release. In the Northern Continental Divide Ecosystem (NCDE), the draft 2013 NCDE Grizzly Bear Conservation Strategy reported 15 capture-related grizzly bear mortalities between 1998 and 2011, which equates to 1.1 grizzly bears per year and accounted for 5% of the total human-caused grizzly bear mortalities during that period. The Interagency Grizzly Bear Study Team for the GYE reported mortality rates of 0.7% and 0.69% for grizzly bear handling events ($n = 863$) and capture events ($n = 1,014$) between 1986 and present (van Manen pers. comm. 2016). Only one of these mortalities was confirmed as capture-related, where a snared grizzly bear was killed by another grizzly bear in 2013. Furthermore, five out of seven of the handling-related mortalities between 2006 and 2008 resulted from bacterial infections transmitted through survey instruments. No bacterial-related deaths have been reported since a new standard was implemented requiring mandatory use of antibiotics on captured animals; therefore, human-caused mortality during capture and release is expected to be minimal.

Source Population. Alternative B would remove up to 5 grizzly bears per year over an initial 2-year period from trapping efforts occurring in south-central British Columbia and/or the NCDE. Occasionally, a few grizzly bears would be needed to replace bears in the NCE that either die or emigrate from the NCE to maintain the desired population trajectory.

South-Central British Columbia—Alternative B would likely remove five or fewer grizzly bears a year from the Wells Gray region of British Columbia, including Wells Gray and Trophy Mountain Parks, over the initial two-year period. Given a grizzly bear population that was slightly over 300 bears in 2012, this would amount to approximately 1.7% of the estimated total population, well below the 6% hunter harvest rate in British Columbia considered to result in a sustainable population (Boyce, Derocher, and Garshelis 2016). Since these populations are not currently hunted, the removal of 1.7% of the population would not affect the sustainability of the local populations.

NCDE—Alternative B would likely remove five or fewer grizzly bears a year from the NCDE over the initial two-year period. Given a grizzly bear population that is likely in excess of 1,000 individuals, this would amount to approximately 0.5% of the estimated total population. Given the estimated sustainable harvest for independent female and male grizzly bears of 2.3% and 3.0% of the total population size, respectively (Costello, Mace, and Roberts 2016), and that the population is not currently hunted, the translocation of grizzly bears from the NCDE to the NCE under alternative B is not likely to affect the sustainability of the resident population of grizzly bears in the NCDE.

Cumulative Impacts

Ongoing and reasonably foreseeable future actions with the potential to contribute to cumulative effects on grizzly bears under alternative B would be the same as those described for alternative A. Alternative B would result in some limited benefit to grizzly bears by restoring a small number of them to areas of suitable habitat; however, it is unlikely that alternative B would result in meaningful population increases on its own. Overall, cumulative impacts under alternative B to grizzly bears would be beneficial, though the contribution of alternative B would be small, limited by the small number of bears released. If a decision is made to transition to alternative C, grizzly bears would experience additional benefits as the population is restored.

Conclusion

The NCDE in Montana and areas of south-central British Columbia have been identified as source areas for capture and translocation of grizzly bears into the NCE. These areas have habitat similar to the NCE and sufficient numbers of grizzly bears to be source areas without affecting the sustainability of the local populations of grizzly bears. The actual number of grizzly bears captured each year would depend on the availability of grizzly bears for translocation and substantial effort by capture crews. The slow release and monitoring of relocated grizzly bears should result in higher survival rates based on higher quality release areas when a decision is made to add additional bears to the population.

Alternative B would have no substantial adverse impacts on the health of source populations because mortality limits in the *Grizzly Bear Recovery Plan* (FWS 1993a) and British Columbia grizzly bear management criteria (BC Ministry of Environment, Lands, and Parks 1995) would be met during implementation of this alternative (less than 5%–6%). Further, because no grizzly bears would be removed from the NCDE in excess of mortality limits and no female grizzly bears would be removed from within Primary Conservation Area, the NCE grizzly bear restoration program would not prevent the NCDE from achieving its own grizzly bear recovery goals due to translocation of grizzly bears from the NCDE to the NCE.

Grizzly bears released into the NCE would benefit in the long term from a large block of suitable habitat that would help further the conservation of the species. Alternative B could promote the highest survival rate of translocated bears of all the action alternatives through its monitoring and adaptive management plan, but the slower rate of releases could likely increase the amount of time to achieve the restoration goal in the NCE. Overall, ongoing and reasonably foreseeable future activities would have both beneficial and adverse impacts on grizzly bears, but in aggregate, these impacts would be largely beneficial. Alternative B would result in some limited benefits to grizzly bears by initiating releases that could help begin to restore them to areas of suitable habitat. If a decision is made to transition to alternative C, grizzly bears would experience additional benefits as the population is restored.

Alternative C: Incremental Restoration

Alternative C would release 5 to 7 grizzly bears per year over 5 to 10 years to achieve an initial population of 25 grizzly bears in the NCE. Once an initial population of grizzly bears has been established in the NCE, it would take between 60 and 100 years to reach 200 bears, depending on the actual survival rate. To promote a higher reproduction rate, the sex ratio for grizzly bears released in the NCE would be slightly skewed towards female grizzly bears, and grizzly bears would be released in close proximity to one another. However, in the case that population targets are not met, the adaptive management strategy for alternative C states that additional grizzly bears could be released in the NCE to achieve restoration goals every few years.

Figure 10 illustrates the projected grizzly bear population over time, with continual release of grizzly bears until the restoration goal is reached. These projections are based on data collected from the CYE grizzly bear augmentation and subsequent monitoring and use the same assumptions regarding population growth and survival rates described above (Kasworm pers. comm. 2016b). The projections use an anticipated population growth rate between 2% and 4%, a survival rate for cubs of approximately 63%, and a survival rate for yearlings of approximately 88%. Survival rates for subadult females and males (up to age 5) were 82% and 76%, respectively, whereas survival rates for adults beyond age 5 were 95% for females and 91% for males. Approximately 72% of the founder bears released into the ecosystem are expected to remain in the ecosystem (Kasworm pers. comm. 2016b).

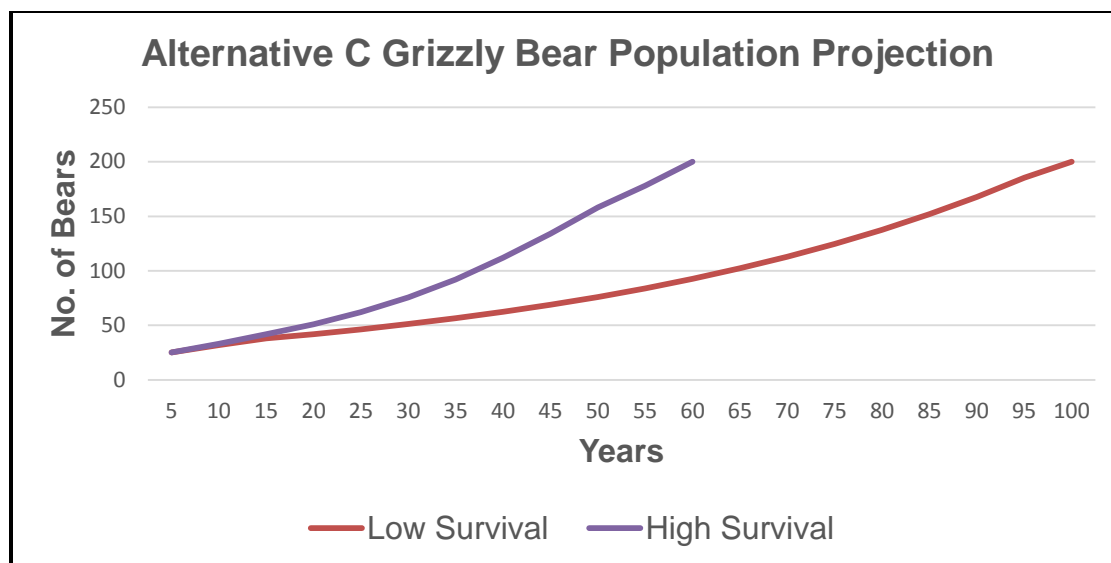


FIGURE 10. APPROXIMATE ALTERNATIVE C GRIZZLY BEAR POPULATION PROJECTION

Capture, Release, and Monitoring. Alternative C would use the same methods to capture and transport grizzly bears as alternative B; therefore, translocated grizzly bears would be exposed to the same level of risk as discussed under alternative B. Over the course of the restoration program, it is estimated that 34 grizzly bears would need to be captured and released; additional capture and handling events would likely be required to achieve the target population of 200 grizzly bears. Additional bears may be required to supplement the population resulting in the need to capture, transport, and release approximately 2 bears every few years. However, capture, release, and monitoring efforts for alternative C are expected to result in minimal grizzly bear mortality—estimated at 2%–4%.

Source Population. Assuming an equal contribution of grizzly bears from Canada and the United States, alternative C would remove approximately 5 to 7 grizzly bears per year combined from south-central British Columbia and the NCDE, depending on capture success. Additional grizzly bears could be needed to replace any translocated bears that either die or emigrate from the NCE, to maintain the desired population. To achieve an initial population of 25 grizzly bears in the NCE, a total of 34 grizzly bears would be needed to account for mortality and emigration of bears from the NCE. Once the initial population of 25 grizzly bears has been achieved, the adaptive management strategy for alternative C may require additional translocation of bears to the NCE depending on a variety of factors, including human-caused mortality, genetic limitations, population trends, and adjustment of the sex ratio.

South-Central British Columbia—Alternative C would remove a maximum of 5 to 7 grizzly bears a year from the Wells Gray region of British Columbia, including Wells Gray and Trophy Mountain Parks over the initial 5- to 10-year period. Given a grizzly bear population that was slightly over 300 bears in 2012, this would amount to approximately 1.7%–2.3% of the estimated total population, well below the 6% hunter annual harvest rate in British Columbia considered to result in a sustainable population (Boyce, Derocher, and Garshelis 2016). This analysis also holds true for the capture of a couple of bears every few years as needed to help meet restoration goals. Because these populations are not currently hunted, the removal of 1.7%–2.3% of the population would not affect the sustainability of the local populations.

NCDE—Alternative C could also remove a maximum of 5 to 7 grizzly bears a year from the NCDE over the 5 to 10 years necessary to achieve an initial population of 25 bears. Given a NCDE grizzly bear population that is likely in excess of 1,000 individuals, this would amount to approximately 0.5%–0.7% of the population per year. This analysis also holds true for the capture of a couple of bears every few

years as needed to help meet restoration goals. Given the estimated annual sustainable harvest for independent female and male grizzly bears of 2.3% and 3.0% of the total population size, respectively (Costello, Mace, and Roberts 2016), and that this population is not currently hunted, the translocation of grizzly bears from the NCDE to the NCE under alternative C is not likely to affect the sustainability of the resident population of grizzly bears.

Cumulative Impacts

Ongoing and reasonably foreseeable future actions with the potential to contribute to cumulative effects on grizzly bears under alternative C would be the same as those described for alternative A. Overall, ongoing and reasonably foreseeable future actions would have both beneficial and adverse impacts on grizzly bears, but in aggregate, these impacts would be largely beneficial given the amount of secure grizzly bear habitat available. Alternative C would result in lasting benefits to grizzly bears by helping to restore them to areas of suitable habitat. Overall, long-term cumulative impacts on grizzly bears would be beneficial, and the contribution of alternative C would be substantial.

Conclusion

The NCDE in Montana and south-central British Columbia have been identified as source areas for translocation of grizzly bears into the NCE. These areas have habitat similar to the NCE and have sufficient numbers of grizzly bears to be source populations. The actual number of grizzly bears captured each year would depend on the availability of grizzly bears for translocation and substantial effort by capture crews.

Alternative C would have no substantial adverse impacts on the health of source populations because mortality limits in the *Grizzly Bear Recovery Plan* (FWS 1993a) and British Columbia grizzly bear management criteria (BC Ministry of Environment, Lands, and Parks 1995) would be met during implementation of this alternative. Further, because no grizzly bears would be removed from the NCDE in excess of mortality limits, and no female grizzly bears would be removed from within the Primary Conservation Area, the NCE grizzly bear restoration program would not prevent the NCDE from achieving its own grizzly bear recovery goals due to translocation of grizzly bears from the NCDE to the NCE.

Grizzly bears released into the NCE would benefit in the long term from a large block of suitable habitat that would help further the conservation of the species. Alternative C would achieve an initial population of 25 grizzly bears in the NCE with an expectation of achieving the restoration goal of 200 bears in 60 to 100 years. Ongoing and reasonably foreseeable future activities would have both beneficial and adverse impacts on grizzly bears, but alternative C would result in lasting benefits to grizzly bears by restoring them to areas of suitable habitat. Overall, alternative C would prevent the permanent loss of grizzly bears from the NCE while enhancing their long-term survival and contributing to species recovery.

Alternative D: Expedited Restoration

Alternative D would release 5 to 7 grizzly bears per year into the NCE until a population of approximately 200 grizzly bears in the NCE is achieved. Using an estimated natural population growth rate of 2%–4% per year for translocated grizzly bears, based on a FWS estimate of the growth rate of grizzly bear populations in the CYE, it would take approximately 25 years to reach 200 bears in the NCE using the expedited restoration strategy and assuming a certain amount of reproduction. While alternative D would achieve the restoration goal of 200 bears at a faster rate (fewer number of years), it would likely result in a lower natural population growth rate relative to the other action alternatives because the sex and age class of translocated bears would be less restrictive under alternative D because of the need to

capture grizzly bears every year until the restoration goal is achieved. A lower natural population growth rate would increase the number of translocated grizzly bears required to achieve the restoration goals relative to the other action alternatives.

Figure 11 illustrates the projected grizzly bear population over time based on continual release of grizzly bears until the restoration goal is reached. These projections are based on data collected from the CYE grizzly bear augmentation and subsequent monitoring and use the same assumptions regarding population growth and survival rates described above and under alternative C (Kasworm pers. comm. 2016b).

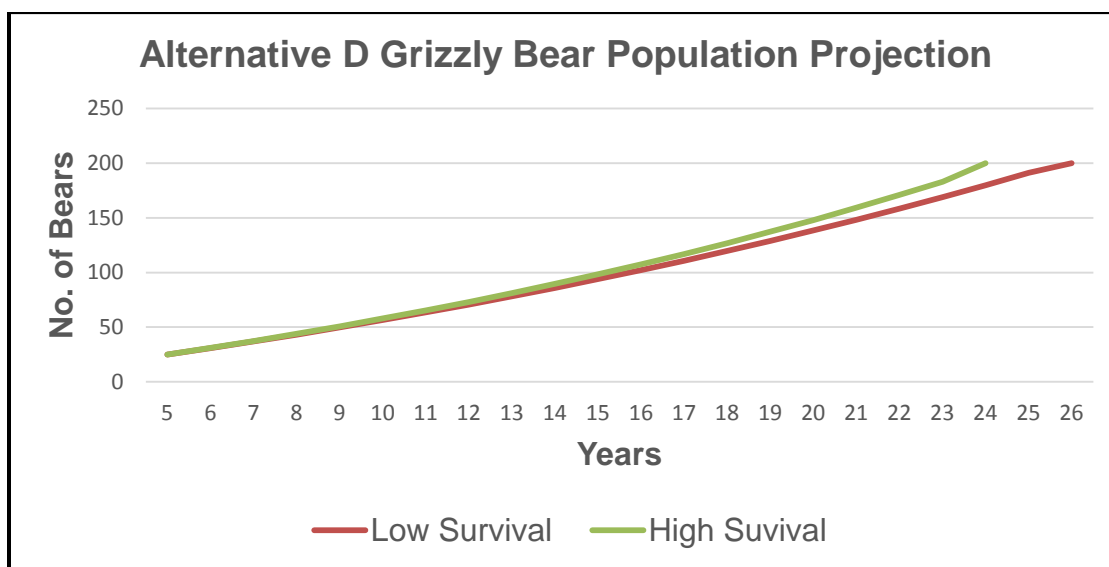


FIGURE 11. APPROXIMATE ALTERNATIVE D GRIZZLY BEAR POPULATION PROJECTIONS

Capture, Release, and Monitoring. Alternative D would use the same methods to capture and transport grizzly bears as described under alternatives B and C; therefore, translocated grizzly bears would be exposed to the same level of risk as discussed in alternative B. However, alternative D would require the translocation of 155 to 168 grizzly bears, assuming a ratio of 119–129 females to 36–39 males can be obtained, which is approximately 5 times the number of grizzly bears required for alternative C. In addition, the greater level of trapping effort required by alternative D would increase the volume of traps and snares set by management agencies in source population areas, thereby increasing the risk of capture-related mortality. As a result, alternative D would have a much higher risk of capture-and-release-related mortality relative to the other two action alternatives.

Source Population. Alternative D would rely on contributions of grizzly bears from south-central British Columbia and the NCDE as they become available. Approximately 5 to 7 bears would be sourced from these populations per year for approximately 25 years. As described above for alternative C, this level of removal would be well below established annual sustainable harvest rates for each of the source population areas. However, alternative D would require a more sustained effort because grizzly bears would be needed each year for up to 25 years, which would require managers to carefully design capture operations to distribute pressure across the local populations to avoid potential effects of over-trapping certain areas. Overall, translocation of grizzly bears from British Columbia or the NCDE to the NCE is not likely to have any substantial adverse impacts on the resident population of grizzly bears in the source areas.

Cumulative Impacts

Ongoing and reasonably foreseeable future actions with the potential to contribute to cumulative effects on grizzly bears under alternative D would be the same as those described for alternative A. Overall, ongoing and reasonably foreseeable future activities would have both beneficial and adverse impacts on grizzly bears given the amount of secure habitat available to grizzly bears. Alternative D would result in lasting benefits to grizzly bears by restoring them to areas of suitable habitat. Overall, long-term cumulative impacts on grizzly bears would be beneficial, and the contribution of alternative D would be substantial.

Conclusion

The NCDE in Montana and south-central British Columbia have been identified as source areas for translocation of grizzly bears into the NCE. These areas have habitat similar to the NCE and have sufficient numbers of grizzly bears to be source populations. However, the rapid rate (restoration over 25 years) of grizzly bear translocation under alternative D means that grizzly bears captured from source populations may not always be of the desired sex and age range, and the actual number of grizzly bears captured would depend on the availability of grizzly bears for translocation and substantial effort by capture crews. As a result, alternative D is likely to have the highest grizzly bear mortality or emigration rates of any of the action alternatives.

While alternative D would require the greatest number of translocated grizzly bears of any of the action alternatives by far, it would have no substantial adverse impacts on the health of source populations because mortality limits in the *Grizzly Bear Recovery Plan* (FWS 1993a) and British Columbia grizzly bear management criteria (BC Ministry of Environment, Lands, and Parks 1995) would be met. Further, because no grizzly bears would be removed from the NCDE in excess of mortality limits, and no female grizzly bears would be removed from within the Primary Conservation Area boundary, the NCE grizzly bear restoration program would not prevent the NCDE from achieving its own grizzly bear recovery goals due to translocation of grizzly bears from the NCDE to the NCE.

Grizzly bears released into the NCE would benefit in the long term from a large block of suitable habitat that would help further the conservation of the species. Alternative D would achieve the restoration goal of 200 grizzly bears in the NCE 3 to 5 times faster than alternative C, but the rapid restoration rate would require the translocation of approximately 5 times the number of grizzly bears. Overall, ongoing and reasonably foreseeable future activities would have both beneficial and adverse impacts on grizzly bears, but alternative D would result in short- and long-term benefits to grizzly bears by restoring them to areas of suitable habitat. Similar to alternative C, except at a faster rate, alternative D would prevent the permanent loss of grizzly bears from the NCE while enhancing their long-term survival and contributing to species recovery.

Areas outside the NCE

Although grizzly bears would be released into remote wilderness areas of the NCE, they could move outside of the NCE into adjacent parts of Washington. Bears that move into suitable grizzly bear habitat could be left there if they did not pose a risk of coming into conflict with humans and livestock. Data from released bears in the Cabinet Mountain from 1990 through 2015 indicate that bears moved, on average, up to approximately 9 miles from the release sites. In the first month bears moved up to approximately 7.5 miles away from release sites; within the first year, they moved approximately 9.5 miles (Kasworm pers. comm. 2016b). If these same patterns were reflected in the NCE, it is unlikely that bears would leave the NCE for other areas of Washington in the near term because the closest release site is approximately 14 miles from the boundary of the NCE, with most sites more than 20 miles away. As

the population grows, bears could increase movements; however, it is unlikely that a meaningful proportion of the released population would leave the NCE.

Bears that move outside of what is considered suitable habitat would be recaptured and moved back to the NCE if at all possible. Based on existing 4(d) rules, managers and landowners could take actions to mitigate human-grizzly bear conflicts, including using hazing and killing bears. These types of actions could reduce the bear population; however, the expected likelihood of these impacts is low based on the low likelihood of bears moving out of the NCE. Any mortality associated with bears moving outside the NCE is expected to be within the 2%–4% estimate previously described.

In the event that the option to designate the NCE population of grizzly bears as a section 10(j) experimental population is implemented, additional management measures may become available to managers to use non-lethal measures to reduce impacts on grizzly bears that move outside NCE or to mitigate human-grizzly bear conflicts.

OTHER WILDLIFE AND FISH

This section assesses the impacts on other wildlife and fish, including mammals, birds, and fish. Impacts on mammals are analyzed in terms of disturbance from restoration activities as well as predator-prey interactions and interspecific competition.

Methods and Assumptions

Potential impacts on other wildlife and fish were evaluated qualitatively based on resource expert knowledge and professional judgment, review of scientific literature, anticipated rates and locations for release of grizzly bears, and the resource-specific issues identified in chapter 1.

Issues Analyzed. The analysis of impacts on other wildlife and fish under each alternative is based on the following issue statements that are identified in chapter 1:

Issue Statement. Wildlife species could be affected by noise and human-related disturbance associated with the capture and release of grizzly bears. Therefore, this impact topic was retained for analysis.

Issue Statement. Wildlife or fish species such as elk and deer, black bear, and trout could be affected in terms of grizzly bear predation or competition for resources. Therefore, this impact topic was retained for analysis.

Assumptions

A number of assumptions were made to analyze the impacts on other wildlife and fish, including several assumptions related to helicopter and other noise disturbance. Wildlife response to aircraft can be highly variable depending on species, type of study, ecological characteristics, and other attributes (NPS 1994). NPS (1994) and other studies (Stockwell, Bateman, and Berger 1991; Mancini et al. 1988) generally conclude that helicopter flights below 500 feet above ground level stimulate a stronger response than fixed-winged aircraft or higher altitude flights.

A study near Fort Sill, Oklahoma suggests that reaction to noise could be related to the experiences of the individuals and groups affected—e.g., bison “appeared oblivious” to F-105 overflights in the early 1970s (Frazier 1972 as cited in Mancini et al. 1988). Other studies indicate environmental conditions, age class, gender, season, type and elevation of aircraft, and even the activity the wildlife is participating in prior to

the disturbance all may influence the reaction (NPS 1994; Ellis, Ellis, and Mindell 1991). Furthermore, several studies (NPS 1994; Carrier and Melquist 1976; Kushlan 1979) conclude that minimal use of aircraft, such as limited-season aerial surveys, are not likely to cause harm or have long-term effects on mammal or bird species; however, no long-term studies have been conducted to confirm this conclusion.

A Hughes 500 or similar helicopter would be required during the capture and release of grizzly bears for any of the possible action alternatives. Federal Aviation Administration testing data (FAA 1977) determined that a Hughes 500 produces between 71 and 90 dBA (A-weighted decibel) during hovering, approach, and low speed (airspeed of 69 miles per hour [mph] at 500 feet above ground level) flyover maneuvers (FAA 1976). Additionally, medium duty diesel trucks may be needed to move culvert traps, grizzly bears, and other equipment. Passing diesel trucks have been recorded producing upwards of 85 dBA (Purdue University 2015) at speeds of 40 mph.

Ambient noise levels can vary depending on location and conditions (Falzarano 2005). Rural settings have been reported to have an ambient noise level of 30 dBA; quiet urban settings have an ambient noise level of 40 dBA; and some bird calls have been recorded at 44 dBA (Purdue University 2015). Falzarano (2005) suggests that backcountry and wilderness areas may be even quieter at 15 dBA to 30 dBA with much louder noise associated with occasional events (e.g., lightning cracks and overflights). Ambient noise levels at grizzly bear capture and release locations in wilderness settings were assumed, under normal conditions, to likely range from 30 dBA to 45 dBA; therefore, the noise associated with a Hughes 500 is expected to be at least eight times louder than normal ambient conditions. However, as suggested in various studies (NPS 1994; Mancini et al. 1988; Ellis, Ellis, and Mindell 1991; Stockwell, Bateman, and Berger 1991), no known direct correlation exists between a specific sound level and responses by wildlife or birds.

In addition to emitting noise, helicopters would also produce what is termed “downwash.” Downwash is defined as the air that is directed vertically down from the horizontal main rotor. Helicopter downwash is calculated by (Rotor&Wing International 2011):

$$\sqrt{\left(\frac{\text{gross wt}}{2}\right) \times (\text{air density}) \times (\text{rotor disk area})}$$

Based on the calculation, a Hughes 500 at sea level would produce a downwash of approximately 23 mph at the base of the main horizontal rotor. However, as the air is forced downward, the air column is restricted (due to outflow and recirculation of air) and because of the Venturi effect, downwash reaches maximum velocity at a distance of approximately twice the rotor diameter below the rotor (Rotor&Wing International 2011). Again, assuming use of a Hughes 500 at sea level, maximum downwash velocity is expected at 53 feet below the rotor at a speed of 46 mph. Assuming grizzly bear capture and release sites are at an approximate elevation of 5,000 feet above mean sea level and a combined culvert trap and grizzly bear weight of 850 pounds, maximum downwash from a Hughes 500 during grizzly bear transport would be 63 mph at 53 feet below the rotor. Downwash could affect birds nesting or flying below the helicopter. However, helicopters would be flying approximately 100 feet above tree level.

Additional alternative-specific assumptions are described under each alternative.

Alternative A: Continuation of Existing Grizzly Bear Management (No Action)

Other Wildlife

Under alternative A, the USFS would continue to uphold the 1997 access management agreement, wherein no net loss of core area would occur, and the NPS would follow the direction provided in the Ross Lake GMP (see chapter 2). The no-action alternative would result in no active transport or release of grizzly bears into the NCE. Because alternative A would not require any change to management practices or other NPS or USFS activities, no new impacts on other wildlife species in the NCE would occur.

Predator-Prey Interactions. As described in chapter 3, grizzly bears are omnivores, but primarily feed on vegetation. Studies indicate that a grizzly bear diet consists of about 90% vegetable and insect matter; however, they also scavenge and prey on ungulates and ground-dwelling rodents. In many locations, animal matter may not constitute a major annual diet item but may be seasonally vital to grizzly bears (Mattson, Blanchard, and Knight 1991; Gunther and Haroldson 1998).

Because alternative A would not release any bears into the NCE, no predator-prey interactions related to released grizzly bears would occur. If grizzly bears are present in the NCE, some small level of predation would continue; however, with an estimated six or fewer bears, any associated predation would be discountable and not result in a population-level response.

Interspecific Competition. As described in chapter 3, grizzly bears in the NCE could compete with gray wolves, coyotes, fishers, Canada lynx, cougars, bobcats, and black bears. Because alternative A would not actively restore grizzly bears, no interspecific competition would occur between released bears and other species. In addition, although some very low level of competition could occur with these species from grizzly bears currently in the NCE, any impacts would be restricted to individual animals and would not likely affect local species populations in a meaningful way because any impacts would be discountable and would not change from current conditions.

Grizzly and black bear population relationships have been studied in areas similar to the NCE as described in chapter 3. Grizzly bear interactions with black bears could result in black bear predation or partitioning of resources. However, because alternative A would not restore grizzly bears to the NCE, no impacts on black bear populations from released bears would occur. Any existing level of black bear predation by grizzly bears would not have a meaningful effect on local black bear populations because any impacts would be discountable and would not change from current conditions.

Birds

Because alternative A would not actively restore grizzly bears, bird species in the NCE would not be affected. Any grizzly bears currently in the NCE would not have a meaningful effect on local bird populations because any impacts would be discountable and would not change from current conditions.

Fish

Because no active grizzly bear restoration activities would take place under the no-action alternative, fish species in the NCE would not be affected. Any grizzly bears present in the NCE could prey on fish; however, given the low estimate of bears (approximately six or fewer), the impacts on any given fish population would be discountable and would not change from current conditions.

Cumulative Effects

Present and ongoing NPS actions with the potential to result in cumulative impacts on other wildlife include ongoing wildlife monitoring efforts, fisher restoration, ongoing trail maintenance and repairs, invasive plant management within wilderness, mountain lakes restoration, fire management operations, the *Stehekin River Corridor Implementation Plan*, the *North Cascades National Park Service Complex Fish Stocking Act* (2014), and administrative flights for search and rescue operations and other purposes. Present and ongoing USFS actions with the potential to result in cumulative impacts on other wildlife species include forest vegetation management, cattle and sheep grazing, motorized travel management projects, mining, CERCLA mine cleanup and abandoned mine lands projects, ski area expansion projects, forest plan updates, ongoing trail maintenance, ongoing road maintenance, wildfire suppression, invasive plant management, special-use permit issuance, and river and aquatic restoration projects. Other projects with the potential to affect other wildlife include the Interstate 90 expansion and recreational and tribal hunting.

Ongoing NPS wildlife monitoring efforts would have little impact on other wildlife species because most monitoring is non-intrusive, and most impacts would occur as a result of human presence engaged in the monitoring activity. Fisher restoration by the NPS would have beneficial impacts on other wildlife because it would restore a population of a state endangered species to the NCE. Invasive plant management within NPS wilderness would have beneficial impacts on other wildlife through the enhancement of native habitat. NPS mountain lakes restoration would have beneficial effects for native aquatic fauna because it would remove non-native fish, although in certain lakes, fish stocking would have adverse impacts because it could affect native aquatic fauna by introducing non-native fish. NPS fire management operations would have beneficial impacts on other wildlife because they would provide opportunities for habitat enhancement. The *Stehekin River Corridor Implementation Plan* could have adverse impacts because it could reroute roads and affect native habitat and displace wildlife. Administrative flights for NPS search and rescue operations, transporting materials for trail maintenance, and transporting staff could have adverse impacts on some wildlife species as a result of disturbance from helicopter and aircraft noise, especially if these flights occur during nesting, denning, or rearing periods.

USFS forest vegetation management projects could have both beneficial and adverse impacts on other wildlife depending on whether they create opportunities to enhance habitat for certain species. Cattle and sheep grazing on USFS lands could have adverse impacts on wildlife or fish species if grazing in riparian areas creates stream turbidity or results in habitat degradation or competition for resources. USFS motorized travel management projects and ongoing road and trail maintenance could have beneficial impacts on fish species through the reduction or mitigation of runoff into streams; adverse impacts on some sensitive species could occur if these species tend to avoid roads and trails or if road or trail construction displace habitat for these species. Beneficial impacts could occur from the decommissioning of roads in or near species habitat. CERCLA mine cleanup and abandoned mine lands projects on USFS lands would have beneficial and adverse effects on fish by preventing toxic runoff into streams. Ski area expansion projects on USFS lands could have adverse impacts on some wildlife and fish species because ground-disturbing activities could increase runoff into streams, and land clearing efforts could disturb habitat for some terrestrial or avian species. USFS wildfire suppression efforts could have both beneficial and adverse impacts on fish and wildlife because it would help reduce the risk of catastrophic fires and improve understory habitat. USFS river and aquatic restoration projects would have beneficial impacts on fish species because they would enhance fish habitat. The expansion of Interstate 90 could have beneficial impacts on certain species through the creation of wildlife underpasses that increase opportunities for dispersal. Recreational and tribal hunting and fishing would continue to affect other wildlife and fish through associated mortality; however, wildlife managers ensure sustainable populations by establishing harvest limits.

Overall, ongoing and reasonably foreseeable future activities would have both beneficial and adverse impacts on other wildlife and fish species, but in aggregate, these impacts would be beneficial given the large amount of protected habitat in the NCE. The decision to not actively restore grizzly bears under alternative A would result in no impacts on other wildlife and fish. Over the long term as grizzly bear numbers continue to decline, any associated predation or competition would also decrease. Overall, cumulative impacts on other wildlife and fish under alternative A would be beneficial, with the contribution of alternative A being discountable.

Conclusion

Under the no-action alternative, no active grizzly bear restoration actions would be undertaken. As a result, no impacts on other wildlife or fish are expected from released bears. Some very low, ongoing impacts related to predation and competition associated with the few grizzly bears that may still be in the NCE is expected, but any impacts would be discountable to the species affected. Ongoing and reasonably foreseeable future actions would have both adverse and beneficial impacts on other wildlife and fish, although given the large area of intact habitat in the NCE, impacts would be overall beneficial. However, any contribution from alternative A would be discountable.

Alternative B: Ecosystem Evaluation Restoration

Alternative B would release up to 10 grizzly bears over the first 2 years of initial restoration activities, monitor those bears for 2 years, and then make a determination on the release of additional bears. Depending on the outcome of monitoring, managers could decide to repeat the initial release and continue monitoring or transition to alternative C. If managers decide to move toward implementation of alternative C during the adaptive management phase of this alternative, the impacts would coincide with those described for alternative C below.

Predator-Prey Interactions. Following completion of the primary restoration phase under alternative B, there would be an initial population of 10 grizzly bears in the NCE with a target sex ratio of 60% females to 40% males.

Studies in the GYE indicate that some grizzly bears are active predators on elk calves given the high calf abundance. Researchers made 944 sightings of grizzly bears on elk calving grounds over 5 years and documented 70 hunts for elk calves, of which 26 were successful (Gunther and Renkin 1990). These researchers noted that the percentage of successful hunts declined dramatically during July as calves became more mobile. Mattson (1997) found that grizzly bears preferred small prey in the form of elk and moose calves and only occasionally preyed on adults. French and French (1990) found that while some grizzly bears were active predators, they were not always very successful, and many grizzly bears never even attempted to prey on ungulate calves. Ungulates are most often incorporated into the grizzly bear diet when they are the most available and vulnerable (e.g., calves during the calving season, winter-killed or weakened animals during spring) (Green and Mattson 1988), and weakened males during the fall rut (Schleyer 1983). Ultimately, Mattson (1997) concludes that grizzly bear predation rates average between 1.4 and 5.8 ungulates per year for adult female and male bears, respectively.

Based on grizzly bear predation rates reported by Mattson (1997) from the GYE, an initial population of 10 adult grizzly bears would on average kill between approximately 14 and 58 ungulates a year depending on the sex ratio. Although no total ungulate population estimate for the NCE is available, based on the conservative population numbers identified in chapter 3, if the NCE contained roughly 70,000 elk, deer, and other ungulates the depredation from up to 10 grizzly bears would be between approximately 0.02% and 0.08 % of the ungulate population.

As described in chapter 3, grizzly bear predation is variable, with male adult grizzly bears in the GYE representing some of the highest rates, in part because of the high population density of ungulates there (Jacoby et al. 1999). Because grizzly bears restored to the NCE would be from areas with similar food economies, their consumption of ungulates is anticipated to be much lower, as discussed in chapter 3. Therefore impacts in the NCE would likely be lower than those described above. Grizzly bears released into the NCE are expected to have an opportunistic feeding strategy and would not single out specific species to prey on. Therefore, grizzly bears are not expected to have any substantial adverse impacts on ungulate or other prey populations in the NCE under alternative B. If a decision is made to transition to alternative C, additional impacts could occur, as described for alternative C below.

Interspecific Competition. As described in chapter 3, some species of predator in the NCE may compete with grizzly bears for prey or other resources. The species most likely to compete or interact with released grizzly bears include gray wolf, coyote, fisher, Canada lynx, cougar, bobcat, and black bear. If a decision is made to transition to alternative C, additional impacts could occur as described for alternative C below.

Gray Wolf. Competition between grizzly bears and gray wolves would be unlikely under alternative B. Most interactions between grizzly bears and wolves that have been documented in other ecosystems are usually characterized by mutual avoidance (Servheen and Knight 1990; Gunther and Smith 2004). Additionally, the two species largely use different food sources. Wolves tend to prey on ungulates year-round, while grizzly bears feed on ungulates primarily as winter-killed carcasses and ungulate calves in spring, and weakened or injured male ungulates during the fall rut (Mattson, Blanchard, and Knight 1991; Fortin et al. 2013). In the NCE, grasses, sedges, forbs, berries, nuts, and roots are expected to comprise the major portion of grizzly bear diets throughout the year. As a result, no consequential, adverse impacts on gray wolves is expected as a result of grizzly bear restoration under alternative B.

Coyote. Because of the coyote's opportunistic feeding strategy and abundance and because of the small number of bears released, grizzly bears would not likely place any competitive pressure on coyote populations in the NCE under alternative B.

Fisher. The potential for adverse impacts on fisher from competition with and predation by grizzly bears would be very low if at all given the small number of bears released and the different habitats exploited by fisher. In addition, the presence of grizzly bears is not expected to affect fisher restoration. As a result, grizzly bears would not likely place any competitive pressure on fisher populations in the NCE under alternative B.

Canada Lynx. Given the low numbers of lynx in the NCE and the small number of grizzly bears released under alternative B, the chance of overlapping with active lynx areas would be small. In the event that there are lynx at the single release site, the likelihood that grizzly bears would compete for food resources would be low because lynx rely heavily on snowshoe hare for food. As a result, grizzly bears would not likely place any competitive pressure on lynx populations in the NCE under alternative B.

Cougar. Although some dietary overlap may exist between cougars and grizzly bears, cougars typically do not occupy the same habitat as grizzly bears. In addition, the small number of grizzly bears released under alternative B would not consume enough meat to place any competitive pressure on cougar populations in the NCE.

Bobcat. Bobcats may occasionally use open habitat and meadows that are preferred by grizzly bears, but bobcats tend to prefer steep, rocky terrain for shelter, raising young, and resting. In addition, the generalist diet of bobcats and grizzly bears would not likely result in any competitive pressure between the two species, especially given the small number of grizzly bears released under alternative B.

Black Bears. Although some displacement occurs where grizzly and black bears coexist, potential adverse impacts on black bear population dynamics following restoration of a grizzly bear population are unclear. Grizzly and black bear population relationships have been studied in areas similar to the NCE. Black bears are the most physiologically similar to grizzly bears of the abovementioned species, and, as a result, they are expected to have the highest degree of niche overlap with grizzly bears. However, Holm, Lindzey, and Moody (1998) argued that behavioral and physiological differences have allowed the two to coexist in areas of sympatry. Apps, McLellan, and Woods (2006) studied the spatial partitioning of resources between black bears and grizzly bears and reported that these two species frequently occupy and forage in separate areas, thus avoiding conflict and maximizing foraging effectiveness. Researchers in Wyoming reported that where grizzly and black bears coexist, black bears become diurnal and occupy more forested habitat than grizzly bears, while adult male grizzly bears were nocturnal and occupied open habitat, and females and subadult grizzly bears were crepuscular, avoiding male grizzly bears (Holm, Lindzey, and Moody 1998; Schwartz et al. 2010). Areas in Glacier Park have extremely high densities of both grizzly and black bears, and Jonkel (1984) observed grizzly bears displacing black bears during drought conditions in two river bottoms typically frequented by black bears. Mattson, Knight, and Blanchard (1992) documented one instance of an adult male grizzly bear preying on a black bear in the GYE, but they reported that less than 0.15% of the 6,979 grizzly bear scats examined contained remains of black bears.

Under alternative B, adverse impacts on black bears, if any, would largely be expected to be limited to interactions between individual grizzly bears and black bears and are not expected to affect black bears at a population level.

Helicopter and Other Human Disturbances. Alternative B would require approximately 40 helicopter flights over the first 2 years of restoration activities, although some additional flights may be necessary for collar retrieval and incidental actions. The noise produced by vehicles, associated human activities, and other disturbances needed to complete the capture and release process would result in adverse impacts on wildlife through temporary disturbances and avoidance of active staging and release areas. Impacts would be limited in duration to 5 to 7 days per year during the mid- to late summer and fall and would be localized to capture and release sites and helicopter flight paths.

The presence and noise associated with aircraft in the NCE is not uncommon. Between 2011 and 2014, the park complex averaged approximately 142 flight hours over wilderness per year (Braaten pers. comm. 2016); the majority of flight hours are typically associated with fire management operations. The flights are often staged outside of wilderness (NPS 2014). A large percentage of the flights are made with smaller, lightweight helicopters such as a McDonald Douglas MD500D or 530F.

Mammals—Introduction of helicopters, trucks, and other capture/transport/release equipment into an area with few human disturbances could have an effect on certain species of mammals, especially those in close proximity to staging and release activities (e.g., ungulates, ground squirrels). Alternative B would result in impacts from noise and disturbances that would likely disperse individuals to areas outside of grizzly bear capture, staging, and release sites, although the flight distance would likely be species-specific. Stankowich (2008) suggests ungulates associate different levels of danger with different types of disturbances as he documented differing responses by elk to humans on foot versus humans in vehicles. This would suggest that even limited use of a truck to transport culvert traps has the potential to affect species during capture and release activities. Stankowich (2008) also identified that in some circumstances, mule deer were likely to respond more intensely to humans in an “off-trail” situation than humans in an “on-trail” setting. The simple presence of personnel, even without use of motorized transportation, can trigger a response. 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, possibly resulting in separation of young from mothers or injuries (NPS 1994;

Stankowich 2008). The displacement of individuals may result in additional stress on these individuals; however, it is unlikely to cause a substantial increase in mortality or lowering of species health.

Stankowich (2008) suggests the possibility that if an ungulate has never been exposed to humans, it may perceive people more as a “curiosity” than a threat. In these cases, wilderness area wildlife that may have never seen a person, truck, or helicopter may not recognize these disturbances as a danger and not respond at all. A complete lack of exposure to human disturbances can create situations where some species simply do not identify the disturbance as a threat that would normally trigger a flight response or other behavioral or physiological reaction.

Research has demonstrated varying short-term reactions of mammals to noise; however, overall, impacts because of helicopter and other human-made noise and disturbance would be limited, lasting for portions of a few days each year, and localized to capture and release sites and helicopter flight paths. Impacts on specific individuals would be limited to minutes and hours of operation and presence of staff and vehicles. Impacts of helicopters and human activity would likely have no population level effects, nor would these disturbances be expected to interfere with long-term behavioral or physiological processes of individuals or populations.

Birds—Impacts on birds can be examined at three separate levels: grassland birds within helicopter landing sites, edge species that may be present near landing and staging sites, and deep forest species that may be flown over during transport of grizzly bears. The NPS (1994) identified one clear connection between wildlife and aircraft, “the closer the aircraft, the greater the probability that an animal will respond, and the greater the responses.” This would suggest that within helicopter landing sites, presumably grassy meadows, grassland bird species would likely incur a higher level of impact compared to birds occupying edge or deep forest habitats. Grassland birds would be exposed to noise from helicopters, the landing of the helicopter, placement of the transport culvert traps for grizzly bears, disturbances associated with release equipment and staff, and the disturbance of helicopter downwash. Noise and downwash from the helicopters may flush adult birds that may be injured or killed as a result of bird strikes with the helicopter. Furthermore, when adults are flushed, they may accidentally expel eggs or young birds from a nest, or eggs or young left in the nest may be vulnerable to predation or the effects of the downwash (NPS 1994). The downwash from the helicopter could produce enough force to destroy nests or blow young birds and eggs out of nests causing reproductive loss. All of these impacts may result in a lower recruitment rates for affected species, and if affected sites are reused for multiple years of the project, habitat abandonment may result for some species (Belanger and Bedard 1989a, 1989b, as cited in NPS 1994). Habitat abandonment has been attributed to aircraft overflights in waterfowl and water birds (NPS 1994; FWS 1993b); however, the literature is lacking as to a possible relationship between grassland bird species nest abandonment and aircraft related disturbances. Impacts on ground-nesting birds would be minimized through pre-release site assessments, and areas with active nesting would be avoided.

Birds that use edge habitat may also be influenced by the noise from helicopters and the disturbance of helicopter downwash. As helicopters land and depart from landing sites, the noise and downwash may flush birds that occupy habitats adjacent to those landing sites. Flushed adult birds may accidentally expel eggs or young birds from a nest. Waterfowl and sand hill cranes were documented to be displaced for days after low altitude aircraft disturbances (NPS 1994; FWS 1993b). However, the literature is again lacking as to a possible relationship between long periods of upland bird displacement and aircraft related disturbances.

The mostly likely response of adult birds in edge habitat would be flushing. Flushed birds run the risk of injury or death from strikes with the helicopter, and eggs or young that may be left at nest after adult birds are flushed would be vulnerable to predation and exposure. The level of risk to eggs and young birds

would depend on the duration adults remain away from the nest, abundance and type of predators present nearby, and the integrity and durability of the nest and trees where nests are located. Birds in edge areas associated with staging areas are less likely to be affected because the staging areas are commonly used for helicopter operations, and species present in those areas would be somewhat habituated to the disturbance.

Birds occupying contiguous forest stands or deep forest may be influenced by the noise associated with helicopter overflights. While transporting grizzly bears, staff, and equipment, helicopters would be flying at least 500 feet above ground level. Maximum downwash from a Hughes 500 is approximately 63 mph at 53 feet below the rotor, assuming an altitude of approximately 5,000 feet above sea level. It is presumed that at an altitude of 500 feet above the ground, downwash would not be an influencing factor to trees or birds. Noise and activities at landing sites are not likely to affect birds occupying forest stands within the NCE. Dense forest and topography are expected to shield or deflect noise produced at helicopter landing areas in both capture and release sites. The agencies therefore assumed that forest bird species would be affected only by noise associated with the overflights. Noise from the Hughes 500 may produce responses ranging from no reaction, to birds stopping calling or defending territories, possibly followed by “raucous discordant cries,” to flushing birds from nests and perches (NPS 1994; Mancini et al. 1988). Birds that flush from nests may expel eggs or young from nests, potentially reducing recruitment or survival of young. Additionally, a flushed bird may stay away from a nest long enough to allow a predator access to eggs or young that remain in the nest.

Raptor responses to disturbances can vary depending on the given circumstances (NPS 1994). For example, the NPS documented a bald eagle pair completely abandoning nesting activities after repeated overflights by military helicopters at Cross Creek National Wildlife Refuge in Georgia (NPS 1994). Grubb et al. (2010) found that incubating golden eagles in the Wasatch Mountain of Utah did not flush when exposed to military helicopters but did respond after hatching young. Helicopters would remain approximately 1,000 feet from any known bald eagle nests.

Possible bird responses to noise and visual cues of people, helicopters, trucks, and other associated equipment could include an alert posturing by birds, stopping calling and defending of territories, random outcries, calmly fleeing the area, energetic escape responses possibly resulting in accidentally expelling eggs and young from nest, and possible permanent nest or habitat avoidance (NPS 1994; FWS 1993b; Mancini et al. 1988; Gladwin, Asherin, and Mancini 1987). The displacement of individuals may result in additional stress on these individuals; however, it is unlikely to cause a substantial long-term increase in mortality or lowering of species health. Overall, impacts on birds from helicopter and other human noise would generally be short term and localized to capture, staging, and release sites and helicopter flight paths, although a few individuals (eggs and young) may be permanently lost. Unlike mammal impacts, helicopter flights have a potential to directly affect birds through bird strikes or destruction of nests, although the probability is low.

Fish

Under alternative B, initial restoration activities would not disturb fish habitat. The number of grizzly bears in the ecosystem would be very small (approximately 10), and the population is expected to remain confined to the northern portion of the NCE. Fish are not expected to be a primary food source, and the number of grizzly bears in the ecosystem would not be sufficient to generate any adverse impacts on fish populations as a result of predation.

Cumulative Effects

Ongoing and reasonably foreseeable future actions with the potential to contribute to cumulative effects on grizzly bears under alternative B are the same as those described for alternative A.

Overall, ongoing and reasonably foreseeable future activities would have both beneficial and adverse impacts on other wildlife and fish species, but in aggregate, these impacts would be beneficial based on the largely intact available habitat. Alternative B would contribute short-term, adverse impacts primarily related to helicopter use limited to 40 flights over 2 years for releases and limited seasonal fixed-wing monitoring flights, but would have no long-term, adverse impacts. Overall, cumulative impacts on other wildlife and fish under alternative B would be beneficial.

Conclusion

Under alternative B, the potential exists for short-term, adverse impacts on other wildlife and fish but would be limited to the period of active restoration. The initial release of up to 10 grizzly bears into the NCE could result in disturbance to denning mammals or nesting birds as a result of disturbance from helicopter operations in close proximity to active dens or nests. The number of helicopter operations in a given season is expected to be limited to approximately 4 flights per bear (a total of 40 flights), and would be limited to 5 to 7 days per year in mid- to late summer and fall. In the long term, the potential for grizzly bear predation on and/or competition with some wildlife and fish species would be limited. However, given the habitat use, life histories, and other characteristics of many of these species, in combination with grizzly bear life history, habitat use, feeding behavior, and the expected population size and density of grizzly bears that would be present in the NCE, adverse impacts on other wildlife and fish species are not expected to affect species populations and would be largely discountable. Overall, ongoing and reasonably foreseeable future activities would have both beneficial and adverse effects on other wildlife species, but in aggregate, these impacts would be beneficial. Alternative B would contribute limited, adverse impacts primarily related to helicopter use during the primary restoration phase because of species disturbance, but adverse impacts are not expected following initial restoration. Overall, cumulative impacts on other wildlife under alternative B would be beneficial. If a decision is made to transition to alternative C, additional impacts on other wildlife and fish could occur, as described for alternative C below.

Alternative C: Incremental Restoration

Predator-Prey Interactions. Alternative C would establish an initial population of 25 grizzly bears in the NCE with a target sex ratio of 60% females to 40% males. Additional bears (1 to 2) could be added every few years to meet restoration objectives. Using the grizzly bear predation rates reported by Mattson (1997), the initial population of 25 adult grizzly bears would on average kill between approximately 35 and 145 ungulates a year, rising to between 280 and 1,160 ungulates a year as the restoration goal of 200 grizzly bears in the NCE is achieved within 60 to 100 years. Based on the conservative ungulate population estimate provided under alternative B, this would be less than 0.2 % of the NCE ungulate population annually for 25 adult grizzly bears, and likely much lower. Even when fully restored, the estimated percent of the ungulate population affected would be less than 2%. Given that grizzly bears have an opportunistic feeding strategy, they would not single out specific species to prey upon; ungulates in areas with higher bear densities could face disproportionate impacts. Overall, grizzly bears are not expected to have any substantial adverse impacts on ungulate populations in the NCE under alternative C.

Interspecific Competition.

Gray Wolf. Short- and long-term impacts on gray wolf under alternative C would be essentially identical to those described for alternative B. Competition between grizzly bears and gray wolves would be unlikely, since documented interactions between grizzly bears and wolves in other ecosystems are usually characterized by mutual avoidance (Servheen and Knight 1990). Additionally, the two species largely use different food sources (Mattson, Blanchard, and Knight 1991). As a result, the likelihood that restoration actions would adversely affect wolves would be small.

Coyote. Because of the coyote's opportunistic feeding strategy and abundance and available habitat, grizzly bears would not likely place any competitive pressure on coyote populations in the NCE under alternative C even when fully restored.

Fisher. Some potential for adverse impacts on fishers would exist under alternative C, similar to those described for alternative B above. The potential for long-term, adverse impacts would be related to both competition and predation as grizzly bear and fisher populations are restored to the NCE. Fishers are mesocarnivores that use a variety of small mammal prey that grizzly bears may also use. The grizzly population is not expected to increase in size sufficiently to adversely affect the fisher through competition or predation. As a result, any long-term, adverse impacts on the fisher are expected to be minimal under alternative C.

Canada Lynx. Under alternative C, potential adverse impacts on lynx would be identical to those described under alternative B; however, additional releases would occur at multiple release sites during the first 5 to 10 years until an initial population of 25 bears is reached. Given the varied and limited distribution of lynx in the NCE and that grizzly bears do not prey on lynx or use similar dens as lynx, the likelihood that restoration actions would adversely affect lynx would be slight.

Cougar. Although some dietary overlap may exist between cougars and grizzly bears, cougars typically do not occupy the same habitat as grizzly bears. In addition, even when fully restored, grizzly bears under alternative C would not consume enough meat to place any competitive pressure on cougar populations in the NCE.

Bobcat. As described for alternative B, bobcats may occasionally use open habitat and meadows that are preferred by grizzly bears, but they tend to prefer steep, rocky terrain. In addition, the generalist diet of bobcats and grizzly bears would not likely result in any competitive pressure between the two species, even when grizzly bears are fully restored under alternative C.

Black Bears. Although some displacement occurs where grizzly and black bears coexist, potential adverse impacts on black bear population dynamics following restoration of a grizzly bear population are unclear but believed to be minimal. Under alternative C, adverse impacts on black bears, if any, are largely expected to be limited to interactions between individual grizzly bears and black bears and are not be expected to affect black bears on a population level.

Helicopter and Other Human Disturbances. Alternative C would require up to four helicopter flights per release. As described in chapter 2, alternative C involves up to approximately 5 to 7 planned releases per year for 5 to 10 years, resulting in at least 100 flights, although some additional flights may be necessary for collar retrieval, release of additional bears, and incidental actions. These helicopter flights would have similar impacts on wildlife as described for alternative B; however, slightly greater than 2.5 times more flights would occur over a longer initial period, although the same number of flights per year is expected as analyzed under alternative B. Impacts associated with noise disturbance and human presence to mammals and birds would be the same as described under alternative B, with varied

responses based on the species. Regardless, associated impacts are unlikely to result in the injury or mortality of individuals and would have no effect on species at the population level.

Fish

Under alternative C, grizzly bear restoration activities would not involve any disturbance of fish habitat. In the short term, the number of grizzly bears in the ecosystem would be very small, and the population is expected to remain confined to the northern portion of the NCE for at least the first several decades following initial restoration activities. While it is possible that grizzly bears, as opportunistic omnivores, could use fish as a food source, fish are not expected to be a primary food source and the number of grizzly bears present in the ecosystem would not be sufficient to create any pressure on fish populations as a result of predation.

Cumulative Effects

Ongoing and reasonably foreseeable future actions with the potential to contribute to cumulative effects on grizzly bears under alternative C are the same as those described for alternative A.

Ongoing and reasonably foreseeable future activities would have both beneficial and adverse impacts on other wildlife and fish species, but in aggregate, these impacts would be beneficial based on the largely intact available habitat. Alternative C would contribute some limited, short-term, adverse impacts primarily related to helicopter use for releases and seasonal fixed-wing monitoring flights. Long-term effects would be limited to predation and competition; however, impacts would be likely discountable given prey populations and varied life history traits of potential competitors. Overall, cumulative impacts on other wildlife and fish under alternative C would be beneficial.

Conclusion

Under alternative C, the potential would exist for short-term, adverse impacts on other wildlife and fish during active restoration activities. The initial release of 25 grizzly bears into the NCE could result in disturbance to denning mammals or nesting birds as a result of disturbance from helicopter operations in close proximity to active dens or nests. The number of helicopter operations in a given season is expected to be limited to approximately 4 flights per bear, and would be limited to 5 to 7 days per year in mid- to late summer and fall. In the long term, the potential for grizzly bear predation on and/or competition with some wildlife and fish species would be limited. However, given the habitat use, life histories, and other characteristics of many of these species, in combination with grizzly bear life history, habitat use, feeding behavior, and the expected population size and density of grizzly bears that would be present in the NCE, adverse impacts on other wildlife and fish species are not expected to affect species populations and would be largely discountable. Overall, ongoing and reasonably foreseeable future activities would have both beneficial and adverse effects on other wildlife species, but in the aggregate, these impacts would be beneficial. Alternative C would contribute adverse impacts primarily related to helicopter use during initial restoration because of species disturbance, but adverse impacts are not expected following initial restoration. Overall, cumulative impacts on other wildlife and fish under alternative C would be beneficial.

Alternative D: Expedited Restoration

Predator-Prey Interactions. Alternative D would seek to achieve the restoration goal of 200 grizzly bears in the NCE as quickly as possible by translocating between five to seven bears to the NCE each year for approximately 25 years. Adding 5 to 7 grizzly bears to the landscape each year would increase the number of ungulates killed each year by translocated bears; however, because of the rapid nature of

restoration efforts, managers would not be able to be as selective about the sex ratio of translocated grizzly bears as in the other action alternatives, so estimates of ungulates killed annually are much more variable. However, the annual rate would be similar to that described under alternative C, except that the target population would be achieved in approximately 25 years rather than the 60 to 100 years under alternatives B and C. As described under alternative C, even when fully restored, the estimated percent of the ungulate population affected would be less than 2% of the population. Given that grizzly bears have an opportunistic feeding strategy, they would not single out specific species to prey on; ungulates in areas with higher bear densities could face disproportionate impacts. Overall, grizzly bears are not expected to have any substantial adverse impacts on ungulate populations in the NCE under alternative D.

Interspecific Competition.

Gray Wolf and Canada Lynx. Under alternative D, any potential impacts on wolves or lynx would be the same as described under alternatives B and C. However, if adverse impacts did occur, they could persist longer because releases would continue until 200 grizzly bears were restored to the NCE. Given the distribution of wolves and lynx in the NCE and the fact that grizzly bears do not prey on or compete with them, the likelihood that restoration actions would adversely affect wolves or lynx would be slight.

Fisher. Impacts on fisher under alternative D would be similar to those described for alternative C. In the long term, the anticipated grizzly bear population in the NCE under alternative D is expected to be the same as under alternative C. The potential for long-term, adverse impacts on fisher from competition with and predation by grizzly bears would be very low, and the presence of grizzly bears is not expected to affect fisher restoration. As a result, adverse impacts on the fisher as a species are not expected under alternative D.

Coyote. Because of the coyote's opportunistic feeding strategy and abundance and available habitat, grizzly bears would not likely place any competitive pressure on coyote populations in the NCE under alternative D, even when the population is fully restored.

Cougar. Although some dietary overlap may exist between cougars and grizzly bears, cougars typically do not occupy the same habitat as grizzly bears. In addition as described for alternative C, even when fully restored, grizzly bears under alternative D would not consume enough meat to place any competitive pressure on cougar populations in the NCE.

Bobcat. As described for alternative B, bobcats may occasionally use open habitat and meadows that are preferred by grizzly bears, but bobcats tend to prefer steep, rocky terrain. In addition, the generalist diet of bobcats and grizzly bears would not likely result in any competitive pressure between the two species, even when the grizzly bear population is fully restored under alternative D.

Black Bears. Although some displacement occurs where grizzly and black bears coexist, potential adverse impacts on black bear population dynamics following restoration of a grizzly bear population are unclear, but believed to be minimal. Under alternative D, adverse impacts on black bears, if any, are largely expected to be limited to interactions between individual grizzly bears and black bears and are not expected to affect black bears on a population level.

Helicopter and Other Human Disturbances. The use of trucks and helicopters would be necessary to safely and humanely capture, transport, and release grizzly bears. The noise produced by these vehicles, associated human activities, and other disturbances needed to complete the capture and release process would result in impacts on wildlife, including mammals and birds. Impacts on wildlife from helicopter and human disturbances would be similar to the impacts associated with alternatives B and C. Impacts would be limited to times when active restoration activities are ongoing and would be localized to capture

and release sites and helicopter flight paths. Although the annual impacts would be the same as those described under alternatives B and C, they would occur annually for approximately 25 years instead of 5 to 10 years for alternatives B and C, equating to around 672 flights (536 more flights than alternative C). Some additional flights may be necessary for collar retrieval and incidental actions, which could result in site abandonment or habituation in staging and release sites as a result of long-term effects from disturbance.

Fish

Under alternative D, long-term impacts on fish from grizzly bear restoration activities would be essentially the same as those described for alternative C. Initial restoration activities would not involve any disturbance of fish habitat. The number of grizzly bears in the ecosystem is expected to grow more rapidly than under alternative C; however, fish are not expected to be a primary grizzly bear food source in the NCE, and the number of grizzly bears in the ecosystem in the first one to two decades would not be sufficient to generate any substantial short-term adverse impacts on fish populations as a result of predation.

Cumulative Effects

Ongoing and foreseeable future activities under alternative D would be the same as those described for alternative A. Overall, ongoing and reasonably foreseeable future activities would have both beneficial and adverse on other wildlife species, but in aggregate, these impacts would be beneficial because of the large amount of undisturbed available habitat. Alternative D would contribute adverse impacts primarily related to helicopter use during active restoration efforts and monitoring for a longer period than the other alternatives considered. However, alternative D would have no lasting adverse impacts on other wildlife or fish populations, although the reestablishment of grizzly bears as part of the ecosystem would result in improved long-term ecosystem health. Overall, cumulative impacts on other wildlife under alternative D would be beneficial.

Conclusion

Under alternative D, the potential would exist for adverse impacts on other wildlife and fish, primarily through active restoration activities. The initial release of grizzly bears into the NCE could disturb denning mammals or nesting birds because of helicopter operations in close proximity to active dens or nests; the potential for these types of adverse impacts on take place would be extended over a longer period of time than under alternatives B and C, but the number of helicopter operations in a given season is expected to be roughly the same under all alternatives. In the long term, grizzly bear predation on and/or competition with some wildlife and fish species could be possible. However, given the habitat use, life histories, and other characteristics of many of these species, in combination with grizzly bear life history, habitat use, feeding behavior, and the expected number of grizzly bears that would be present in the NCE in the long term, adverse impacts on other wildlife species are expected to be minimal. Overall, ongoing and reasonably foreseeable future activities would have both beneficial and adverse on other wildlife species, but in aggregate, these impacts would be beneficial. Alternative D would contribute adverse impacts primarily related to helicopter use, but would have no lasting adverse impacts. The reestablishment of grizzly bears as part of the ecosystem would result in improved long-term ecosystem health. Overall, cumulative impacts on other wildlife and fish under alternative D would be beneficial.

Areas outside the NCE

Although grizzly bears would be released into remote wilderness areas of the NCE, they could move outside of the area into other parts of Washington adjacent to the NCE. Bears that move into suitable

grizzly bear habitat could be left there if they did not pose a risk of coming into conflict with humans and/or livestock. As the population grows, bears could increase movements; however, it is unlikely that a meaningful proportion of the released population would leave the NCE. It is also unlikely that impacts on other fish and wildlife from individual grizzly bears that move outside the NCE would differ from those described for each of the action alternatives.

WILDERNESS CHARACTER

The *Wilderness Act* (16 US C 1131-1136) defines wilderness as “an area untrammeled by man; an area of undeveloped land that retains its primeval character and influence; an area protected and managed to preserve its natural conditions; and, which has outstanding opportunities for solitude or a primitive and unconfined type of recreation” (section 2(c)). The *Wilderness Act* (section 4(c)) also prohibits certain uses within designated wilderness “[...] except as necessary to meet minimum requirements for the administration of the area for the purpose of this Act (including measures required in emergencies involving the health and safety of persons within the area), there shall be no temporary road, no use of motor vehicles, motorized equipment or motorboats, no landing of aircraft, no other form of mechanical transport, and no structure or installation within such area.”

NPS wilderness management policies are based on general provisions under Title 54 of the United States Code governing the national park system, the 1964 *Wilderness Act*, NPS director’s orders, and legislation establishing individual units. Wilderness areas on NPS land are devoted to the public purposes of recreational, scenic, scientific, educational, conservation, and historic use. NPS policy requires that all management decisions affecting wilderness be consistent with the minimum requirement concept defined in the *Wilderness Act*, which is a documented process to determine if administrative actions, projects, or programs undertaken by the park and affecting wilderness character, resources, or the visitor experience are necessary, and if so, how to minimize impacts (NPS 2006).

USFS wilderness management policies are based on general provisions under Title 36 of the United States Code governing the National Forest System, the 1964 *Wilderness Act*, forest plans, and legislation establishing individual units. Wilderness areas on USFS land are meant for multiple uses, protecting wilderness character, and public values including, but not limited to, scientific study, inspiration, and primitive recreation experiences. USFS policy requires that wilderness values dominate over all other considerations except where limited by the *Wilderness Act*, subsequent legislation, or regulations (USFS 2007).

Methods and Assumptions

Potential impacts on wilderness are evaluated qualitatively, based on professional judgment concerning the potential impacts of grizzly bear restoration actions on each of the individual wilderness qualities listed in the affected environment and the effect of grizzly restoration actions on the preservation of wilderness in an unimpaired condition. For more information regarding the potential management actions analyzed below, see appendix F.

Analysis Area. The area of analysis for impacts of the alternatives on wilderness character includes federally designated wilderness areas located within the NCE grizzly bear recovery zone. This includes federally designated wilderness in the park complex, Mt. Baker-Snoqualmie National Forest, and Okanogan-Wenatchee National Forest that may be currently or potentially used as habitat by grizzly bears. Additionally, if grizzly bears that are captured for release into the NCE are sourced from areas located within U.S. federally designated wilderness, the impacts of capture operations on wilderness character in those source areas are analyzed based on the wilderness criteria described in chapter 3.

Issues Analyzed. The analysis of impacts on wilderness character under each alternative is based on the following issue statements that are identified in chapter 1:

Issue Statement. The use of aircraft in the release or monitoring of grizzly bears in designated wilderness areas, should grizzly bears be released and monitored, could adversely affect a number of characteristics, including the undeveloped and opportunities for solitude or primitive and unconfined recreational qualities of wilderness character.

Issue Statement. The restoration of grizzly bears would also increase the overall biodiversity present in wilderness areas, increasing the overall benefits to the natural quality of wilderness character and other features of value.

Alternative A: Continuation of Existing Grizzly Bear Management (No Action)

Untrammeled. Under alternative A, grizzly bears would not be released into the NCE, resulting in no new impacts on the untrammeled quality of wilderness character.

Natural. Under alternative A, no new impacts on the natural quality of wilderness character would occur because grizzly bears would not be released into the NCE. However, natural ecological systems inside wilderness areas would continue to be adversely affected by the loss of grizzly bears as a native species because they would become extirpated from the NCE given their low numbers and lack of reproduction.

Undeveloped. Under alternative A, grizzly bears would not be released into the NCE by use of motorized equipment, resulting in no new impacts on the undeveloped quality of wilderness character.

Opportunities for Solitude or Primitive and Unconfined Recreation. Under alternative A, there would be no new impacts on opportunities for solitude or primitive and unconfined recreation because grizzly bears would not be released into the NCE. Therefore, taking no action would not result in additional noise or closures in wilderness areas.

Other Features of Value. Under alternative A, grizzly bears would not be released into the NCE, resulting in no new impacts on other features of value. These features, such as historic properties and ongoing scientific study, could continue to offer outstanding opportunities to understand the history and ecology of vegetation, wildlife, fire, geology, and water resources in wilderness areas.

Cumulative Impacts

Alternative A would have no impacts on untrammeled or undeveloped character or opportunities for solitude or primitive and unconfined recreation or other features of value, but the decision to not actively restore grizzly bears to the NCE would affect the natural character of the wilderness. The natural quality of wilderness character could be affected by a number of cumulative actions, including intentional or accidental introduction of non-native and invasive species, air pollution, water pollution, and soil disturbance. However, all federal actions in wilderness would need to comply with the minimum requirements of the law, minimizing potential impacts. Overall, cumulative actions could result in some adverse impacts on wilderness character, specifically the natural quality. Alternative A would contribute a slight adverse increment to overall cumulative impacts on the natural quality because the decision to not restore grizzly bears would likely result in their future absence from the ecosystem.

Conclusion

Under alternative A, no new impacts on wilderness character would occur however, the decision to not restore grizzly bears would adversely affect the natural quality of wilderness if the species were to be lost from the NCE. Cumulative actions would contribute to overall adverse or beneficial impacts on the natural quality, which could be exacerbated by the eventual loss of a species. Overall, alternative A could result in long-term impacts on the natural quality of the wilderness in the NCE.

Alternative B: Ecosystem Evaluation Restoration

Alternative B would release up to 10 grizzly bears over the first 2 years of initial restoration activities, monitor those bears for 2 years, and then make a determination on the release of additional bears. Depending on the outcome of monitoring, managers could decide to repeat the initial release and continue monitoring or transition to alternative C. If managers decide to move toward implementation of alternative C during the adaptive management phase of this alternative, the impacts would coincide with those described for alternative C below.

Untrammelled. Under alternative B, restoring grizzly bears in the NCE would constitute a direct manipulation of the behavior or lives of autonomous animals. There would be intermittent (up to 10 releases over 2 years) and localized (focused at a single release site) adverse impacts on the untrammelled quality of wilderness character related to the release and monitoring grizzly bears or additional translocations of grizzly bears to address mortality, population trends, genetic limitations, distribution, and the sex ratio. Overall, the ecological systems within wilderness in the NCE, along with their biological and physical components, is expected to remain relatively, but not completely, free from human intervention in the form of vehicles and equipment used to release and monitor bears.

Natural. Under alternative B, the restoration of grizzly bears would support recovery of natural conditions in wilderness, notably the restoration of a population of a native species and the ecological functions it serves as a component of the NCE. Minimal adverse impacts on the natural quality of wilderness character could occur as a result of localized disturbance to native vegetation and wildlife species in the vicinity of the release site during active release of grizzly bears. Disturbance would be limited due to the frequency of restoration and monitoring activities over the course of 5 years. Similar localized (limited to a single release site) adverse impacts could also occur as a result of the periodic release of additional grizzly bears or relocation of grizzly bears. These impacts would, however, take place on a highly intermittent basis within the first 5 years under alternative B. Overall, the long-term restoration of grizzly bears, both in terms of their physical presence on the landscape and their role in the terrestrial food web, is expected to have lasting beneficial impacts on the natural quality of wilderness in the NCE because digging and foraging by bears positively influences nitrogen available to plants, as well as seed and nutrient dispersal, and predation on wildlife helps to stabilize the food web.

Undeveloped. Under alternative B, the remoteness and lack of roads in wilderness would necessitate the use of helicopters for releasing grizzly bears. The use of motorized equipment would result in adverse effects on the undeveloped quality of wilderness because, during active release efforts, the imprint of human activity would be noticeable. However, once bears are released, the impacts would cease to occur. Additionally, the placement of culvert traps during release of grizzly bears would adversely affect the undeveloped quality of wilderness character because these traps, although in place for only a few hours per release, would not promote the primeval character and influence of wilderness. These impacts would be limited primarily to the first 2 years of implementation when up to 10 bears would be released around a single release site. These impacts are expected to last for only a few days at a time as bears become available for release and would require 40 helicopter flights spread out over the first 2 years. Overall,

impacts of alternative B on the undeveloped quality of wilderness character in the NCE would be minimal.

Opportunities for Solitude and Unconfined Recreation. Under alternative B, noise would be produced in wilderness from the use of helicopters for the release of up to 10 bears over the first 2 years. Noise is typically measured in A-weighted decibels (dBA), which are an expression of the relative loudness of sounds as perceived by the human ear (OSHA 2013). The U.S. Environmental Protection Agency recommends that in areas of outdoor activity where quiet is a basis of use, the average ambient sound level over a 24-hour period should not exceed 55 dBA (USEPA 1974). A Hughes 500 or similar helicopter would be required during the capture and release of grizzly bears for the action alternative. Federal Aviation Administration testing data (FAA 1977) determined that a Hughes 500 produces between 71 and 90 dBA during hovering, approach, and low speed (airspeed of 69 mph at 500 feet above ground level) flyover maneuvers (FAA 1976). While helicopters would create noise above the ambient sound level at distances over a half mile, the noise would be intermittent and temporary as the helicopter traverses the landscape—lasting seconds to minutes. Furthermore, topography and vegetation would influence the level and distance at which noise would be audible. For a complete discussion of noise impacts as a result of motorized equipment, see “Other Wildlife and Fish” above.

Helicopters would make up to 4 round-trips per grizzly bear (accounting for 40 total trips) and up to 2 landings in wilderness for the release of each grizzly bear, drop-off and retrieval of staff, and drop-off and retrieval of culvert traps, although some additional flights may be necessary for collar retrieval and incidental actions. With the time needed to mobilize and demobilize and potential issues associated with weather conditions, release operations would likely take place over 5 to 7 days annually, depending on available bears. Helicopter flight time over wilderness would likely vary depending on the location of the release site and corresponding staging area. Flight time over wilderness would not exceed 24 hours during each of the first few years of implementation under alternative B. Figure 12 shows potential release areas and corresponding staging areas near wilderness. Table 9 provides the range of hours helicopters could be operating over, and in, wilderness.

Release of grizzly bears would take place from mid-summer through early fall. Release activities in wilderness would take place during daylight hours. Closures within the immediate vicinity of ongoing grizzly bear release operations may be required, although attempts would be made to avoid high visitor use areas. These temporary closures are expected to last from a few hours to a few days.

The use of helicopters during release of grizzly bears would have temporary, adverse impacts on opportunities for solitude because the resulting noise would be audible and would disrupt the natural soundscape of wilderness areas. The potential for wilderness users to encounter wildlife management personnel associated with grizzly bear release operations would also have adverse impacts on opportunities for solitude, although given the remoteness of the release sites, chances for encounters would be very low. Even though very limited in size and duration, any temporary closures of areas of wilderness during release of grizzly bears would have adverse impacts on unconfined recreation because they would restrict the recreational activities of some wilderness users. Similarly, but much more intermittently, adverse impacts on opportunities for solitude and unconfined recreation would result from the use of helicopters that periodically release additional grizzly bears as a result of mortality or emigration from the NCE. These impacts are expected to be infrequent, localized, and limited in duration.

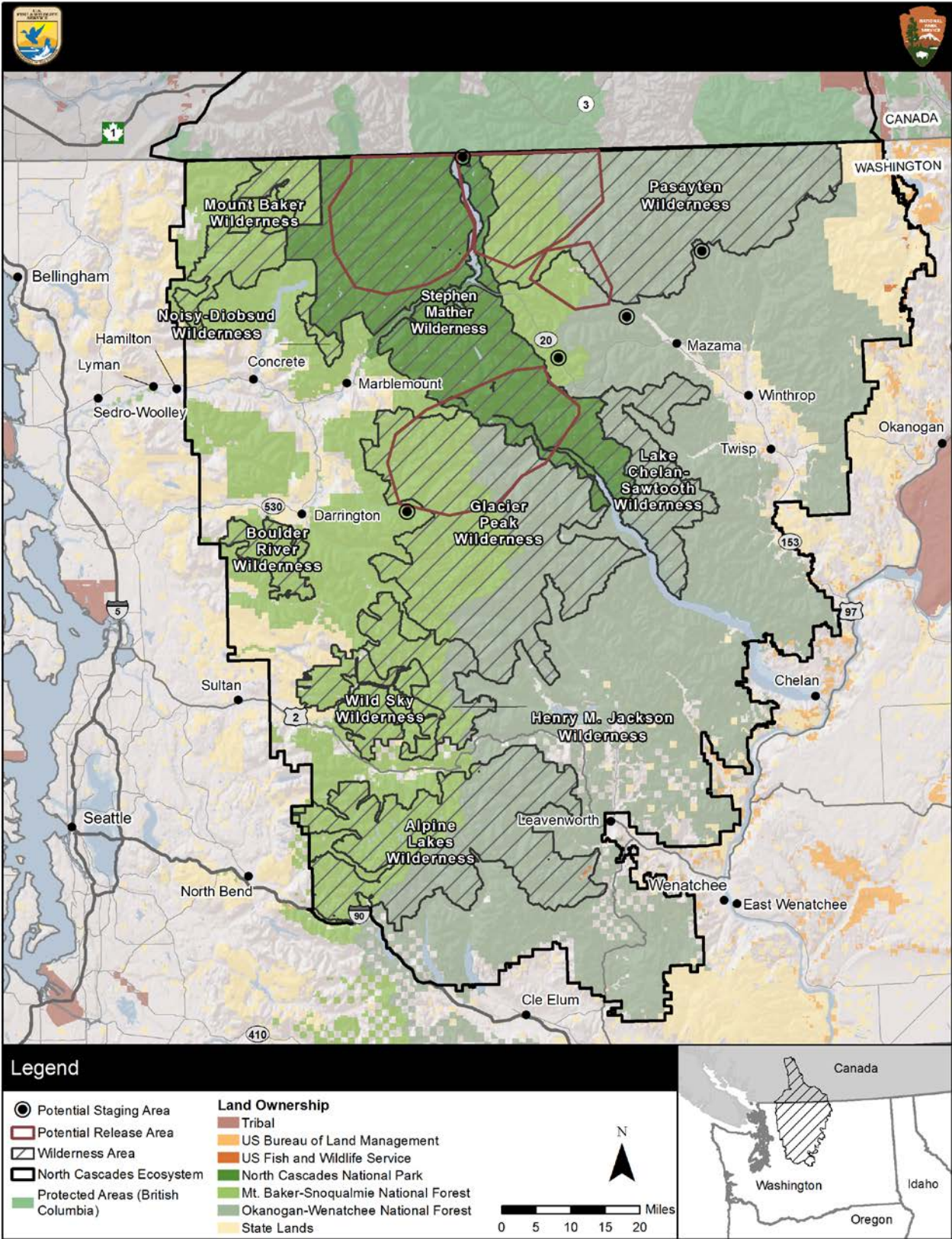


FIGURE 12. POTENTIAL RELEASE AREAS AND FEDERAL WILDERNESS AREAS IN THE NORTH CASCADES ECOSYSTEM

TABLE 9. ESTIMATE OF FLIGHT TIME OVER WILDERNESS*

Proposed Staging Area	Hours Over Wilderness Per Release
Billy Goat	4–4.8
Hozomeen	2.2–3.6
Swamp Creek	0.15–1.8
Green Mountain	1.6–2.4
West Fork Methow	0

*Hours for four round trip flights.

Source: IGBC NCE Subcommittee 2016

Other Features of Value. Under alternative B, no impacts on historic properties are expected. Ongoing scientific study could be affected because the restoration of grizzly bears has the potential to adversely and beneficially affect vegetation and wildlife species in wilderness. The omnivorous diet of the grizzly bear, in combination with habitat requirements, could create localized disturbance to plant and animal species being studied by researchers. However, given the random and isolated locations of vegetation research plots and the limited number of bears being released under this alternative, these impacts would be minimal. Furthermore, having grizzly bears on the landscape would allow for additional research opportunities on a species that has not had a viable population in the NCE in many years, resulting in beneficial impacts on the quality of other features of value. Overall, any adverse impacts are expected to be infrequent, localized, and limited in duration because of the small number of bears released and because alternative B includes monitoring grizzly bear habitat use and instances of human conflict for adjusting future releases.

Impacts on Wilderness Character in Grizzly Bear Source Areas

If grizzly bear source populations are in wilderness areas, the impacts on wilderness character in the source areas would be similar to those described above for release areas because the equipment and procedures used, and the timing and duration of capture operations would be similar. Capture would include the use of helicopters, trucks in accessible areas, culvert traps, snares, and area closures. Capture operations in source area wilderness would have adverse impacts on all of the qualities of wilderness character described above and would be identical to those described for wilderness areas in the NCE. Adverse impacts related to periodic capture of additional grizzly bears necessary to address potential mortality or emigration from the NCE could also occur. The major difference between the impacts on wilderness in the NCE and the impacts on source area wilderness would be that the capture of grizzly bears would have adverse impacts on the natural quality of source area wilderness. These adverse impacts would result from capturing and permanently removing individual grizzly bears from the source area landscape and food web. Source areas would be chosen in part because the grizzly bear populations in those areas would be at sufficient levels to withstand the loss of a small number of individual grizzly bears. Therefore, adverse impacts on the natural quality of source area wilderness are expected to be minimal.

Cumulative Impacts

The untrammelled quality of wilderness character could be adversely affected by fire suppression and non-native fish management. Whereas, the natural quality of wilderness character could be affected by a number of factors, including accidental introduction of non-native and invasive species, air pollution, water pollution, soil disturbance, and climate change. The undeveloped quality of wilderness character

could be affected by a number of existing facilities and the use of motorized equipment. Opportunities for solitude or primitive and unconfined recreation could be affected by light pollution, noise intrusions, the backcountry permit system, group size restrictions, campfire limitations, food storage policies, and campsite restrictions. No impacts are expected to other features of value. Overall, cumulative actions would result in adverse impacts on wilderness character. It is likely that alternative B would contribute to the overall cumulative impacts from the actions associated with the release and subsequent management of grizzly bears, but the adverse contribution of alternative B would be minimal given the limited number of days that grizzly bear release operations would occur and would be offset by the ultimate restoration of a component of the natural landscape, a beneficial impact, if managers decide to transition to alternative C.

Conclusion

The implementation of alternative B would result in adverse and beneficial impacts on wilderness and long-term, beneficial impacts on wilderness character. This alternative would restore up to 10 grizzly bears over the first 2 years of initial restoration activities. The duration of impacts on the qualities of wilderness character would likely be short during the primary phase, only occurring during releases. Intermittent and localized, adverse impacts would occur from monitoring grizzly bears or additional translocations of grizzly bears to address issues with mortality, population trends, genetic limitations, distribution, or the sex ratio. However, the restoration of grizzly bears would benefit the natural value of wilderness because the species is largely absent from the NCE with only one to two sightings in the last 10 years. When combined with other past, present, and reasonably foreseeable future actions, the cumulative actions of alternative B would result in adverse impacts on wilderness character as a result of the methods used for restoration, and the adverse contribution of alternative B to these cumulative actions would be minimal. However, the limited, adverse impacts from alternative B would be offset by initiating the restoration of a native species, a beneficial impact. Additional benefits would be realized if managers ultimately transition to alternative C and continue to restore the species.

Alternative C: Incremental Restoration

Untrammeled. The magnitude of impacts on the untrammeled quality of wilderness character associated with the release of grizzly bears would be similar to alternative B, although the impacts would extend for additional years. Under alternative C, the release of grizzly bears into wilderness would constitute direct manipulation of the behavior or lives of autonomous animals. Alternative C would have adverse impacts on the untrammeled quality of wilderness character as a result of restoration activities. Intermittent and localized, adverse impacts on the untrammeled quality of wilderness would occur related to capturing and releasing bears; monitoring grizzly bears; or releasing additional grizzly bears to address mortality, population trends, genetic limitations, or the sex ratio. The primary restoration phase would be limited to the release of 5 to 7 bears over a 5 to 10 year period until a population of 25 bears is achieved, although agencies could supplement the population every few years through the release of 1 to 2 bears. Overall, ecological systems within the wilderness in the NCE, along with their biological and physical components, are expected to remain relatively but not completely free from human intervention.

Natural. Under alternative C, adverse impacts on the natural quality of wilderness character would be likely, as a result of localized disturbance to native vegetation and wildlife species in the vicinity of the release sites. However, disturbance would be limited because of the frequency of restoration activities over the course of 5 to 10 years. Similar localized, adverse impacts may also occur as a result of periodic release of additional grizzly bears or relocation of grizzly bears. These impacts would, however, take place on a highly intermittent basis (every few years). The restoration of grizzly bears, both in terms of their physical presence on the landscape and their role in the terrestrial food web, would have lasting beneficial impacts on the natural quality of national park and national forest wilderness areas in the NCE.

Undeveloped. Under alternative C, impacts would be similar to those described for alternative B from the use of motorized equipment, although the primary phase would last longer (5 to 10 years). Adverse effects on the undeveloped quality of wilderness character would occur because the imprint of human activity from helicopter use would be noticeable. Additionally, the temporary placement of culvert traps during the release of grizzly bears would adversely affect the undeveloped quality of wilderness character because these traps would not promote the primeval character and influence of wilderness. However, these traps would be removed immediately once bears have been released. Overall, the adverse impacts of alternative C on the undeveloped quality of wilderness character in the NCE would be minimal.

Opportunities for Solitude or Primitive and Unconfined Recreation. Under alternative C, the use of motorized equipment and presence of wildlife management personnel associated with grizzly bear release operations would adversely affect opportunities for solitude because the resulting noise and visual disturbance would affect the landscape and soundscape. The potential for closures of various portions of wilderness areas, if necessary during release of grizzly bears, would adversely affect unconfined recreation because the closures would restrict the recreational activities of wilderness visitors. Adverse impacts on opportunities for solitude associated with helicopter noise would occur with more frequency, with approximately 100 to 136 helicopter round trips. Impacts on unconfined recreation would result from the use of helicopters to periodically release additional grizzly bears or to place culvert traps and transport wildlife management personnel during relocation or removal of conflict grizzly bears. It is expected that these impacts would be infrequent, localized, and limited in duration.

Other Features of Value. Under alternative C, no impacts on historic properties are expected. Ongoing scientific study could be affected since the restoration of grizzly bears has the potential to adversely and beneficially impact vegetation and wildlife species in wilderness. The omnivorous diet of the grizzly bear, in combination with habitat requirements, could create localized disturbance to plant and animal species being studied by researchers. However, given the random and isolated locations of vegetation research plots, along with the limited number of grizzly bears being introduced under this alternative, these impacts would be minimal. Furthermore, having grizzly bears on the landscape would allow for additional research opportunities regarding a species that has not had a viable population in the NCE in many years, resulting in beneficial impacts on the quality of other features of value of wilderness character.

Impacts on Wilderness Character in Grizzly Bear Source Areas

If grizzly bear source populations are identified in wilderness areas, the impacts on wilderness character in the source areas would be similar to those described under alternative B because the equipment and procedures used and the timing of capture operations would be the similar, although the duration would be 5 to 10 years.

Cumulative Impacts

Cumulative actions under alternative C would be similar to those described for alternative B. It is likely that alternative C would contribute to the overall cumulative effects from the actions associated with the release and subsequent management of grizzly bears, although the contribution of adverse impacts from alternative C would be minimal. However, alternative C would also provide lasting benefits to wilderness through the reestablishment of a native species.

Conclusion

The implementation of alternative C would result in both adverse impacts and beneficial impacts on wilderness character in the NCE. The qualities of wilderness character such as untrammeled, undeveloped, and opportunities for solitude and unconfined recreation would be adversely affected during

grizzly bear restoration activities over the course of 5 to 10 years. These impacts include the manipulation of the ecosystem and use of motorized vehicles (helicopters). However, the restoration of the grizzly bear would result in benefits to the natural quality of wilderness as it will restore a native species to the ecosystem. Overall, cumulative actions would result in adverse impacts on wilderness character, and the adverse contribution of alternative C to these cumulative actions would be minimal. However, alternative C would also provide lasting benefits to wilderness by restoring a native species.

Alternative D: Expedited Restoration

Untrammelled. The magnitude of impacts on the untrammelled quality of wilderness character associated with the release of grizzly bears would increase under alternative D because active restoration would last approximately 25 years. Similar to alternatives B and C, restoring grizzly bears in the NCE would constitute direct manipulation of the behavior or lives of autonomous animals under alternative D. Because alternative D involves the release of a considerably larger numbers of grizzly bears (up to 168 grizzly bears), the duration of trammeling impacts would be longer than those described under alternative C. Intermittent and localized, adverse impacts would occur on the untrammelled quality of wilderness character related to monitoring grizzly bears or removing or relocating conflict grizzly bears.

Natural. Under alternative D, the impacts on the natural quality of wilderness character associated with the release of grizzly bears would likely increase due to the frequency of disturbance to native vegetation and wildlife species in the vicinity of release sites, as multiple release sites would be used, over the course of 25 years. However, like alternative C, it is expected that the restoration of grizzly bears, both in terms of their physical presence on the landscape and their role in the terrestrial food web, would have lasting beneficial impacts on the natural quality of national park and national forest wilderness areas in the NCE.

Undeveloped. Under alternative D, the impacts on the undeveloped quality of wilderness character associated with the release of grizzly bears would likely increase due to the increased frequency of helicopter overflights (totaling 672) and use of culvert traps related to additional grizzly bears being released over time compared to alternative C.

Opportunities for Solitude and Unconfined Recreation. Under alternative D, the impacts on opportunities for solitude and unconfined recreation associated with the release of grizzly bears would be greater than those described under alternative C. Increases in the use of motorized equipment and presence of wildlife management personnel would result in adverse impacts on opportunities for solitude. For example, adverse impacts associated with noise from helicopter flights associated with alternative D would be more pronounced than under alternative C, given a greater number of flights (i.e., 4 flights per bear) with 672 flights, although some additional flights may be necessary for collar retrieval and incidental actions. The resulting noise and visual disturbance would affect the landscape and soundscape over the course of 25 years, but only during the release periods. The potential for an increase in temporary closures in wilderness during the release of grizzly bears would have adverse impacts on unconfined recreation because closures would restrict the recreational activities of wilderness visitors. Any closure would be limited in nature as described in alternatives B and C, but the closures could occur more repeatedly, related to the number of years of active restoration.

Other Features of Value. Under alternative D, no impacts on historic properties are expected. Ongoing scientific study could be affected since the restoration of grizzly bears has a potential to adversely and beneficially impact vegetation and wildlife species in wilderness. The omnivorous diet of the grizzly bear, in combination with habitat requirements, would create localized disturbance to plant and animal species being studied by researchers. However, given the random and isolated locations of vegetation research plots, along with the size of the area and the continued low density of the grizzly bears population, these impacts would be minimal. Having grizzly bears on the landscape would, however, allow for additional

research opportunities on a species that has not had a viable population in the NCE in many years. This would result in beneficial impacts on the quality of other features of value of wilderness character.

Impacts on Wilderness Character in Grizzly Bear Source Areas

If grizzly bear source populations are identified in wilderness areas, the impacts on wilderness character in the source areas would be similar to those described under alternative C because the equipment and procedures used and timing of capture operations would be similar; however, capture efforts would extend for up to 15 additional years under this alternative compared to alternative C, substantially extending adverse impacts on wilderness character over time.

Cumulative Impacts

Cumulative actions under alternative D would be similar to those described for alternative C. It is likely that alternative D would contribute to the overall cumulative effects from actions associated with the release and subsequent management of grizzly bears, which could amplify adverse impacts on wilderness character, although the adverse contribution from alternative D would be minimal. However, alternative D would also provide lasting benefits to wilderness through the reestablishment of a native species that have not had a viable population in the NCE in many years.

Conclusion

The implementation of alternative D would result in adverse impacts associated with the release and management of grizzly bears restored to the NCE and lasting beneficial impacts on wilderness character. These impacts are similar to those described under alternative C; however, adverse impacts would continue for up to 15 additional years, substantially extending the impacts on wilderness character over time. Overall, cumulative actions would result in adverse impacts on wilderness character, and the adverse contribution of alternative D to these cumulative actions would be minimal. However, like alternative C, alternative D would also provide lasting benefits to wilderness by restoring a native species that has not had a viable population in the NCE in many years.

Areas outside the NCE

Although grizzly bears would be released into remote wilderness areas of the NCE, they could move outside of the area into other parts of Washington adjacent to the NCE. Bears that move into suitable grizzly bear habitat would be left there if they did not pose a risk of coming into conflict with humans and livestock. This is especially true of other wilderness areas outside the NCE. As the population grows, bears could increase movements; however, it is unlikely that a meaningful proportion of the released population would leave the NCE. If grizzly bears move into other wilderness areas where they have been absent, they would improve the overall wilderness character of the area.

In the event that the option to designate the NCE population of grizzly bears as a section 10(j) experimental population is implemented, additional management measures may become available to managers to use non-lethal measures to reduce impacts by grizzly bears that move outside NCE or to mitigate human-grizzly bear conflicts, including those that could occur in wilderness areas.

VISITOR USE AND RECREATIONAL EXPERIENCE

Methods and Assumptions

The potential impacts of the alternatives on visitor use and recreational experience were evaluated qualitatively based on resource expert knowledge and professional judgment; review of visitor use statistics for park and national forest visitors; and information provided by the NPS, FWS, and USFS recreation, natural resources, and public information experts. To assess impacts on visitor use and recreation, the current types of visitor uses in areas where grizzly bears may be encountered were considered, and the potential effects of the implementation of the alternatives on visitor use and recreation were analyzed. Additionally, the level and regularity of various types of noises experienced by visitors were considered, and the potential for impacts on visitor use and recreation attributable to effects on the natural soundscape were analyzed.

Analysis Area. The area of analysis for impacts of the alternatives on visitor use and experience comprises the NCE grizzly bear recovery zone where grizzly bear restoration activities and subsequent grizzly bear habitat use may overlap with visitor use.

Issues Analyzed. The analysis of impacts on visitor use and recreational experience under each alternative is based on the following issue statements that are identified in chapter 1:

Issue Statement. The restoration of grizzly bears to the NCE could increase visitation and recreational use of the park and national forests as visitors seek to experience grizzly bears in their native habitat.

Issue Statement. Restoration actions that result in an increased grizzly bear population could also affect recreational opportunities for visitors who do not wish to encounter grizzly bears.

Issue Statement. Depending on the type and location of visitors' attitudes and preferences, there would be varying effects on visitor use and recreation related to area closures during ongoing grizzly bear restoration activities, noise, and the visible presence of helicopters, as well as the potential for human-grizzly bear encounters as initial restoration activities give way to adaptive management activities.

Alternative A: Continuation of Existing Grizzly Bear Management (No Action)

As discussed in chapter 1, it is highly unlikely that the NCE contains a viable grizzly bear population, and natural recovery in the NCE is thus not expected to occur. Consequently, under the no-action alternative, impacts on existing visitor use patterns and recreational opportunities are not expected. The majority of visitors are expected to continue to visit the NCE with little change in their trip frequency or length. Visitors who are in favor of the restoration of grizzly bears and who believe that the presence of grizzly bears would constitute a unique recreational/outdoor experience would be denied that experience in the NCE under the no-action alternative, but that would not be a change from existing conditions.

Implementation of the no-action alternative would maintain the status quo, as NPS and USFS personnel would continue to promote public education, outreach, and sanitation measures, as discussed previously. Continued public education and management efforts would benefit visitors by fostering awareness, promoting behavior modification, and encouraging coexistence between people and bears. The NPS, USFS, and FWS would continue to encourage recreational visitors and hunters to report potential grizzly

bear sightings as well as black bear sightings. Existing black bear interactions with wildlife and humans would likely remain unchanged. Popular recreational activities such as hiking, camping, mountaineering, winter sports, boating, and fishing would be likely to continue unchanged under the no-action alternative.

Cumulative Effects

Because alternative A is unlikely to affect visitor use or recreational experience, no cumulative impacts would occur under alternative A.

Conclusion

Under the no-action alternative, grizzly bear restoration activities would not occur in the NCE. Therefore no direct, indirect, or cumulative impacts on visitor use and recreational experience are expected compared to existing conditions.

Alternative B: Ecosystem Evaluation Restoration

Alternative B would release up to 10 grizzly bears over the first 2 years of initial restoration activities, monitor those bears for 2 years, and then make a determination on the release of additional bears. Depending on the outcome of monitoring, managers could decide to repeat the initial release and continue monitoring or transition to alternative C. If managers decide to transition to the implementation of alternative C during the adaptive management phase of this alternative, the impacts would coincide with those described for alternative C, below.

Under alternative B, potential beneficial and adverse impacts on visitor use and recreational experience could result from the initial restoration of grizzly bears in the NCE. Because grizzly bears have a high profile worldwide, and because they are rare in the contiguous 48 states, visitation could increase or decrease depending on visitor interest in or aversion to them. Some visitors may perceive the opportunity to view a grizzly bear as a unique recreational experience because grizzly and other bears are deeply embedded in the myths and social constructions of American society. Impacts would be beneficial for those visitors who feel that the presence of grizzly bears and restoration of a large native mammal that is an important part of the terrestrial food web enhances their wilderness experience. Impacts would be adverse for those visitors who do not wish to encounter grizzly bears.

Public outreach and education would be more comprehensive under alternative B than under the no-action alternative. These measures would have beneficial impacts by teaching members of the public about grizzly bear behavior and natural history, while educating them to recognize signs that grizzly bears are in the area. Management efforts in the front country would continue to be directed at minimizing attractants and deterring grizzly bears from easily accessible areas developed for high human use. Visitor compliance with NPS and USFS policies designed to protect natural resources would likely enhance their unique recreational experiences by mitigating the potential for human-grizzly bear conflict. Public acceptance and perceptions may change as grizzly bears increase in number over time and begin to use habitat over a larger area of the ecosystem.

Grizzly bears would be released away from areas of high visitor use, including motorized roads, campsites, and trails. It is assumed that any trail and/or area closure would be very temporary, localized, and limited to a few hours to a few days, and adverse impacts are not anticipated to occur outside wilderness/backcountry areas. As discussed in the “Wilderness Character” section, these temporary closures could have adverse impacts on unconfined recreation because they could restrict the recreational activities of some wilderness users. All released grizzly bears would be monitored to keep the public informed of restoration efforts.

Generally, adverse noise impacts on visitor use and recreational experience from helicopter flights associated with alternative B would be limited in duration to the 40 trips necessary to release 10 bears and would only occur in a certain portion of the NCE. Efforts would be made to avoid trails and campgrounds by using a single, remote release site (figure 13).

Helicopters would take the most efficient routes to and from the release site, reducing the duration spent over campsites or along trails. When landing and taking off from staging areas and release sites, helicopters could be audible to humans above the ambient sound level for approximately 0.5 mile. At approximately 650 feet from the staging areas and release site, helicopter noise would be audible at or above approximately 60 dBA, which is the threshold for interruption of normal voice communications at 3 feet. Under the primary phase of alternative B, approximately 40 total round-trip helicopter flights in the NCE would occur per year for the first 2 years for the release of up to 5 bears per year. It is unlikely that more than 1 bear would be released in a given day, and helicopter operations would require a maximum of 8 total flying hours in a given day during first two seasons. See table 12 in the “Wilderness” section regarding the range of hours helicopters could be operating over wilderness. The management window for helicopter-based capture and release would be approximately 10 days each year in late summer. However, given the single, remote location of a release area in the northern portion of the NCE under this alternative, the probability of many human visitors being affected by noise is low.

Staging areas in general are not located near heavy visitor use areas; the exception to this is the Hozomeen Campground near the Canadian border. Similar but much more intermittent adverse impacts on opportunities for solitude and unconfined recreation would result from the use of helicopters to place culvert traps and transport wildlife management personnel during relocation or removal of conflict grizzly bears. These impacts are expected to be infrequent, localized, and limited in duration.

Helicopter operations are not uncommon in the NCE. As discussed under the “Wilderness” section of chapter 3, flight hours over wilderness average approximately 142 hours per year. The majority of these flight operations stemmed from active fire management operations, with high activity during 2009, 2010, and 2014. Grizzly bear helicopter operations are expected to take place over a total of 2 years, which would limit impacts on individual visitors at any given time in any given location. Some visitors may perceive the noise and frequency of helicopter operations as an impact on the tranquility and ecology of the setting. Adverse impacts on the natural visual landscape resulting from such operations would be temporary, intermittent, and would vary based on an individual’s position on the landscape and distance from ongoing restoration activities. Because the release of grizzly bears would take place from mid-summer through early fall, visitors would not experience helicopter related noise impacts during the winter and spring.

The potential frequency and duration of additional grizzly bear capture and release activities beyond the primary phase is unknown and would be influenced by the population size, distribution relative to visitor use on the landscape, available funding and personnel, and other management considerations. However, the impacts would be similar to those described above. The intensity of adverse impacts would vary based on the location, frequency, and timing of restoration activities.

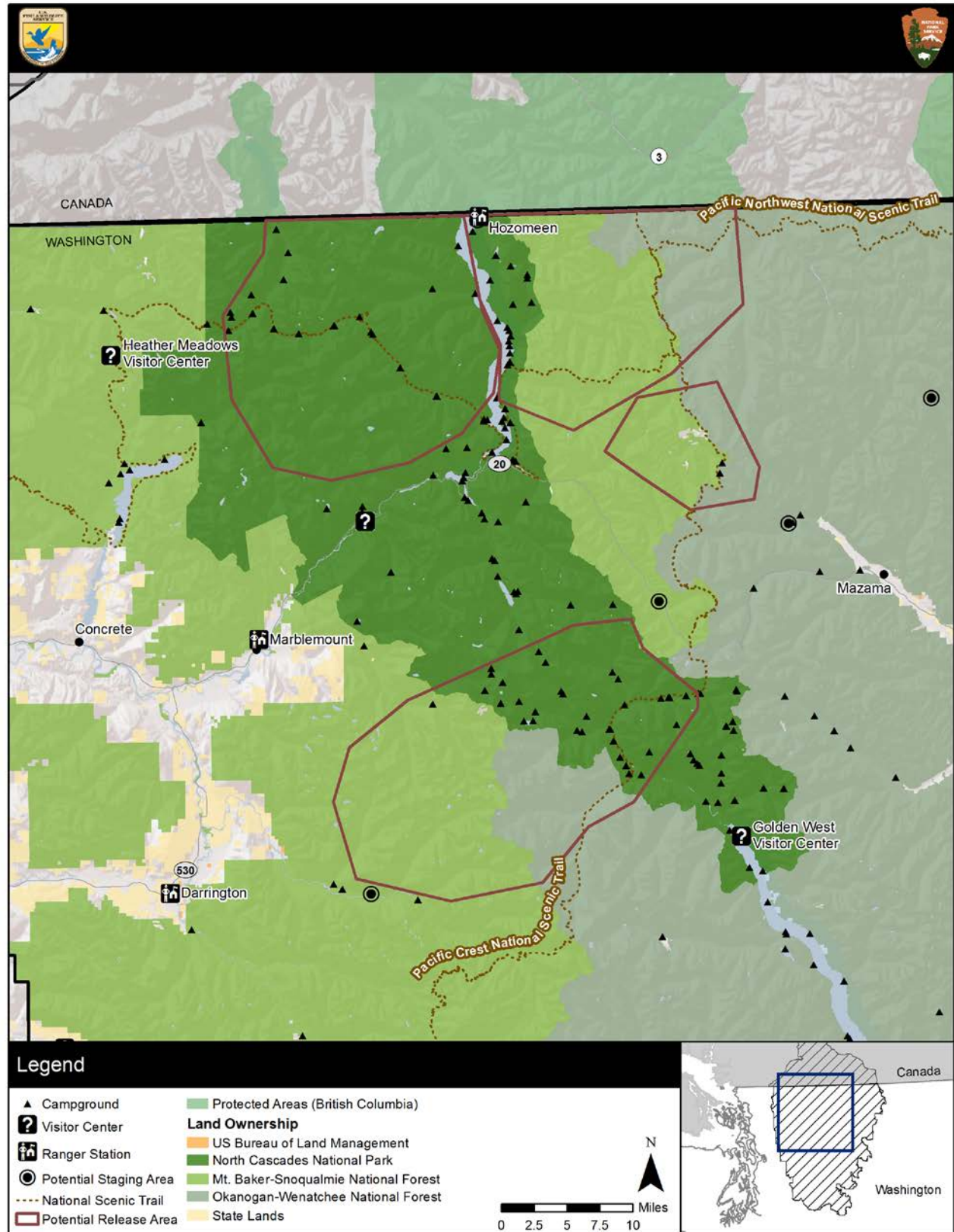


FIGURE 13. POTENTIAL RELEASE AREAS AND RECREATIONAL SITES IN THE NORTH CASCADES ECOSYSTEM

Some front country areas that may be highly desirable to visitors (i.e., ranger stations, highways, roads used by visitors to access front country areas, and locations proximate to bathroom facilities, picnic grounds, campsites, and boat launches) are not typically preferred habitat for seasonal grizzly bear use; therefore, adverse impacts on these areas would be unlikely, especially given the small number of grizzly bears to be released initially and the designation of a single release site. Closure of park or forest facilities and main roads are not expected to occur. Given that only two trails were temporarily closed on national forest lands in the NCDE because of grizzly bears in the 10-year period from 1990 to 2000 (FWS 2016d), it is reasonable to assume that any trail and area closures would be temporary, localized, and limited.

In the event of a human-bear conflict, the 2002 Interagency Grizzly Bear Committee (IGBC) Guidelines for the NCE would govern actions (see discussion in chapter 2 and appendix E). Bear-human conflict can occur in diverse locations (residential, rural, agricultural, and backcountry), so real-time information is essential for effective management. Analysis of habitat use would help NPS, USFS, FWS, and WDFW personnel determine what makes certain areas conducive to grizzly bear activity and how to prevent conflicts from occurring in the future. During the primary phase of restoration under alternative B, habitat use and human-bear conflict would be monitored. Data collected during this period would help agency personnel make decisions regarding future release sites before additional bears are released into the landscape. Management decisions would be made in the context of reducing the probability of bear-human conflict, as well as preferred habitat.

As grizzly bears increase in number over time and begin to use habitat over a larger area of the NCE, the potential for humans to encounter them would exist over a greater geographical range, which could provide benefits for those visitors hoping to experience grizzly bears in the natural environment, while dissuading some other visitors from recreating in the NCE. Given the amount of recreation that occurs in other grizzly bear ecosystems associated with Glacier National Park and Yellowstone National Park, it is unlikely that adverse impacts would limit visitor use and experience of the NCE.

The potential impacts on recreation from monitoring bear movements and habitat use would be restricted to the potential for fixed-wing flights, similar to those currently occurring for other purposes under the no-action alternative. Therefore, bear monitoring is unlikely to adversely affect visitor use or recreational experience to the point that experiences are diminished.

Cumulative Effects

Present and ongoing actions with the potential to result in cumulative impacts on visitor use and experience include ongoing road maintenance, trail maintenance and repairs, wildlife monitoring, invasive plant management within wilderness areas, and fire management. Ongoing road maintenance would result in adverse impacts during the construction phase such as temporary road closures, traffic interruptions, and traffic delays. Timely road maintenance is important because it sustains the quality and safety of the road in a condition close to the original design and minimizes the user costs by reducing wear to vehicles. Proper road maintenance would provide indefinite benefits by ensuring visitors unimpeded access to recreational areas and ease of travel. Trail maintenance would also have indefinite beneficial impacts on visitor use and experience through the continued provision of a well-maintained trail system.

Efforts by NPS and USFS personnel to monitor and maintain natural resources on federal lands would have overall beneficial impacts on visitor use and experience. For example, specific areas may be temporarily closed during invasive plant management activities, forcing some visitors to take alternate trails or camp in different areas. However, the eradication of invasive plants would improve the survival of native species, allowing visitors to experience a more intact native ecosystem. Ski area expansion projects would likely have beneficial impacts on visitor use and experience by expanding opportunities

for winter recreation. River and aquatic restoration projects may yield adverse impacts by temporarily inconveniencing anglers, but could lead to indefinite beneficial impacts, by improving habitat for native species. During restoration activities, such as sampling, surveying or shoreline/habitat restoration, anglers may be prohibited from fishing in certain areas. Temporary use restrictions may also be an issue for recreational visitors seeking to use canoes, kayaks, and boats.

Actions prescribed in existing management plans, such as the *Stephen Mather Wilderness Management Plan*, would continue to allow for long-term, beneficial impacts on visitor use and experience. Wilderness management, such as the issuance of special-use permits, has the potential to reduce human-to-human contact and enhanced visitors wilderness experience (NPS 1989). Mountain lakes restoration would continue to improve existing ecological conditions, while providing sport-fishing opportunities in reservoirs, rivers and streams, and select mountain lakes within each of the three units of park complex (NPS 2011a). The removal of non-native fish could produce long term, adverse impacts on anglers who fish in those lakes slated for fish removal. Stocking trout where they did not originally exist was an accepted practice in the North Cascades under a 1988 agreement between the State of Washington and NPS (NPS 2008a). However, this practice does not comport with NPS *Management Policies 2006*, and it is prohibited in other national parks (NPS 2008a). Following an extensive environmental review, including a 12-year scientific study, the NPS decided to end fish stocking if it did not receive Congressional approval by July 1, 2009. This decision was later amended by the *North Cascades National Park Service Complex Fish Stocking Act*, signed into law on July 25, 2014. The law requires the Secretary of the Interior to stock only fish that are: (1) native to the slope of the Cascade Range on which the lake to be stocked is located; and (2) non-reproducing, as identified in management alternative B of the *North Cascades National Park Service Complex Mountain Lakes Fishery Management Plan and Environmental Impact Statement*. Anglers may be inconvenienced by implementation of the mountain lakes restoration program if they are trying to catch a specific variety of fish in a non-native aquatic environment where fish are no longer stocked.

Pack and saddle stock outfitter guided activities would continue to cause isolated disturbances to lakeshores, stream crossings, trails, and wetland/riparian areas (USFS 2010). Visitors may experience temporary adverse impacts from these activities as they disturb the natural conditions of wilderness areas. Visitors may also experience beneficial impacts, as guided activities such as horseback riding are unique experiences.

Heavy metals and process chemicals from mining activities within the NCE have the potential to negatively impact humans (USEPA 2000). Additionally, toxic levels of heavy-metal residues generated by mining operations are a health threat to surrounding watersheds and drainage areas where fishery resources are highly valued aspects of recreation and tourism (USEPA 2000). The long-term impact of cleaning up these sites under CERCLA would produce beneficial impacts on visitors use and experience. Because current mining activities and CERCLA mine cleanup projects often produce localized, adverse impacts (e.g., dust and noise), restricting access is used to minimize access to areas where there may be an exposure. For example, USFS (in concert with the US Environmental Protection Agency) could restrict the use of off-road vehicles in an area where the use could damage the remediation and allow contaminants to be released by erosion (e.g., air or surface water). Hikers would be forced to navigate alternate routes if they encounter fencing or posted signs. Such adverse impacts would probably not be widespread and would not affect most visitors to the NCE.

Aviation activities over parks include general aviation, commercial passenger flights, park maintenance, and fire and emergency operations. Excessive aircraft noise may produce adverse impacts such as annoyance or interference with the uses and enjoyment of natural areas and can adversely affect wildlife (NPS 2016g). NPS Overflights and Aviation Uses Policy 8.4 mandates that private or commercial aircraft may be operated in parks only on lands or water surfaces designated by the NPS as landing sites through

special regulations (NPS 2016g). The types of aircraft generating noise exposure are important, as visitors have shown greater negativity regarding helicopters than fixed-wing aircraft, propeller planes, and high-altitude jets (TRB 2013). Helicopter flights, such as for search and rescue and fire operations, would continue to produce intermittent noise impacts. Such impacts could temporarily detract from visitors experience by limiting opportunities for viewing wildlife.

Overall, the cumulative impacts of past, present, and reasonably foreseeable actions on visitor use and experience would be beneficial because the intermittent, brief disruptions to visitor use that may be associated with certain activities (e.g., CERCLA cleanups, ski area expansion projects) would be offset by the long-term benefits to visitor use and recreational experience. Under alternative B, restoration activities would produce a combination of beneficial and adverse impacts on visitor use and experience associated with increased temporary noise during restoration activities and the restoration of grizzly bears in the NCE. Overall, cumulative impacts on visitor experience and recreational use would be largely beneficial when analyzed beyond the period of initial visitor disturbance (i.e., generally expected to be 2 years in duration), and alternative B would contribute a small beneficial increment to the overall cumulative impacts.

Conclusion

Overall, the impacts of alternative B on visitor use and recreational experience would be varied, but limited given the small number of bears released into the ecosystem. Under alternative B, initial restoration activities in grizzly bear habitat would result in potential adverse impacts over a 5-year time frame as a result of the increased potential for human-grizzly bear conflicts due to the increased number of grizzly bears in the ecosystem. The potential for conflicts to occur is expected to remain low because the number and population density of grizzly bears on the landscape would remain very low (approximately 10 bears), limiting the probability that visitors would encounter them. Additionally, the location of the release sites in high quality grizzly habitat away from main visitor areas would mitigate the potential for human-grizzly interactions. Adverse impacts associated with intermittent, brief disruptions to visitor use that may be associated with certain activities (e.g., helicopter flights) would be offset by the benefits of grizzly bears being restored to a native ecosystem. Grizzly bears are a high profile species with interest worldwide. As such, some visitors may perceive the presence of grizzly bears as enhancing the depth of visitor experience and a unique opportunity. Other visitors may avoid the NCE given a fear of grizzly bears. Since road and trail access will not be restricted, there would be no change from the existing condition. Cumulative impacts resulting from other management actions (repair and maintenance of trails and infrastructure, removal of invasive species, and habitat restoration projects) would be an improvement to existing conditions and would combine with alternative B to provide overall benefits.

Alternative C: Incremental Restoration

Under alternative C, the primary phase of grizzly bear restoration would occur over 5 to 10 years, although the agencies may release additional bears (1 to 2) every few years to help meet restoration objectives. Visitation could increase or decrease depending on visitor interest in or aversion to grizzly bears. As with alternative B, impacts would be beneficial for those visitors who feel that the presence of grizzly bears would enhance their wilderness experience by restoring a large native mammal that is an important part of the terrestrial food web. Impacts would be adverse for those visitors who fear grizzly bears and do not wish to encounter them.

Public outreach and education would be the same as discussed under alternative B. As with alternative B, these measures could help reduce human-grizzly bear conflicts and associated adverse impacts.

Under alternative C, grizzly bears would be released away from areas of high visitor use, including motorized roads, campsites, and trails, however there would be more than one release site under alternative C. It is assumed that any trail and area closures would be very temporary, localized, and limited to a few hours to a few days, and adverse impacts are not anticipated to occur outside backcountry areas. As discussed in both the “Wilderness character” section and under alternative B, these temporary closures could have adverse impacts on unconfined recreation because they would restrict the recreational activities of some wilderness users. As with alternative B, all released grizzly bears would be monitored to keep the public informed of restoration efforts, and to inform further releases.

Generally, adverse impacts from noise on visitor use and experience from helicopter flights associated with alternative C would be similar to those described under alternative B, but the number of flights would be higher. Under alternative C, between 100 to 136 flights would be required to transport and release bears increasing the potential risk for adverse impacts associated with noise disturbance to visitors, though additional flights could be required in the future to supplement the grizzly bear population. However, helicopter operations at NCE are not uncommon, as described under alternative B. It is expected that helicopter operations would take place over a total of 5 to 10 years, which would limit impacts on individual visitors at any given time in any given location. Similarly, adverse impacts on the visual landscape would be temporary, intermittent, and would vary based on an individual’s position on the landscape and distance from ongoing restoration activities.

The potential frequency and duration of additional grizzly bear capture and release activities beyond the primary phase is unknown, and would be influenced by the population size, distribution relative to visitor use on the landscape, available funding and personnel, and other management considerations. However, the impacts would be similar to those described above.

The intensity of adverse impacts would vary based on the location, frequency, and timing of restoration activities. As with the other alternatives, as the grizzly bear population approaches the restoration goal, the potential for human-grizzly bear interaction could increase, causing an increase in beneficial and adverse impacts associated with grizzly bear presence and potential conflicts with visitors, as described in alternative B.

Some frontcountry areas that may be highly desirable to visitors (i.e., ranger stations, highways, and roads used by visitors to access front country areas, and locations proximate to bathroom facilities, picnic grounds, campsites, and boat launches) are not typically preferred habitat for seasonal grizzly bear use; therefore, adverse impacts on these areas would be unlikely, especially given the small number of grizzly bears to be released initially and the remoteness of the release sites. Closure of park or forest facilities and main roads are not expected. Given that only two trails were temporarily closed on national forest lands in the NCDE because of grizzly bears in the 10-year period from 1990 to 2000 (FWS 2016d), it is reasonable to assume that any trail and area closures would be temporary, localized, and limited.

Cumulative Effects

Ongoing and reasonably foreseeable future actions with the potential to contribute to cumulative effects on visitor use and recreational experience under alternative C are the same as those described for alternative B above. As with alternative B, benefits would be derived from the restoration of grizzly bears and the opportunity provided to visitors to see grizzly bears in their natural setting. Adverse impacts would include the potential for temporary closures lasting from a few hours to a few days requiring some visitors to adjust their stay to avoid closed areas and noise associated with helicopter operations. Overall cumulative impacts of past, present, and reasonably foreseeable actions on visitor use and experience would be beneficial because the intermittent, brief disruptions to visitor use that would be associated with certain activities (e.g., helicopter operations) would be offset by the benefits to visitor use and experience.

Overall, alternative C would contribute a small beneficial increment to the overall cumulative impacts on visitor use and experience based on the restoration of the grizzly bear to the NCE.

Conclusion

The impacts of alternative C on visitor use and recreational experience would be varied. Under alternative C, the primary phase of grizzly bear restoration would be spaced out over 5 to 10 years, with up to 100 to 136 helicopter flights into remote areas to release 25 to 34 bears (up to 9 bears additional to the intended 25 may need to be flown in to address mortality or emigration), although some additional flights may be necessary for collar retrieval and incidental actions. These flights could cause temporary disruptions of visitor use and recreational experience if visitors are in the flight path or areas of releases. These impacts would be very short, lasting only minutes per occurrence. Other adverse impacts could occur if restoration activities require temporary closures; however, based on experience in other ecosystems, lengthy closures are not expected.

The time to achieve the desired restoration goal would range from 60 to 100 years. Visitor perceptions and impacts would be the similar to those described under alternative B. Overall, restoration activities under alternative C would result in potential adverse impacts for the foreseeable future as a result of the increased potential for human-grizzly bear conflicts due to the increased number of grizzly bears in the ecosystem. However, the potential for conflicts is expected to remain low given the size of the NCE and low density of the grizzly bear population. When combined with other past, present, and reasonably foreseeable future actions, cumulative impacts from alternative C are expected to be primarily beneficial, with alternative C contributing some adverse, but otherwise beneficial impacts.

Alternative D: Expedited Restoration

Under alternative D, the number of grizzly bears released each year would be subject to the same parameters as under alternative C (i.e., 5 to 7 bears per year). However, increased annual releases, monitoring, and evaluation efforts extending beyond the first 5 to 10 years would result in the target restoration goal of 200 grizzly bears to be achieved in a shorter period—roughly 25 years. As with alternatives B and C, impacts under alternative D would be beneficial or adverse depending on visitors' attitudes toward grizzly bears. Under alternative D, public education and outreach regarding safety and grizzly bear management goals would likely be similar to alternative C. As with alternative C, all visitors would be notified of ongoing grizzly bear release activities and directed to follow proper sanitation and safety protocols.

The potential for human-grizzly bear interaction would be greatest under this alternative, given the projected 25-year time horizon to achieve the restoration goal. As with the other alternatives, the intensity of adverse impacts would vary based on the visitor's location, and the frequency and timing of restoration activities. Given the expedited pace of restoration, the probability of adverse impacts on visitor use and recreational experience related to human-grizzly bear conflict is somewhat more likely to occur. Further discussion of human-grizzly bear conflict is provided in the "Public and Employee Safety" section. As discussed previously under alternatives C, trail and area closures would likely be temporary, localized, and limited. However the likelihood of a closure would be increased under this alternative given the number of bears being released (up to 168 bears).

Because alternative D would involve the release of considerably larger numbers of grizzly bears over a period of approximately 25 years, the duration of impacts would be longer than those described under alternatives B and C. For example, adverse impacts on visitor use and recreational experience associated with noise from helicopter flights associated with alternative D would be more pronounced than under alternatives B and C, given a greater number of flights. Compared to alternative C, alternative D would

require 536 additional helicopter trips (672 total flights) to release bears. This would create the potential for more chances for impacts on visitors along helicopter flight paths or near remote release sites. As with alternatives C, adverse impacts on the visual landscape associated with helicopter flights would vary based on an individual's position on the landscape and distance from ongoing restoration activities but the chances for impacts would increase. As discussed in the "Wilderness" section, impacts on opportunities for solitude and unconfined recreation associated with the release of grizzly bears would be greater than those described under alternatives B and C.

Cumulative Effects

Ongoing and reasonably foreseeable future actions with the potential to contribute to cumulative effects on visitor use and recreational experience under alternative D are the same as those described for the no-action alternative above. NPS and USFS management actions and unrelated ongoing activities would produce a combination of beneficial and adverse impacts on visitor use and recreational experience. Impacts associated with alternative D would be similar to those described for alternative C, although chances for adverse impacts from helicopter noise and other release activities could be higher based on the additional releases under this alternative. Overall cumulative impacts of past, present, and reasonably foreseeable actions on visitor use and experience would be beneficial because the intermittent, brief disruptions to visitor use that would be associated with certain activities (e.g., helicopter operations) would be offset by the benefits to visitor use and experience. Overall, alternative D would contribute a small beneficial increment to the overall cumulative impacts on visitor use and experience based on the restoration of the grizzly bear to the NCE.

Conclusion

Alternative D has the potential to produce more impacts on visitor use and recreational experience compared to the other alternatives because it would involve the release of more grizzly bears than alternatives B and C, and active capture and release operations would take place over a longer time frame. The number of grizzly bears to be released would be based on the availability of appropriate equipment and qualified personnel and the ability to capture candidate grizzly bears meeting the appropriate age and sex class requirements from donor populations. Alternative D would have more pronounced effects (during the primary phase) on visitor use and recreational experience related to management activities, noise, and the visible presence of helicopters and aircraft as well as the potential for human-grizzly encounters when compared to the other alternatives. Alternative D involves the additional releases of bears; therefore, the potential for human-grizzly bear interaction is somewhat greater within a shorter time frame compared to alternatives B and C. However, alternative D would provide lasting benefits regarding visitors' experience of nature through the reestablishment of a native species that has not had a viable population in the NCE for many years. When combined with other past, present, and reasonably foreseeable future actions, cumulative impacts from alternative D are expected to be primarily beneficial, with alternative D contributing some adverse, but otherwise beneficial impacts.

Areas outside the NCE

Although grizzly bears would be released into remote wilderness areas of the NCE, they could move outside of the recovery zone into areas adjacent to the NCE. Bears that move into suitable grizzly bear habitat would be left there if they did not pose a risk of coming into conflict with humans and livestock. As the population grows over a very long time, bears' dispersal could increase; however, it is unlikely that a meaningful proportion of the released population would leave the NCE. If grizzly bears move into recreation areas with high visitor use, managers would work to remove the bears and return them to the NCE.

In the event that the option to designate the NCE population of grizzly bears as a section 10(j) experimental population is implemented, additional management measures may become available to managers to use non-lethal measures to reduce impacts on grizzly bears that move outside NCE or to mitigate human-grizzly bear conflicts, including those associated with recreation.

PUBLIC AND EMPLOYEE SAFETY

Methods and Assumptions

The analysis of impacts on public and employee safety considers risks to the NPS, FWS, USFS, and WDFW staff, residents in and around the NCE, visitors, and the general public associated with human-grizzly bear encounters, as well as the potential employee safety risks associated with grizzly bear restoration activities proposed under each alternative. Impacts for this resource topic were analyzed qualitatively using information provided by the NPS, FWS, and USFS staff familiar with current grizzly bear management within the NCE; IGBC and WDFW guidance on the management of conflict bears; and the nature of the different types of restoration activities proposed under each alternative. The analysis also considered the types and level of visitor use taking place in areas where human-grizzly bear encounters could take place as well as impacts on residents.

Analysis Area. The area of analysis for impacts of the alternatives on public and employee safety includes the source population areas and lands within the NCE grizzly bear recovery zone, including residential areas. In addition, the analysis also assesses potential impacts that could occur if grizzly bears move outside the NCE.

Issues Analyzed. The analysis of impacts on public and employee safety under each alternative is based on the following issue statements that are identified in chapter 1:

Issue Statement. The restoration of grizzly bears in the NCE has raised concerns about safety risks to backcountry recreationists, residents, and other visitors as a result of negative grizzly bear interactions.

Issue Statement. The capture, release, and monitoring of grizzly bears could affect employee safety given the dangerous nature of the activity.

Alternative A: Continuation of Existing Grizzly Bear Management (No Action)

Under the no-action alternative, the few grizzly bears that could be using habitat in the NCE would likely remain unchanged in the short term. Without an existing viable grizzly bear population and no observed evidence of reproduction, eventual extirpation of grizzly bears in the NCE is anticipated under the no-action alternative. Prior to the permanent loss of this species in the NCE, there would be a very small possibility of public safety risk associated with human-grizzly bear encounters because only a very small number of grizzly bears have been detected in the ecosystem in the last 20 years. The potential for interactions between humans and grizzly bears would continue to be extremely low, and adverse impacts would only result in the highly unlikely event of a negative interaction. The probability of adverse impacts from human-grizzly bear encounters is expected to decrease in the long term as the grizzly bear becomes extirpated in the NCE. Tools to reduce potential conflicts, including signage, educational materials, sanitation efforts, regulations on food storage, and visitor outreach would continue to be employed and would further reduce the potential for adverse impacts from human-grizzly bear encounters.

The option to implement trail closures and access restrictions would be available as necessary in the event of a conflict between a grizzly bear and a visitor or resident. All of the actions described above would further mitigate the already highly unlikely potential for adverse impacts on public safety to a level where they generally are not expected. Over time, this alternative is not expected to result in any discernible adverse impacts on public safety.

Under the no-action alternative, adverse impacts related to injuries to employees who are conducting grizzly bear surveying activities in the backcountry are possible and could involve foot travel over difficult terrain and in very rare circumstances, transportation by helicopter. Some potential for injuries to employees could exist if there is a need to conduct aversive conditioning or otherwise manage a conflict grizzly bear; however, because of the small number of grizzly bears in the NCE, this would be considered extremely unlikely. The potential for employee accidents and injuries would be mitigated, but not completely eliminated, through proper staff training and adherence to safety protocols, including the *North Cascades National Park Service Complex Backcountry Travel Procedures* (NPS 2016h). The small number of grizzly bears present in the NCE and the expected decline in the number of grizzly bears over the long term would likely diminish efforts spent on surveying. The probability of adverse effects on employee safety related to grizzly bear management activities under the no-action alternative would be slight and would likely diminish to zero over time.

Cumulative Impacts

Activities associated with the cumulative actions were reviewed to identify potential cumulative impacts on public and employee safety in the project area. Ongoing and reasonably foreseeable future actions with the potential to contribute to cumulative effects on public and employee safety under the no-action alternative include ongoing NPS trail maintenance and repairs, implementation of the Mountain Lakes Fishery Management Plan and associated Act, NPS fire management operations, the *Stehekin River Corridor Implementation Plan*, and NPS administrative flights. Additional ongoing and reasonably foreseeable future actions with potential safety impacts include CERCLA mine cleanup and abandoned mine land projects on USFS lands, implementation of forest plan updates, ongoing USFS trail maintenance and repairs, ongoing USFS road maintenance, and USFS wildfire suppression efforts.

NPS trail maintenance and repairs would have beneficial impacts on public and employee safety over an indefinite time period because these actions would provide a well-maintained trail system and correct potentially unsafe trail conditions as they occur. Implementation of the Mountain Lakes Fishery Management Plan and associated Act could have adverse impacts on employee safety during implementation actions because implementation activities may involve the use of helicopters to transport NPS employees into remote areas, resulting in safety risks associated with helicopter takeoff, flight, and landing. NPS fire management activities would have beneficial impacts on public and employee safety from reduced fire risk but would have potential adverse impacts on employee safety as a result of the safety risks associated with fire management activities while these actions are occurring. NPS administrative flights for search and rescue operations would have beneficial impacts on visitor safety because of the lifesaving function that these flights serve; potential adverse impacts on employee safety could result from safety risks associated with takeoff, flight, and landing and the operation of helicopters and aircraft in adverse weather conditions. CERCLA mine cleanup and abandoned mine land projects on USFS lands would have beneficial impacts on public and employee safety through the removal of existing health and safety hazards. Forest plan updates for the Okanogan-Wenatchee and Mt. Baker-Snoqualmie National Forests would have beneficial impacts on safety because they would clarify existing policies and provide specific direction on bear and human avoidance techniques. USFS trail maintenance and repair projects would have beneficial impacts on public and employee safety by providing a well-maintained trail system and correcting potentially unsafe trail conditions as they occur. USFS road maintenance projects would have beneficial impacts on public and employee safety by providing a well-maintained

road system and correctly potentially unsafe road conditions. USFS wildfire suppression effort would have beneficial impacts on public and employee safety as a result of reduced fire risk and potential adverse impacts on employee safety from the safety risks associated with fire management activities.

Overall, cumulative actions would result in both adverse and beneficial impacts on public and employee safety; however, in aggregate these impacts would be beneficial because many of them would improve the safety of those people living and recreating in the NCE. The no-action alternative may contribute some minimal adverse impacts on employee safety as noted in the analysis above. Based on identified mitigation measures, adverse impacts on public and employee safety would be minimized to the greatest extent possible; however, although rare, some potential adverse impacts on public and employee safety would persist. As the grizzly bear population declines over time and eventually becomes extirpated, adverse impacts from potential human-grizzly bear interactions would diminish and would eventually be non-existent. As a result, when the minimal, adverse impacts of the no-action alternative are combined with the effects of other cumulative actions in the study area, an overall beneficial cumulative impact is expected. The no-action alternative would contribute a slight adverse increment on the overall beneficial cumulative impact that would decline over time.

Conclusion

Under the no-action alternative, the continuation of management activities in grizzly bear habitat would result in beneficial impacts on visitor safety as a result of safety, sanitation, and public outreach efforts and minimal, long-term, adverse impacts on employee safety as a result of the potential for employee injury during monitoring or conflict grizzly bear response activities. The likely eventual loss of grizzly bears in the NCE would eliminate the possibility of any negative human-grizzly bear interactions. Present and reasonably foreseeable future actions, as analyzed above, would contribute beneficial and adverse impacts, but in aggregate, these impacts would be beneficial. Overall, cumulative effects on public and employee safety under the no-action alternative would be beneficial. The contribution of the no-action alternative to overall beneficial cumulative impacts would be small and adverse and decrease over time.

Alternative B: Ecosystem Evaluation Restoration

Employee Safety Impacts Related to Capture, Transport, and Releases

Under alternative B, initial grizzly bear restoration activities would have potential adverse impacts on the safety of agency employees and contractors because of the activities involved in capture, transport, and release of grizzly bears in the first 2 years of implementation. Depending on the outcome of monitoring, managers could decide to repeat the initial release and continue monitoring or transition to alternative C. If managers decide to move toward implementation of alternative C during the adaptive management phase of this alternative, the impacts would coincide with those described for alternative C, below.

Agency staff, including Canadian counterparts, would seek to locate areas with high grizzly bear densities in the NCDE and part of British Columbia, Canada, to maximize their potential for capturing bears that fit the demographic criteria. These activities would result of in risks to staff safety. However, through implementation of required safety measures, the likelihood of risks to safety would be minimal.

During capture activities, grizzly bears would be sedated, further minimizing impacts on employee safety. During transport, sedation would be allowed to wear off to allow grizzly bears the opportunity to recover from anesthesia before they are released. Based on the initial sedation and adherence to applicable safety protocols and precautions, impacts on employee and contractor safety during capture and release would be minimized.

Helicopter flight operations associated with capture and transport of grizzly bears and takeoff and landing operations, which could take place in potentially difficult backcountry terrain, would pose a risk to the safety of employees and contractors involved in grizzly bear capture and release operations. Pilots and personnel who participate in helicopter capture and release operations would be properly licensed and trained and use all required safety equipment and precautions. Release sites would be reviewed for safety concerns prior to use. Flights would take place only during favorable weather to avoid potentially dangerous flight conditions. Helicopter operations in the NCE are not uncommon. As discussed under the “Wilderness” section of chapter 3, flight hours over wilderness average approximately 142 hours per year. The majority of flight operations stem from active fire management operations. Approximately 10 capture and release operations, with up to 4 helicopter trips per operation, for a total of 40 helicopter round trips would take place over approximately 2 years, which would limit the number of opportunities for adverse impacts to occur. In the event of an accident involving the operation of a helicopter that leads to human injury or loss of life, adverse impacts on employee safety could be catastrophic for the individual employee or employees involved; however, with the extensive safety precautions that would be in place, the potential for adverse impacts on employee safety from helicopter operations during the primary phase would be minimized.

Release of grizzly bears from culvert traps would involve using a remote controlled door-release that could be operated from a helicopter or by ground personnel located a safe distance away to minimize potential adverse safety impacts on employees (Ransom pers. comm. 2016). In the event of a conflict between an employee and a grizzly bear during capture or release that leads to human injury or loss of life, adverse impacts on employee safety could be substantial; however, with the extensive safety precautions that would be in place, the potential for adverse impacts on employee safety from handling of grizzly bears during capture and release during the initial years of restoration would be minimized.

Under alternative B, monitoring grizzly bears through satellite tracking is not anticipated to result in any adverse impacts on employee safety. The occasional use of fixed-wing aircraft for aerial monitoring could result in some slight potential for adverse impacts on employee safety. However, when flights for aerial monitoring occur, all personnel and activities would follow safety standards set forth by the U.S. Department of the Interior’s Office of Aviation Services and other applicable safety protocols, and all pilots and operators would be properly trained, minimizing any potential impacts.

Impacts on employee safety under alternative B could also result from hazing, relocation, or removal of conflict grizzly bears. These activities would involve many of the same components as capture and release activities, including using helicopters to transport NPS and FWS employees, placing traps, and relocating grizzly bears, and would therefore have the same potential adverse impacts on employee safety that the release of grizzly bears would have. The potential for these adverse impacts on employee safety to occur would be limited and infrequent because the need for these types of conflict grizzly bear management activities is expected to be limited and infrequent. Adverse impacts could be substantial if a helicopter-related incident or a grizzly bear conflict results in injury or loss of life; however, with the extensive safety precautions that would be in place, the potential for adverse impacts on employee safety would be minimized.

Public Safety Impacts Associated with Restoration Activities

Staging Area Impacts. Under alternative B, the staging area used for initiating grizzly bear restoration activities would be closed to the public; therefore, impacts on public safety, including the safety of visitors and residents, would be avoided.

Grizzly Bear Release Impacts. Under alternative B, adverse impacts on public safety could occur during release activities. However, the potential for public safety impacts would be minimal given the small

number of grizzly bears to be released at a single, remote release site. Subsequent releases would not take place until at least two seasons of monitoring have passed. When a decision is made related to additional releases, either the primary restoration phase would be repeated, or managers would transition to implementing alternative C, which would result in different impacts as described for alternative C below. The potential for initial adverse impacts on visitor safety related to the presence of grizzly bears in the ecosystem and the associated risk of human-grizzly bear encounters would be highly localized under alternative B and would be limited for the first several years to the general proximity of the one remote site within designated wilderness in the northern portion of the NCE. Given the very small number of grizzly bears that would be present on the landscape during the first several years of initial restoration activities, it is highly unlikely that visitors would encounter a grizzly bear and extremely unlikely that a conflict would ensue. Monitoring of the 10 grizzly bears that are initially released would inform managers about grizzly bear movement and habitat use relative to areas of the NCE that experience heavy human use.

Under alternative B, there could be some adverse impacts on residents who reside in or in close proximity to the NCE; however, the exact location and potential future movement patterns of grizzly bears released into the NCE are difficult to predict. Therefore, impacts on specific communities cannot be determined. However, Concrete, Darrington, Marblemount, and Mazama are located closer to the potential release site than other communities. Therefore, if any impact were to occur, it would be more probable that any impacts would first occur in these communities. Communities located farther from the release site would be less likely to be affected, especially those located communities outside the NCE. However, the likelihood that any safety conflict would occur as a result of human-grizzly bear interaction would be very low in the primary phase because only up to 10 grizzly bears would be released into the NCE. In the GYE, which had an estimated 757 grizzly bears in 2014, 11 incidences of conflict grizzly bears occurred around developed sites such as housing with only 3 incidences of human injury (IGBC 2014). Additionally, one of the key characteristics of grizzly bears captured for restoration purposes is that the grizzly bears have no history of conflict with humans and no history of positive attraction to humans, human-use areas, or human-related foods (Kasworm et al. 2011; MacHutchon and Austin 2004). These selection criteria should further reduce any expected interaction between grizzly bears and local communities. Overall, the potential for adverse impacts on communities would be very small in the primary phase because of the small number of bears released into the NCE and the continued use of preventative grizzly bears-human interaction measures described above.

Current management actions, such as providing food lockers and grizzly bear-resistant waste receptacles and visitor education on backcountry food preparation and storage, contribute to maintaining the safety of both grizzly bear and human populations. These proactive measures are intended to prevent adverse interactions between human populations and grizzly bears. Ongoing community education regarding the removal or management of attractants, similar to that currently provided by the WDFW and a small number of non-governmental organizations would also be essential. Another proactive measures includes the establishment of electric fencing around community or home gardens, which are effective in preventing damage to these facilities (Gunther et al. 2004).

Grizzly Bear Restoration Impacts. Under alternative B, the population of grizzly bears and the probability of human-grizzly bear encounters are anticipated to remain very low for several decades following initial restoration activities because of the low density of the population of grizzly bears released in the area. As an example, in the CYE and Selkirk Ecosystem (SE), where there are low-density recovering populations of grizzly bears (45–50 and 70–80, respectively), only one human injury caused by a grizzly bear has been recorded in the last 36 years (Kasworm pers. comm. 2016a). Given these statistics, it is reasonable to assume that the smaller sized grizzly bear population projected in the NCE under alternative B (10 bears within the first 5 years) would present even less potential risk to public safety. Grizzly bear awareness and safety education, sanitation measures, backcountry/wilderness use

permitting requirements, and other grizzly bear safety measures described in chapter 2 and under the no-action alternative above are expected to mitigate safety risks under alternative B. Grizzly bears released into the NCE would be monitored for habitat use, mortality, and incidences of human conflict. Increased outreach efforts, including public notification of the potential presence of a grizzly bear within a general geographic area, are expected to provide further mitigation by increasing visitor and resident awareness and allowing visitors and residents the option of avoiding an area where a grizzly bear may be present. In addition, all applicable NPS and USFS policies and state laws (see appendix C) regarding proper food storage would be adhered to as noted in the no-action alternative. In the event of a human-grizzly bear conflict, the 2002 IGBC guidelines for the NCE would be implemented to quickly resolve the source of conflict (see appendix E). Management of all conflict grizzly bear situations would first emphasize removal of the human cause of the conflict (such as a food source) when possible, and management and education actions would be implemented to prevent future conflicts. Temporary area closures required to manage the human-grizzly bear conflict may be implemented lasting from several hours to several days. Aversive conditioning measures would be implemented to deter grizzly bears that may become habituated to human presence and/or food conditioned. Grizzly bears may be preemptively moved if they are in areas where they are likely to come into conflict with humans and human-related attractants that cannot be secured at a quick enough pace to prevent grizzly bears from becoming food conditioned. Grizzly bears displaying unacceptable aggression or a conflict resulting in a serious human injury or fatality would be removed from the population upon first incidence of such a conflict.

In the event of a conflict between a visitor and a grizzly bear resulting in human injury or fatality, adverse impacts on public safety would be substantial. However, given the small number of grizzly bears that would be present on the landscape in the primary phase, their limited distribution, and the proactive measures and conflict grizzly bear response actions discussed above, the probability of such impacts occurring is considered minimal. The probability that a visitor would encounter a grizzly bear would remain low, with the probability of conflict or human injury being further reduced. As a point of comparison, from 1980 to 2014, close to 100 million people visited Yellowstone National Park, which is the core of the GYE grizzly bear recovery zone and makes up approximately 37% of its land area. During the same 34-year period, 45 people were injured by grizzly bears in the park, which contained a peak population of 757 bears in 2014. Out of the 45 total injuries, 33 were in the backcountry (NPS 2016i). The vast majority of injuries were attributable to defensive aggression by grizzly bears during surprise encounters with hikers. For all visitors to Yellowstone National Park combined, the chances of being injured by a grizzly bear are approximately 1 in 2.7 million (table 10) (Gunther 2015). During the 144-year history of Yellowstone National Park, seven people have been killed by grizzly bears in the park, and one additional person was killed by a bear whose taxonomy was not specified (i.e., the animal was not specifically identified as a grizzly bear). During that same time frame at Yellowstone National Park, 119 people have died from drowning, 36 from falling, 24 from suicide, 20 from thermal burns from falling into thermal pools, 19 in horse related accidents, 10 from freezing, and 9 from murder, highlighting the rarity of deaths from grizzly bear attacks at Yellowstone National Park (Gunther 2015).

For relative comparison purposes, Yellowstone National Park received more than 4 million visitors in 2015, while the park complex received 823,000 visitors during the same period, a number of whom remained within the state highway 20 corridor. However, only approximately 21,000 visitors used backcountry areas. Given this level of visitation and the lower population density of grizzly bears, potential injuries and fatalities within the NCE are expected to be far lower than those presented for Yellowstone National Park, all resulting in a decreased potential for grizzly bear and visitor interactions.

TABLE 10. TYPE OF RECREATION ACTIVITY AND RISK OF GRIZZLY BEAR ATTACK IN YELLOWSTONE NATIONAL PARK

Type of Recreational Activity	Risk of Grizzly Bear Attack
Remain in developments, roadsides, and boardwalks	1 in 25.1 million visits
Camp in roadside campground:	1 in 22.8 million overnight stays
Multi-day backcountry trips:	1 in 200 thousand overnight stays
All park activities combined	1 in 2.7 million visits

Source: Gunther 2015.

In front country areas or portions of the NCE that are distant from release areas (such as the southernmost portion of the NCE located between U.S. Highway 2 and Interstate 90), the probability of adverse impacts on public safety related to the release of grizzly bears in the NCE under alternative B is expected to be near zero.

As grizzly bears increase in number over time and begin to use habitat over a larger area of the ecosystem, the potential for humans to encounter grizzly bears would exist over a greater geographical range. It should be noted that only a very small fraction of grizzly bear-human interactions are negative; most involve the avoidance of people by the bear(s).

In the adaptive management phase, coordinated interagency efforts to promote grizzly bear awareness through education and outreach would be intensified, sanitation measures would continue to be implemented, and backcountry/wilderness use permitting requirements would continue to enforce safety precautions. The 2002 IGBC guidelines for the NCE would continue to govern the implementation of human-grizzly bear conflict avoidance/mitigation measures and the management, relocation, or removal of conflict grizzly bears, as described above.

Cumulative Impacts

Ongoing and reasonably foreseeable future actions with the potential to contribute to cumulative effects on public and employee safety under alternative B are the same as those described for the no-action alternative. Cumulative actions would result in both adverse and beneficial impacts on public and employee safety, but in aggregate the impacts would be beneficial as agencies work to improve conditions in the NCE. Alternative B would contribute adverse impacts on public and employee safety in terms of conflicts with grizzly bears and risks associated with initiating restoration actions; however, the probability of adverse impacts occurring would be low, as detailed above. As a result, when the primarily minimal adverse impacts of the alternative B are combined with the effects of other cumulative actions in the study area, an overall beneficial cumulative impact is expected, with alternative B contributing a slight adverse increment. If a decision is made to transition to alternative C, these adverse impacts would likely increase as grizzly bears are restored.

Conclusion

Alternative B would result in adverse impacts on employee safety during restoration activities, related to helicopter operations and capture and release activities associated with grizzly bears. The probability of these adverse impacts occurring would diminish over time as initial restoration efforts that release multiple grizzly bears into the NCE each season give way to more intermittent additional releases as necessary during the adaptive management phase. Proper employee training, licensing, and adherence to safety precautions and protocols would mitigate and reduce the probability of adverse impacts on employee safety. Periodic hazing, relocation, or removal of conflict grizzly bears would also result in adverse impacts on employee safety that would be similar to those described for release of grizzly bears.

Under alternative B, management activities in grizzly bear habitat would result in adverse impacts on public safety over an indefinite time frame because of the increased potential for human-grizzly bear conflicts associated with the increased number of grizzly bears in the ecosystem. The potential for conflicts to occur is nonetheless expected to remain very low because the number and population density of grizzly bears on the landscape would remain low enough to limit the probability that visitors or residents would encounter grizzly bears. Information from grizzly bear monitoring would be used both to inform outreach to visitors and residents and to proactively mitigate human-grizzly bear conflicts. The implementation of safety, sanitation, and public outreach efforts and conflict grizzly bear management would further mitigate the potential for adverse impacts resulting from human-grizzly bear conflicts. Present and reasonably foreseeable future actions would contribute both beneficial and adverse impacts. Overall, cumulative effects on public and employee safety under alternative B would be and beneficial with alternative B contributing a slight adverse increment.

Alternative C: Incremental Restoration

Employee Safety Impacts Related to Capture, Transport, and Releases

Initial grizzly bear restoration activities would have potential adverse impacts on the safety of agency employees, including Canadian counterparts and contractors, from the activities involved in the capture, transport, and release of grizzly bears during the primary phase.

The type of impacts related to the capture of grizzly bears would be the same as those described for alternative B, although the probability for impacts would be slightly higher given the additional number of bears that would be captured during the primary phase of restoration—25 bears (likely 34 total to compensate for grizzly bear mortality or emigration). As described for alternative B, grizzly bears would be sedated during capture and allowed to recover from anesthesia before they are released. The combination of the initial sedation and adherence to applicable safety protocol and precautions would diminish impacts on employee safety. Helicopter flight operations associated with capture and transport of grizzly bears and takeoff and landing operations, which could take place in potentially difficult backcountry terrain, would pose a similar safety risks to employees and contractors as described under alternative B. However, when compared to alternative B, alternative C would require up to 96 additional trips (100 to 136 total) to support transport and release efforts, thus incrementally increasing the potential risk for impacts. Pilots and personnel who participate in helicopter capture and release operations would be properly licensed and trained and would use all required safety equipment and precautions. Flights would take place only during favorable weather to avoid potentially dangerous flight conditions. Capture and release operations are expected to occur over 5 to 10 years. In the event of an accident involving the operation of a helicopter that leads to human injury or loss of life, adverse impacts on employee safety could be substantial; however, with the extensive safety precautions that would be in place, the potential for primary phase adverse impacts on employee safety from helicopter operations would be minimized.

In the adaptive management phase, agency employee actions under alternative C would largely consist of monitoring grizzly bears through satellite tracking, which is not anticipated to result in any adverse impacts on employee safety. As noted under alternative B, the occasional use of fixed-wing aircraft for aerial monitoring could result in some slight potential for adverse impacts on employee safety. When flights for aerial monitoring occur, all personnel and activities would follow safety standards set forth by the U.S. Department of the Interior's Office of Aviation Services and other applicable safety protocols and all pilots and operators would be properly trained, minimizing any potential impacts. Adaptive management activities are likely to involve the periodic release of additional grizzly bears into the NCE to replace grizzly bears that have been lost to mortality, have emigrated out of the NCE, or have been relocated or removed as a result of conflicts with humans. Additional grizzly bears may also be released as necessary to influence genetic and demographic diversity. These additional release activities would be

undertaken in the same way as initial capture and release activities; therefore, they would have the same potential impacts related to the operation of helicopters and the capture, handling, transport, and release of grizzly bears as described above. Similar to the initial phase of restoration, impacts on employee safety during the adaptive management phase could be adverse, but the opportunities for such impacts to occur would be limited and infrequent because of the intermittent nature of additional release activities. Adverse impacts could be substantial if a helicopter-related incident or a grizzly bear conflict results in human injury or loss of life; however, with the extensive safety precautions that would be in place, the potential for adverse impacts on employee safety from additional releases of grizzly bears during the adaptive management phase would be minimized.

Impacts on employee safety under alternative C during the adaptive management phase could also result from hazing, relocation, or removal of conflict grizzly bears. These activities could involve many of the same components as capture and release activities, including using helicopters to transport agency employees, placing traps, and relocating grizzly bears; therefore, they would have the same potential adverse impacts on employee safety associated with the release of grizzly bears. The potential for these adaptive management phase adverse impacts on employee safety to occur would be limited and infrequent because the need for these types of conflict grizzly bear management activities is expected to be limited and infrequent. Adverse impacts could be substantial if a helicopter-related incident or a grizzly bear conflict results in injury or loss of life; however, with the extensive safety precautions that would be in place, the potential for impacts on employee safety during the adaptive management phase would be minimized.

Public Safety Impacts Associated with Restoration Activities

Staging Areas Impacts. Under alternative C, similar to alternative B, staging areas used for grizzly bear restoration activities would be temporarily closed to the public; therefore, impacts on visitor safety would be avoided.

Grizzly Bear Release Impacts. Under alternative C, there would be potential adverse impacts on public safety in both the primary phase and adaptive management phase. These impacts would be similar to those described above for alternative B, with the probability of impacts occurring during the initial onset being potentially slightly higher under alternative C than alternative B as a result of the increased number of grizzly bears in the initial release. In the primary phase, the potential for public safety impacts related to active grizzly bear release operations would be minimized because release sites would be chosen in locations that are remote from high human-use areas. The potential for primary phase adverse impacts on public safety related to the presence of grizzly bears in the ecosystem and the associated risk of human-grizzly bear encounters would be highly localized and limited to the general proximity of the two to three remote sites within designated wilderness in the northern portion of the NCE. General grizzly bear awareness education, sanitation measures, backcountry/wilderness use permitting requirements, and other grizzly bear safety measures already in place on federal lands in the NCE as described in chapter 2 and under the no-action alternative are expected to mitigate public safety risks. Grizzly bears released into the NCE would be monitored for habitat use, reproduction, mortality, and incidence of conflict. Increased outreach efforts, including public notification of the potential presence of a grizzly bear within a general geographic area, are expected to provide further mitigation by increasing public awareness and allowing people the option of avoiding an area where a grizzly bear may be present. A few bears (one to two at any one time as determined necessary) could be added every few years during the adaptive management phase, potentially resulting in additional public safety impacts.

Grizzly Bear Restoration Impacts. As noted under alternative B during the first several decades following initial restoration, the chance of human injury caused by grizzly bears would be exceedingly small because of the low density of the grizzly bear population and the relatively few members of the

public present in the area. In the event of a human-grizzly bear conflict, existing 2002 IGBC guidelines for the NCE would be quickly implemented to resolve the source of conflict (see appendix E).

Management of all conflict grizzly bear situations would proceed in an identical fashion as described under alternative B. In the event of a conflict between a visitor or resident and a grizzly bear that results in human injury or fatality, adverse impacts on public safety would be substantial; however, given the small number of grizzly bears that would be present on the landscape in the primary phase, their limited distribution, and the mitigation measures and conflict grizzly bear response actions discussed above, the probability of such impacts in the primary phase would be minimal. As noted under alternative B, in front country areas or portions of the NCE that are distant from release areas, the probability of adverse impacts on visitor safety associated with release efforts during the primary phase are expected to be near zero.

Under alternative C, the presence of an increased number of grizzly bears in the NCE has the potential to result in adverse impacts on public safety related to human-grizzly bear conflicts in the adaptive management phase and beyond. In addition, as grizzly bears increase in number over time and begin to use habitat over a larger area of the ecosystem, the potential for humans to encounter grizzly bears would exist over a greater geographical range. Under alternative C, the NCE grizzly bear population is anticipated to achieve the initial restoration goal of 25 grizzly bears in the course of roughly 5 to 10 years and a further restoration goal of approximately 200 grizzly bears in approximately 60 to 100 years. The probability that not only a visitor or resident would encounter a grizzly bear, but that there could be a human injury, would nonetheless be expected to remain low, as illustrated by the examples provided under the analysis of alternative B.

Under the adaptive management phase, as more grizzly bears could potentially be introduced into the NCE, and as the population of grizzly bears grows, the likelihood of more human-grizzly bear interactions would increase. Any adverse impacts would likely occur first in areas with agriculture, apiaries, livestock operations, or human housing because these areas could be attractants to grizzly bears. Communities with multiple unsecured attractants located in close proximity to one another would be likely to experience higher impacts than areas with only one of these attractants (Wilson et al. 2006). Additionally, these interactions are likely to increase during seasons when the availability of natural food for grizzly bears is low (Gunther et al. 2004). However, some residents located in suitable grizzly bear habitat outside the NCE could experience additional long-term impacts as bears move into these habitats over the next 60 to 100 years.

Coordinated interagency efforts to promote grizzly bear awareness through education and outreach would be intensified; sanitation measures would continue to be implemented; and backcountry/wilderness use permitting requirements would continue to enforce safety precautions. The 2002 IGBC guidelines for the NCE would continue to govern the implementation of human-grizzly bear conflict avoidance/mitigation measures and the management, relocation, or removal of conflict grizzly bears, as described above.

Similar to primary phase impacts, impacts on public safety in the adaptive management phase under alternative C would be primarily attributable to the potential for human-grizzly bear conflicts. In the event of a conflict between a visitor or resident and a grizzly bear that results in human injury or fatality, adverse impacts on visitor safety would be substantial; however, given the low probability of a conflict, and the implementation of the safety, sanitation, and conflict avoidance/mitigation measures described above, many of which are already implemented in the NCE, the probability of adverse impacts on public safety is expected to be minimal.

Cumulative Impacts

Ongoing and reasonably foreseeable future actions with the potential to contribute to cumulative effects on public and employee safety under alternative C are the same as those described under the no-action

alternative. Cumulative actions would result in both adverse and beneficial impacts on public and employee safety. Alternative C would contribute adverse impacts on public and employee safety in terms of potential conflicts with grizzly bears and risks associated with implementing restoration actions during the primary and adaptive management phase and into the future; however, the probability of adverse impacts occurring would be low, as detailed above. As a result, when the minimal adverse impacts of the alternative C are combined with the effects of other cumulative actions, an overall beneficial cumulative impact is expected, with alternative C contributing a slight adverse increment to the overall beneficial cumulative impact.

Conclusion

Alternative C could result in adverse impacts on employee safety related to helicopter operations and capture and release activities associated with grizzly bear restoration. The probability of these adverse impacts occurring would diminish in the long term as initial restoration efforts that release multiple grizzly bears into the NCE each season give way to more intermittent additional releases as necessary. Proper employee training, licensing, and adherence to safety precautions and protocols would mitigate and reduce the probability of such adverse impacts on employee safety. Any necessary hazing, relocation, or removal of conflict grizzly bears would also result in adverse impacts on employee safety similar to those described for release of grizzly bears. Under alternative C, restoration activities in grizzly bear habitat would result in long-term, adverse impacts on visitor safety in the primary and adaptive management phases and into the future as a result of the slightly increased potential for human-grizzly bear conflicts from the increased number of grizzly bears in the ecosystem. The potential for conflicts to occur would nonetheless be expected to remain relatively low because the number and population density of grizzly bears on the landscape would remain low enough to limit the probability that visitors would encounter grizzly bears. Impacts on residents would be low in the primary phase and higher in years with lower food availability; however, the likelihood of impacts under this alternative would be greater in the long term because of the larger population of grizzly bears in the adaptive management phase. The implementation of interagency safety, sanitation, and public outreach efforts and 2002 IGBC guidance for conflict grizzly bear management would further mitigate the potential for adverse impacts resulting from human-grizzly bear conflicts. Present and reasonably foreseeable future actions, as analyzed above, would contribute beneficial and adverse impacts, but in aggregate, these impacts would be beneficial. Overall, cumulative effects on public and employee safety under alternative C would be long term and beneficial with alternative C contributing a slight adverse increment to the overall beneficial cumulative impact.

Alternative D: Expedited Restoration

Under alternative D, grizzly bear restoration activities would have potential adverse impacts that could be more substantial than those described for alternatives B and C because grizzly bear restoration activities would be carried out continuously each summer/fall until the restoration goal of approximately 200 grizzly bears in the ecosystem is reached. It is thus possible that active restoration activities could be ongoing for approximately 25 years to reach this goal.

Employee Safety Impacts Related to Capture, Transport, and Releases

Similar to alternatives B and C, adverse impacts on the safety of agency employees and contractors would result from the activities involved in the capture, transport, and release of grizzly bears. However, the risk of impacts would be higher because almost five times as many bears would need to be captured and handled compared to alternative C. All applicable safety measures described for alternatives B and C would be implemented to minimize potential risks.

Capture of grizzly bears in source areas, similar to other action alternatives, would use free-range darting, foot snares, and culvert traps and could place employees and contractors in situations where they would be in close contact with defensive grizzly bears. During capture grizzly bears would be sedated, but they would be allowed to recover from anesthesia before they are released. Release of grizzly bears would be undertaken in the same way as described under alternative B—a remote-controlled door release would be used to minimize potential safety impacts on employees. Alternative D would result in a far greater number of capture operations in the short term than alternatives B and C. This would provide a greater number of opportunities for employee injury during capture operations in the primary phase. In the event of a conflict between an employee and a grizzly bear during that leads to human injury or loss of life, adverse impacts on employee safety would be substantial; however, because of the extensive safety precautions that would be in place, the potential for adverse impacts on employee safety from handling of grizzly bears during capture and release would be minimized to the greatest possible extent.

Under alternative D, impacts associated with activities at staging areas would be similar to those described under alternative C, except the duration of risk to employee safety would be longer and the number of opportunities for impacts on employee safety to occur would be greater because of the longer duration and greater intensity of grizzly bear restoration activities. Agency employees and contractors involved in the transport and release of grizzly bears would be operating various types of vehicles and equipment at the staging areas, including 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 and training necessary to minimize the probability that an injury would occur. Appropriate protective equipment would be required, and personnel trained in first aid would be present on location. Overall, activities at staging areas under alternative D could result in adverse impacts on employee safety; however, the probability of such adverse impacts would be low.

In the primary phase, helicopter flight operations associated with capture of grizzly bears, as well as takeoff and landing operations, which could take place in potentially difficult backcountry terrain, would pose a safety risk to employees or contractors involved in grizzly bear capture operations. Likewise, helicopter takeoff, flight, and landing during grizzly bear release operations would present similar employee safety risks. These impacts would be similar to alternative C, except alternative D would require 672 flights, or 536 additional helicopter trips to release bears. Pilots and personnel who participate in helicopter capture and release operations would be properly licensed and trained and use all required safety equipment and precautions. Flights would take place only during favorable weather, to avoid potentially dangerous flight conditions. In the event of an accident involving the operation of a helicopter that leads to human injury or loss of life, adverse impacts on employee safety could be substantial; however, the extensive safety precautions that would be in place are expected to minimize the potential for primary phase adverse impacts on employee safety to the greatest possible extent.

Potential impacts on employee safety under alternative D could result from hazing, relocation, or removal of conflict grizzly bears. These activities would involve many of the same components as capture and release activities, such as the potential use of helicopters to transport NPS and FWS employees, place traps, and relocate grizzly bears, and would therefore have the same potential adverse impacts on employee safety that the capture and release of grizzly bears would have. The potential for these adverse impacts on employee safety to occur would be limited and infrequent because the need for these types of conflict grizzly bear management activities is expected to be low. Adverse impacts could be substantial if a helicopter-related incident or a grizzly bear conflict results in injury or loss of life; however, with the extensive safety precautions that would be in place, the potential for long-term adverse impacts on employee safety would be minimized. These activities would mitigate potential indefinite, long-term, adverse impacts on a point where they would be unexpected and uncommon, as they would deter or remove a conflict grizzly bear and thereby remove a public and employee safety threat.

Public Safety Impacts Associated with Restoration Activities

Staging Area Impacts. Staging areas used for grizzly bear restoration activities would be temporarily closed to the public; therefore, impacts on visitor safety would be avoided.

Grizzly Bear Release Impacts. Relative to alternatives B and C, alternative D would result in an increased probability of human-grizzly bear encounters within the first several decades of restoration because grizzly bears would be released continuously until the full restoration goal of 200 grizzly bears is achieved. Alternative D would result in a higher number of grizzly bears present in the ecosystem within the primary phase than alternatives B or C, and the restoration goal would be reached within a shorter time frame. The potential for adverse impacts from conflicts between humans and grizzly bears would still be low, as illustrated in the examples from other grizzly bear ecosystems that are discussed under alternative B. All of the public outreach, sanitation, and conflict grizzly bear response measures discussed under alternatives B and C would also be implemented under alternative D, and these actions are expected to minimize the potential for adverse impacts. In the event of a conflict between the public and a grizzly bear resulting in human injury or fatality, adverse impacts on individuals would be substantial. While the probability of a conflict in the short term under alternative D may be greater than under alternatives B and C, it would nonetheless still be considered very low, given the number of bears released and number of potential visitors. Furthermore, the implementation of the safety, sanitation, and conflict avoidance/mitigation measures and conflict grizzly bear response measures described under the no-action alternative and alternatives B and C are expected to minimize the probability of substantial adverse impacts on visitor safety.

Grizzly Bear Restoration Impacts. The potential for indefinite, long-term, adverse impacts on public safety related to human-grizzly bear conflicts would be similar to alternative C because all three alternatives are expected to result in a grizzly bear population of similar size over the long term. Coordinated interagency efforts to promote grizzly bear awareness would continue, sanitation measures would continue to be implemented, and backcountry/wilderness use permitting requirements would continue to enforce safety precautions. The 2002 IGBC guidelines for the NCE would continue to govern the implementation of human-grizzly bear conflict avoidance/mitigation measures and the management, relocation, or removal of conflict grizzly bears, as described above. Indefinite, long-term, adverse impacts on visitor safety under alternative D would be primarily attributable to human-grizzly bear conflicts. In the event of a conflict between a visitor and a grizzly bear resulting in human injury or fatality, adverse impacts on visitor safety would be substantial; however, the implementation of the safety, sanitation, and conflict avoidance/mitigation measures described above, most of which are already implemented in the NCE, are expected to minimize the probability of a conflict occurring.

Cumulative Impacts

Ongoing and reasonably foreseeable future actions with the potential to contribute to cumulative effects on public and employee safety under alternative D are the same as those described for alternative B above. Cumulative actions would result in both adverse and beneficial impacts on public and employee safety, but in aggregate these impacts would be beneficial as agencies work to improve conditions in the NCE. Alternative D would contribute primary phase and additional longer-term adverse impacts on public and employee safety in terms of conflicts with grizzly bears and risks associated with implementing restoration actions; however, the probability of adverse impacts occurring would be minimized to the greatest extent possible, as detailed above. As a result, when the primarily minimal adverse impacts of the alternative D are combined with the effects of other cumulative actions in the study area, an overall beneficial cumulative impact is expected with alternative D contributing a slight adverse increment to the overall beneficial cumulative impact.

Conclusion

Alternative D could result in adverse impacts on employee safety related to helicopter operations and capture and release activities associated with grizzly bear restoration. The probability of these adverse impacts occurring would diminish in the adaptive management phase and beyond and would be limited to relocation and removal of conflict grizzly bears because additional releases would not be carried out once the restoration goal of 200 grizzly bears is achieved. Proper employee training, licensing, and adherence to safety precautions and protocols would mitigate and reduce the probability of adverse impacts on employee safety to the greatest extent possible. Under alternative D, restoration activities in grizzly bear habitat could result in adverse impacts on visitor safety in both the primary phase and adaptive management phase and into the future because of the increased potential for human-grizzly bear conflicts from the increased number of grizzly bears in the ecosystem. The potential for conflicts to occur would be greater in the primary phase of alternative D than under the primary phases of alternatives B and C because of the greater intensity of initial restoration efforts and the shorter time frame for achieving the restoration goal of 200 grizzly bears. Monitoring; the implementation of interagency safety, sanitation, and public outreach efforts; and implementation of IGBC guidance for conflict grizzly bear management would mitigate the potential for adverse impacts resulting from human-grizzly bear conflicts. Impacts on residents could be greater in the primary phase of alternative D than under alternative C because of the increased number of grizzly bears being released. Present and reasonably foreseeable future actions, as analyzed above, would contribute beneficial and adverse impacts, but in aggregate, impacts would be beneficial. Overall, cumulative effects on public and employee safety under alternative D would be beneficial, with alternative D contributing a slight adverse increment to the overall beneficial cumulative impact.

Areas outside the NCE

Although grizzly bears would be released into remote wilderness areas of the NCE, they could move outside of the area into other parts of Washington adjacent to the NCE. Bears that move into suitable grizzly bear habitat would be left there if they did not pose a risk of coming into conflict with humans and livestock. As the population grows, bears movement could increase; however, it is unlikely that a meaningful proportion of the released population would leave the NCE. If grizzly bears move into residential areas or areas with concentration of people, managers would work to remove bears and return them to the NCE, if possible. In the event grizzly bears become conditioned to humans, they would be removed. Recapturing activities would increase the risks to employee safety.

In the event that the option to designate the NCE population of grizzly bears as a section 10(j) experimental population is implemented, additional management measures may become available to managers to use non-lethal measures to reduce impacts on grizzly bears that move outside NCE or to mitigate human-grizzly bear conflicts, including those associated with public safety.

SOCIOECONOMICS

The CEQ regulations implementing NEPA state that when economic or social effects and natural or physical environmental effects are interrelated, the EIS discusses these effects on the human environment (40 CFR 1508.14). The CEQ regulations further state that the “human environment shall be interpreted comprehensively to include the natural and physical environment and the relationship of people with that environment.” This socioeconomic analysis evaluates how the action alternatives could affect elements of the human environment such as employment, tourism, agriculture, cattle grazing, timber harvesting, and mining.

Methods and Assumptions

The analysis of socioeconomic impacts considers potential effects on employment, population, and revenue from natural resource-related activities and revenue from park and national forest visitation that may result from grizzly bear restoration under each alternative. Impacts for this resource topic were analyzed using information on population, employment, and key regional industry sectors provided by the U.S. Census Bureau; information on the economic contribution of national park visitation in the NCE provided by the NPS; and information on timber sales and grazing leases provided by the USFS. A qualitative analysis was performed by subject matter experts based on professional judgment supported by the information described above.

Analysis Area. The area of analysis for socioeconomic impacts resulting from the alternatives includes the seven counties that, in whole or in part, make up the NCE grizzly bear recovery zone. The seven-county region of influence (ROI) includes Chelan, King, Kittitas, Okanogan, Skagit, Snohomish, and Whatcom counties. The area occupied by the NCE grizzly bear recovery zone comprises approximately 52% of the total land area of the ROI. The area of analysis for socioeconomic impacts is expanded beyond the boundaries of the NCE grizzly bear recovery zone because the population and employment centers that could potentially experience socioeconomic impacts as a result of grizzly bear restoration are, in many instances, located outside of the recovery zone. Where appropriate, specific communities or industries located closer to the NCE may be discussed in detail if more acute impacts on these communities or industries are expected as a result of potential future grizzly bear movement outside the NCE.

Issues Analyzed. The analysis of impacts on socioeconomics under each alternative is based on the following issue statements that are identified in chapter 1:

Issue Statement. The restoration of grizzly bears in the NCE has raised concerns about economic impacts on natural resource-based industries such as mining and logging. Concerns have been raised about potential for depredation of livestock or agriculture such as fruit orchards.

Issue Statement. Revenue may be impacted as a result of changes in tourism and hunting revenue resulting from grizzly bear restoration.

Alternative A: Continuation of Existing Grizzly Bear Management (No Action)

Under alternative A, no grizzly bears would be released into the NCE. No emigration of grizzly bears into the NCE is expected, and a self-sustaining population of grizzly bears within the NCE is not expected under this alternative. Current management conditions within the NCE would continue.

Communities. Under alternative A, no impacts on population or communities identified in the socioeconomics baseline described in chapter 3 are anticipated because grizzly bears would not be released into the NCE, and the NCE would be managed using current management practices.

Employment. No impacts on employment related to tourism, agriculture, cattle grazing, timber harvesting, mining, wildlife managers, or park managers are anticipated under this alternative.

Tourism, Agriculture, Cattle Grazing, Timber Harvest, and Mining. Tourism, agriculture, cattle grazing, timber harvesting, and mining leases are not anticipated to be affected under alternative A because grizzly bears would not be released into the U.S. portion of the NCE.

Cumulative Effects

Because socioeconomics would not be affected under this alternative, cumulative impacts would not occur.

Conclusion

Under the no-action alternative, no impacts on socioeconomics would occur because grizzly bears would not be restored in the NCE.

Alternative B: Ecosystem Evaluation Restoration

Under alternative B, up to 10 grizzly bears would be released over the first 2 years of primary restoration activities, and these bears would be monitored for habitat use and incidence of human conflict over several seasons to inform future releases. The adaptive management phase could include transitioning to alternative C and the release of additional bears to achieve an initial population of 25 grizzly bears; however, if pursued, impacts would be reflective of alternative C (see alternative C below). Therefore the scope of analysis for alternative B focuses on the primary phase with the release of up to 10 grizzly bears. Most impacts would occur within the area of the ROI closest to the single release site within the NCE.

Employment. Alternative B could result in impacts on employment related to tourism, agriculture, cattle grazing, mining, timber harvest, wildlife management, or federal land management, although the likelihood would be extremely low given the number of bears released. Impacts on all of these sectors, with the exception of wildlife and federal land management, are described separately in the sections below. Most increases in employment in wildlife management and federal land management resulting from this alternative would likely occur as wildlife and federal land managers capture and release grizzly bears. More NPS, FWS, and USFS staff would likely be required during this phase to successfully release and monitor the initial population of grizzly bears and educate the public at large about grizzly bears in the NCE.

Tourism. Under alternative B, no closures to wilderness areas are expected; however, occasional, localized wilderness closures for public safety during release activities could occur, but these would be site-specific and short (hours to days). Tour operators or recreational visitors, including hunters or horseback riders, are not expected to be substantially affected by these closures because the release areas would be remote, closures would be publicized, and operators and the public could avoid these areas and travel elsewhere within the extensive wilderness of the NCE if necessary. Additionally, increased public outreach and education efforts to promote general bear awareness and provide education on clean camping and the use of bear repellent spray containing capsaicin would be provided for tourists and hunters to mitigate impacts when they are in the grizzly bear habitat. Any area closures are anticipated to be infrequent and very small in scope; therefore, revenue and employment associated with tourism, including hunting, horseback riding, hiking, sightseeing, and tour operations, would not be noticeably affected as a result of this alternative in or adjacent to the ROI.

It is possible that restoration of grizzly bears into the NCE could attract tourists who are interested in seeing the grizzly bears from a distance, which would benefit the local economy through increased spending that supports local jobs and income; however, any change in tourism is likely to be negligible. While there may be some perceived safety risk on the part of backpackers, in the long term, they are anticipated to become re-accustomed to hiking in grizzly bear habitat, and public outreach and education would make most backpackers comfortable with backpacking in the NCE similar to conditions that exist today. Therefore, impacts on backpacking-related revenues are not likely to be noticeably impacted.

Collaboration with potential user groups and public outreach and education would likely mitigate many potential tourism-related adverse impacts as wilderness users become accustomed to backcountry practices that reduce chances for negative interactions with grizzly bears. Therefore, potential adverse tourism-related impacts in and adjacent to the ROI would be mitigated to the extent that no adverse impacts on tourism are expected as a result of this alternative.

Agriculture and Livestock Grazing. Grizzly bear depredation is highly variable between and among years (DOI 2000). Projections of depredation rates based on other areas is difficult because of differences in terrain, vegetation, size of farms, livestock husbandry practices, and food abundance (DOI 2000). A study conducted by Gunther et al. (2004) between 1992 and 2000 found that most of the livestock depredations in the GYE by grizzly bears were cattle—311 cattle out of 436 livestock depredation incidents. Similarly in the NCDE, depredations included an estimated 516 grizzly bears, 34,841 cattle, and 8,500 sheep. Annual grizzly bear livestock depredations in the NCDE were 8 cattle and 17 sheep. According to Gunther et al. (2004), permanent removal of chronic depredators was the most effective method of alleviating livestock losses. Incidents of damage to orchards and beehives represented less than 10% of all depredation incidents during this period. Gunther et al. also found that damage to gardens, orchards, and beehives and protection of sheep was relatively easy to prevent using electric fencing (Gunther et al. 2004). According to a study by Wilson et al. (2006), most human-grizzly bear conflicts were associated with concentrated attractants located within productive bear habitat. These attractants include orchards, beehives, livestock boneyards, and cattle and sheep calving areas. The study found that the likelihood of human-bear conflicts was greater where multiple attractants were located within close proximity to one another.

It is unlikely that grazing leaseholders would be affected by release of grizzly bears in the NCE under alternative B because the number of grizzly bears released and monitored would be small. In the unexpected event that impacts occur, they would likely be intermittent. Impacts per grizzly bear are also likely to be much less than in the GYE because grizzly bears relocated under this alternative would be less carnivorous than grizzly bears in the GYE based on their feeding habits in source areas; therefore, any depredation is expected to occur at a much lower rate than grizzly bears in the GYE. Any impacts on grazing leaseholders' operations could potentially result in reduced employment in cattle ranching in the NCE area or increased costs of operating cattle ranching operations within the NCE. However, this is unlikely because ranchers could be compensated for cattle and sheep killed as the result of a grizzly bear depredation, if funds are available. Additionally, these impacts are somewhat less likely to occur given that most grazing lands are located primarily within an area of lower quality grizzly bear habitat. Figure 14 shows current, active grazing leases within the NCE. The closest grazing lease is located approximately 10 miles from a potential grizzly bear release area.

Currently, 4,100 ewe/lamb pairs and 4,552 cow/calf pairs are authorized to graze during the summer on USFS allotments within the NCE. No livestock are present within the central portion of the NCE because it is national park (USFS 2015). Because approximately only 10 bears would initially be released into the NCE under alternative B, it is highly unlikely that depredation would occur during the primary phase.

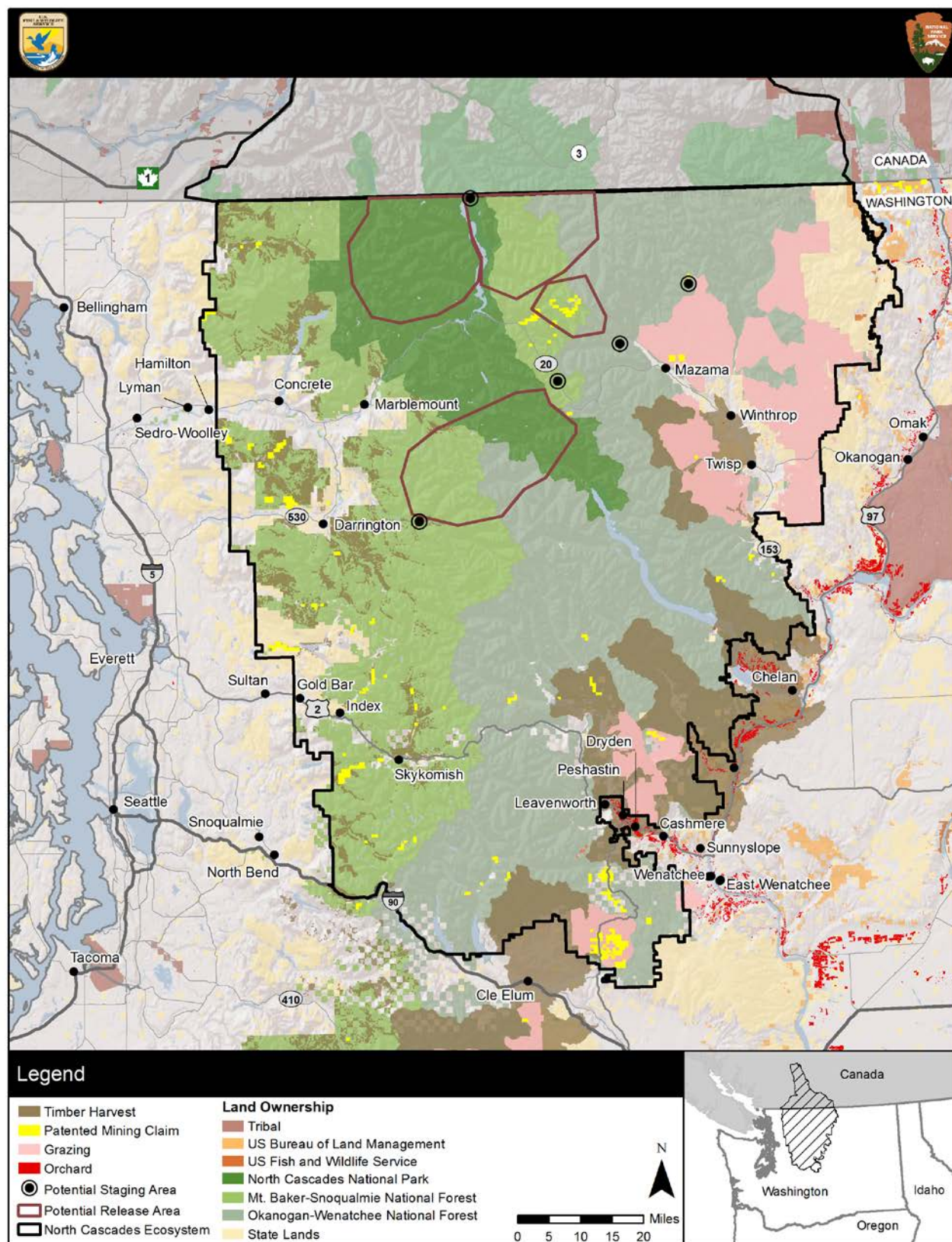


FIGURE 14. AGRICULTURE, TIMBER, AND MINING OPERATIONS IN RELATION TO GRIZZLY BEAR RELEASE AREAS

Adverse impacts on agriculture and livestock grazing would therefore be inconsequential compared to the number of livestock present in or adjacent to the NCE. The potential for impacts could be further reduced by providing grizzly bear education to farmers and ranchers, including education on the use of electric fencing and managed boneyards. All release areas are located away from active grazing allotments, and all released grizzly bears would be GPS-collared and monitored. If a bear frequents an allotment area, the FWS and WDFW would work with the USFS and livestock owners to determine the best course of action to minimize bear-livestock interactions. Agriculture and grazing operations located closest to release areas or suitable grizzly bear habitat would be the most likely to be affected under this alternative. In the unlikely event a grizzly bear depredates agriculture or livestock, appropriate 2002 IGBC guidelines for the NCE would be followed, and the rancher may be compensated for the loss as described in the discussion of compensation for grizzly bear depredation in chapter 2.

Timber Harvest. Leaseholders of timber lands could be adversely affected by release of grizzly bears if grizzly bears move through leased lands while leaseholders are harvesting timber. However, any timber harvest on USFS lands would be subject to ESA consultation requirements, which may allow operators to temporarily disturb bears while continuing to operate. Impacts on timber operations from grizzly bears would be temporary and intermittent because timber is not harvested all the time, timber leases are generally located along the periphery of suitable grizzly bear habitat, and grizzly bears are not expected to be on these lands all of the time. Under alternative B, there would be little to no potential for lost work hours and employment based on the small number of bears released. If a timber company chooses to temporarily stop work as the result of safety considerations of their workers, any lost time would be minimal. Any impacts could be mitigated by allowing workers to harvest other lands if available, although some small, temporary, and intermittent impacts on employment and income of site workers could be possible.

Mining. Similar to impacts described for timber harvests, holders of mining claims may be adversely affected if grizzly bears pass through leased lands while mining is in progress. However, because of the small number of bears released under the primary phase of alternative B and the fact that the closest mining claim is at least 15 miles from the nearest potential release area, the likelihood of these impacts would be very low. In the event that grizzly bears are present in or near mining leases, they are expected to move through in minutes to hours; therefore, these impacts are anticipated to be temporary and very intermittent if they occur at all. Some lost work hours and employment could occur if a mining company chooses to temporarily stop work for safety reasons related to workers working around grizzly bears.

Cumulative Effects

Ongoing and reasonably foreseeable future actions with the potential to contribute to cumulative effects on socioeconomics under alternative B include ongoing NPS trail maintenance and repairs, NPS fire management operations, forest vegetation management, motorized travel management projects, and implementation of the *Stehekin River Corridor Implementation Plan*. Additional ongoing and reasonably foreseeable future actions with potential socioeconomic impacts include CERCLA mine cleanup projects on USFS lands, mining operations on USFS lands, cattle and sheep grazing on USFS lands, a domestic/bighorn sheep interaction EIS, issuance of special-use permits, forest plan updates, ski area expansions and the expansion of Interstate 90, ongoing USFS trail maintenance and repairs, and USFS wildfire suppression efforts.

NPS trail maintenance and repairs, fire management and suppression activities, motorized travel management projects, and issuance of special-use permits would all continue to benefit visitors of the NCE and subsequently the local tourism industry. However, some trails, roads, and sections of the NCE

may need to be occasionally closed for maintenance or fire suppression activities to motorized vehicles, which could result in temporary reductions in tourism as these areas are closed for a short time for these activities.

Ongoing and reasonably foreseeable future CERCLA mine cleanup projects and mining leases on USFS lands provide local jobs and income to the ROI. Cleanup of mine sites also provides new economic opportunities for future land uses at these sites and provides a cleaner environment for tourists visiting the NCE, which could encourage additional visitation and visitor spending within the ROI. Expansion of two ski areas could allow more visitors to visit, thereby increasing the amount of income and jobs supported by these visitors. Expansion of Interstate 90 would support local jobs and income and allow more visitors to access the ROI. At this time, the exact impact of the expansion on total visitation within the NCE is not known. The development of the Domestic and Bighorn Sheep Interaction EIS could result in a change in the number of domestic sheep leases on USFS lands, which could adversely affect agricultural income in the ROI. Additionally, there are ongoing and reasonably foreseeable future cattle and sheep grazing allotments on USFS lands. These allotments support local jobs and income by allowing ranchers to graze their cattle and sheep on USFS lands.

Overall, cumulative actions would result in both adverse and beneficial impacts on employment, income, and sales in the ROI based on shifts in tourism spending and increased local employment and wages for new projects. Alternative B would contribute negligible impacts on communities, agriculture, and livestock grazing as a result of grizzly-bear human interaction because of the very small number of grizzly bears released compared to the size of the NCE and the size and location of human presence and activity relative to the potential release sites of the grizzly bears. Alternative B is not likely to contribute noticeable impacts on tourism, and it may contribute some benefits in the form of slight increases in tourism from tourists visiting the NCE who are interested in learning about or seeing grizzly bears. Alternative B would contribute a negligible increment to cumulative impacts with regard to employment. There could also be beneficial impacts on employment as additional staff or contractors would be brought on for monitoring activities. Alternative B is not likely to result in any impacts on mining or timber operations within the NCE because of the small number of grizzly bears being released and the distance between these release sites and the operations.

Conclusion

As described above, alternative B would contribute both adverse and beneficial, albeit negligible, impacts on employment, communities, agriculture, cattle grazing, tourism, timber harvesting, and mining as the result of releasing 10 grizzly bears into the NCE over 2 years. Impacts on communities would be small in the primary phase. More NPS, FWS, and USFS staff would be required during the primary phase to implement the project and educate the public. Tourism could be beneficially as affected because grizzly bears may draw more tourists to the area and negatively affected because some areas may be temporarily and intermittently closed to tourists and some visitors may choose to avoid the NCE due to the presence of grizzly bears. Agriculture and livestock grazing would be unlikely to be affected during the primary phase given the small number of bears that would be released under this alternative, depredation compensation programs, and relative distance that these operations are located from potential grizzly bear release sites. Impacts on timber harvests and mining operations would also be intermittent and short term because of the small number of bears present relative to the total amount and location of these types of operations. Present and reasonably foreseeable future actions would contribute both beneficial and adverse impacts, as analyzed above. Cumulative effects on socioeconomics under alternative B would be beneficial. Overall, alternative B would likely result in very limited, adverse impacts based on the small number of bears released into the NCE during the primary phase, while providing some benefits related to tourism.

Alternative C: Incremental Restoration

Impacts on employment, tourism, agriculture and livestock grazing, timber harvesting, and mining operations under alternative C would occur earlier and would be greater relative to those described under alternative B because the primary phase of this alternative would result in the release of up to 25 grizzly bears during the primary phase and eventually result in a restored population of 200 grizzly bears. Therefore, the potential for increased adverse impacts on tourism, mining, timber, agriculture, cattle grazing, and impacts on local employment and populations would be felt a few years earlier than under alternative B and would be incrementally greater than those impacts described under alternative B. Overall impacts on jobs, income, and sales in the ROI could be greater during the primary phase and adaptive management phase—resulting in more jobs being created in both phases—although the relative difference in number of jobs is likely to be negligible.

Impacts on tourism would likely be similar to those described under alternative B; however, they would be greater in the primary phase because more bears would be released during this phase, which could result in a greater chance of interaction between the grizzly bears and tourists, although the overall population density of bears present in the NCE would be low. These impacts would be beneficial in terms of the potential for increased number of tourists coming to the NCE to see grizzly bears and adverse in terms of the types of tourism that could be negatively affected by wilderness closures. However, these releases would be intermittent, occur in remote areas, and closures would be publicized allowing for most of these potential adverse impacts to be avoided.

Alternative C would result in slightly more adverse, temporary impacts on agriculture and livestock grazing because more grizzly bears would be released earlier and over the long term under this alternative, leading to the potential for more impacts to occur to these resources than under alternative B. In order to estimate potential depredation effects, a U.S. Department of Interior formula used in the development of the final EIS for Grizzly Bear Recovery in the Bitterroot Ecosystem, was considered as described below (DOI 2000):

$$\frac{\text{Number of cattle/sheep (NCE)}}{\text{Number of cattle/sheep (Other Ecosystems)}} \times \frac{\text{Number of grizzly bears (NCE)}}{\text{Number of grizzly bears (Other Ecosystems)}} \times \frac{\text{Mean annual depredations (Other Ecosystems)}}{\text{Estimated annual depredations in NCE}} =$$

Assuming a restored population of 200 grizzly bears and using the U.S. Department of the Interior's formula, one cow and two sheep are estimated to be killed annually once the restoration goal is reached, which is expected to take 60 to 100 years under this alternative. However, it is probable that the actual number of cattle and sheep killed would be less due to a number of factors including juxtaposition of bear habitat and grazing; type of grazing operation; distribution and abundance of other predators; and abundance and distribution of prey. However, even with this uncertainty, the total number of cattle and sheep depredated within the NCE would result in few if any adverse impacts on agriculture and livestock grazing operations.

Impacts on timber harvesting and mining would be similar to those described under alternative B; however, the impacts would likely be incrementally greater during adaptive management under alternative C given that the number of grizzly bears released under alternative C would be up to 25 bears compared to 10 under alternative B and would be greater in the long term as the restored population of 200 grizzly bears is achieved. However, impacts on timber harvesting and mining are still anticipated to be intermittent and short term, lasting minutes to hours, as workers become aware of grizzly bear presence in the area.

Cumulative Effects

Ongoing and reasonably foreseeable future actions with the potential to contribute to cumulative effects on socioeconomics under alternative C are the same as those described under alternative B. Overall, cumulative actions would result in both adverse and beneficial impacts on employment, income, and sales in the ROI based on shifts in tourism spending and increased local employment and wages for new projects. Alternative C would contribute adverse and potentially beneficial impacts as described above associated with the release of 25 bears over 5 to 10 years and periodic subsequent releases in the future. As a result, when the primarily adverse and beneficial impacts of alternative C are combined with the effects of other cumulative actions in the ROI, an overall beneficial cumulative impact on socioeconomic resources is expected. Alternative C would contribute a negligible increment to the overall cumulative impact.

Conclusion

Under alternative C, impacts would be both adverse and beneficial, albeit negligible, on employment, agriculture, cattle grazing, tourism, timber harvesting, and mining; however, they would be incrementally greater than those impacts described under alternative B. More NPS, FWS, and USFS staff would be required during both the primary phase and adaptive management phase to implement the project and educate the public. Tourism could be beneficially affected because grizzly bears could draw more tourists to the area; it could also be negatively affected because some additional areas may be closed to tourists on an intermittent and temporary basis. Agriculture and livestock grazing would be more likely to be affected given the larger number of bears that would be released under this alternative; however, given depredation compensation programs and the relative distance that these operations are located from potential grizzly bear release sites these impacts are still anticipated to result in few if any adverse impacts. Impacts on timber harvests and mining operations would still be intermittent and short term because of the small number of bears present relative to the total amount and location of these types of operations. Present and reasonably foreseeable future actions would contribute beneficial and adverse impacts, as analyzed above. Overall, cumulative effects on socioeconomics under alternative C would be negligible. Overall, alternative C would likely result in some adverse impacts on socioeconomic resources, although there would also be benefits, especially to tourism because some additional visitors may come to the NCE to see grizzly bears in the NCE.

Alternative D: Expedited Restoration

Impacts under alternative D would ultimately be greater and more adverse than those described under alternative C during the primary phase of the restoration of grizzly bears into the NCE. As the restoration goal of 200 grizzly bears would be reached over a shorter period (25 years) under this alternative, the degree of impacts on tourism, mining, timber, agriculture, cattle grazing, and impacts on local employment and populations would likely be felt much earlier than they would under alternative C. For example, any impacts on agriculture and livestock operations would likely occur much earlier during the primary phase than under alternative C. Additionally, it is likely that employment impacts on NPS, FWS, and USFS staff would be greater during the primary phase because of both the larger volume of grizzly bears being captured and released and the likely additional amount of public outreach, education, and conflict mitigation that they would need to undertake in the primary phase. Further, it would likely be more difficult to manage socioeconomic impacts because less initial information about grizzly bear space use, habits, and movement patterns would be available, which would make impact mitigation more difficult under this alternative. In addition, bears would likely move outside the NCE sooner, which could result in earlier impacts on socioeconomic resources, but these impact would ultimately be same as described under alternative C in the long term. Therefore, initial socioeconomic impacts would likely be greater and more adverse under this alternative relative to alternative C.

Cumulative Effects

Ongoing and reasonably foreseeable future actions with the potential to contribute to cumulative effects on socioeconomics under alternative D are the same as those described under alternative B. Overall, cumulative actions would result in both adverse and beneficial impacts on employment, income, and sales in the ROI. Alternative D would contribute the same impacts as described above under alternative C, although many impacts on socioeconomic resources would likely occur earlier due to the accelerated rate at which the restoration goal (200 bears) would be achieved. Therefore, the contribution from alternative D to the overall cumulative impacts on socioeconomics would be adverse, although likely small, to many of the socioeconomic resources, although some benefits could occur for tourism.

Conclusion

Under alternative D, because the restoration goal of 200 grizzly bears would be reached over a shorter period (25 years), impacts would be both adverse and beneficial, albeit negligible, on employment, agriculture, cattle grazing, tourism, timber harvesting, and mining, but would be greater than the impacts described under alternative C during the primary phase. More NPS, FWS, and USFS staff would be required during the primary phase to implement the project and educate the public. Tourism could be more beneficially affected under this alternative because more grizzly bears may draw more tourists to the area and could be slightly negatively affected because some additional areas may be temporarily and intermittently closed to tourists during the primary phase. Agriculture and livestock grazing would be more likely to be affected during the primary phase given the larger number of bears that would be released; however, given depredation compensation programs and the relative distance that these operations are located from potential grizzly bear release sites these impacts are still anticipated to result in few if any adverse impacts. Impacts on timber harvests and mining operations would be intermittent and short term because of the small population density of bears in the NCE relative to the total amount and location of these types of operations. Present and reasonably foreseeable future actions would contribute beneficial and adverse impacts, as analyzed above. Overall cumulative impacts on socioeconomics would be adverse, although likely small, to many of the socioeconomic resources, although some benefits could occur for tourism.

Areas outside the NCE

As discussed above, adverse and beneficial impacts on employment, income, and sales could occur as a result of impacts on communities, tourism, agriculture, cattle grazing, timber harvests, and mining. If grizzly bears move outside the NCE but remain in suitable bear habitat, benefits associated with tourism could occur as visitors are more likely to see grizzly bears in other areas. However, if bears move outside suitable habitat, adverse impacts on socioeconomic resources could occur. A large number of bears is unlikely to leave the NCE; it is more likely that individuals dispersing or attracted to human uses could adversely affect socioeconomic resources. Given the large diverse economy of Washington, bears are unlikely to have any noticeable impacts, although individual landowners could experience impacts. However, these impacts would be limited in duration (hours to days), as the agencies implement actions to recapture or remove the grizzly bear causing damage. Impacts associated with capture or removal actions would be minimal because they would be limited to trapping events and would not affect socioeconomic conditions. In addition, under existing ESA 4(d) rules, landowners could be permitted to mitigate or eliminate grizzly bear impacts or damage and compensation could be provided as currently allowed under state law in Washington, if funding is available.

In the event that the option to designate the NCE population of grizzly bears as a section 10(j) experimental population is implemented, additional management measures may become available to managers to further reduce any impacts on communities or economic sectors.

ETHNOGRAPHIC RESOURCES

Although various federal laws and executive orders pertain to the management of cultural resources by all federal agencies (see chapter 1), some agencies provide additional guidance on resource management. For example, the NPS Director's Order 28: *Cultural Resource Management* outlines the standards and requirements for managing all cultural resources on park lands and specifically, ethnographic resources, whereas the USFS Handbook 2309.12 provides guidance on heritage program management. As noted in chapter 3, not all agencies use the term "ethnographic resources" to describe these types of resources; sometimes they are called traditional cultural properties, which are considered a category of historic property (defined as a building, site, district, structure, and object) with specific cultural significance that can be listed in the national register of historic places and addressed by the *National Historic Preservation Act*. For this draft plan/EIS, guidance specifically applying to traditional cultural properties would not apply to the grizzly bear as an ethnographic resource.

Methods and Assumptions

The analysis of impacts on ethnographic resources considers potential impacts that may result from grizzly bear restoration under each alternative. Impacts for this resource topic were analyzed using information on ethnographic resources available in published literature as well as information provided by cultural resource experts from the NPS and USFS along with a number of tribes consulted with on this project. A qualitative analysis was performed by subject matter experts, based on professional judgment and supported by the information described above.

Beneficial and adverse impacts on ethnographic resources could occur as a result of this draft plan/EIS. Beneficial impacts can be both intangible and tangible. For example, the agencies assumed that the return of grizzly bears to the NCE would have beneficial impacts by reinforcing an existing connection between tribal oral histories, ceremonies and sacred areas, and with the bears themselves. This is an intangible benefit that results from the physical presence of the bears within the area of traditional use and importance to the tribes. In the long term, the return of grizzly bears to the NCE may lead to the ability of the tribes to hunt these animals for subsistence and ceremonial uses.

For this analysis, the agencies assumed that the faster the grizzlies were restored to the NCE, the better chance that tribes would be able to continue traditions associated with these animals and ensure that they were passed down to younger tribal members. Additionally, the agencies assumed that the more bears present within the NCE would also facilitate the continuation of cultural traditions by increasing the likelihood of their presence within areas of traditional use. Therefore, the analysis of beneficial impacts was based on the growth of the grizzly population over time and the total length of time needed to achieve the restoration goal of 200 bears.

However, the release of grizzly bears may affect the tribes' use of important areas for hunting and gathering or ceremonial use. The potential for restricted access to some areas could lead to adverse impacts on ethnographic resources. For the analysis, the agencies assumed that the activities associated with releasing the bears within the North Cascades could result in adverse impacts by temporarily restricting access to ethnographic resources. The agencies assumed that closures would be temporary—no more than a few days—and could occur after the release of a bear.

Grizzly bears could target some of the plants that are important to tribal people, such as huckleberry, and reduce the amount available for gathering. However, given the restoration goal (200 bears), the area being considered for their release, and the omnivorous nature of the animals, it is highly unlikely that grizzly bears would reduce these resources to the extent that there would be an impact on tribal use. The low likelihood for conflicts between bears and human resources is well documented in other sections of this

document. Therefore, the analysis below focuses on bears as ethnographic resources and potential impacts from restricted access.

The identification and determination of impacts is best accomplished through tribal consultation aimed at reviewing the relationship between the action alternatives and known resources. Tribal consultation has been initiated for this project and is still in progress, with meetings scheduled for the winter 2017. The draft impact analyses below are a discussion of the potential impacts on ethnographic resources. Tribal consultation may lead to additional and more detailed impacts. Although some published information is available on ethnographic resources within the Northern Cascades, site-specific location information and traditional names or uses of areas are not included to protect confidential information until tribal consultation indicates it is acceptable to talk about these areas and uses.

Issues Analyzed. The analysis of impacts on ethnographic resources under each alternative is based on the following issue statements that are identified in chapter 1:

Issue Statement. The grizzly bear is an important part of tribal culture and history in the Northwest. The decline or restoration of grizzly bears would be likely to affect ethnographic resources in various ways.

Alternative A: Continuation of Existing Grizzly Bear Management (No Action)

Under the no-action alternative, grizzly bears would not be released into the U.S. portions of the NCE, but the USFS and NPS would continue to maintain a core area of grizzly bear habitat (per a 1997 interim agreement). This alternative could have a negative impact on ethnographic resources because the chance of a population of grizzly bears moving back into the NCE on their own would be small. Grizzly bears as an ethnographic resource would continue to be absent from this area, which could impede tribal connections to the area and to the animal that has been maintained via oral histories and cultural practices. There is no chance that grizzly bears would move into the NCE much less achieve the target population, which could result in permanent, adverse impacts on the animal as an ethnographic resource. The exact nature of these impacts would be determined through consultation with the tribal communities that continue to use the area. Other ethnographic resources would not be affected under this alternative. No management activities associated with releasing grizzly bears would occur that could impede access to ethnographic resources or impact cultural uses.

Cumulative Effects

Past, present, and reasonably foreseeable actions that have the potential to impact ethnographic resources in the NCE are primarily occurring on national forest lands and include forest vegetation management, cattle and sheep grazing, motorized travel management, mining, CERCLA mine cleanup and abandoned mine land projects, ski area expansion, wildfire suppression, aquatic restoration, and goat relocation. These projects have the potential to have both adverse and beneficial impacts on ethnographic resources. Projects that have the potential to cause ground disturbance or remove important vegetation, such as cattle and sheep grazing, mining activities (including cleanup), ski area expansion, and wildfire suppression, could result in adverse impacts on ethnographic resources by removing important plants or making it difficult to access and use traditional areas. Areas used for traditional purposes, either gathering plants and animals or for ceremonial use could be directly affected by ground-disturbing activities that remove plants, animals, or places or could be indirectly affected by introducing sound and visual changes that make the use of an area difficult. Overall, the agencies would consult with the tribes to ensure that these activities and their corresponding impacts are minimized or avoided.

In general, forest vegetation management tends to consider potential impacts on ethnographic resources and can have beneficial impacts by maintaining important plants within traditional areas. Aquatic restoration and goat relocation could also benefit ethnographic resources by ensuring animal species important to tribes remain within traditional use areas.

Under the no-action alternative, grizzly bears would not be released into the NCE and would likely become extirpated within the area. This would have an adverse impact on ethnographic resources by removing an entire category of ethnographic resources from the area. The tribes would no longer be able to associate important activities and traditions with the grizzly bear in the NCE area. This, combined with the other activities described above, would result in overall adverse cumulative impacts on all ethnographic resources, and alternative A would contribute a noticeable adverse increment to the loss of those resources.

Conclusion

Ethnographic resources are defined by the community to which they are important. The tribes that maintain connections to the NCE have documented ethnographic resources, heritage resources, and traditional cultural properties within the NCE, including the grizzly bear. Grizzly bears would not repopulate the NCE, and the agencies would not take any actions to relocate bears to the NCE under this alternative, leading to permanent adverse impacts on ethnographic resources. However, there would be no potential adverse impacts on other ethnographic resources, such as hunting and gathering, associated with this alternative because the release of bears would not occur. When alternative A is considered with other past, present, and reasonably foreseeable projects, adverse cumulative effects associated with the loss of the grizzly bear as an ethnographic resource are possible, but given the current population status of the grizzly bear in the NCE, these adverse impacts are not anticipated to substantially alter the overall ethnographic resources within the NCE. The no-action alternative would have a noticeable contribution of adverse impacts on overall adverse cumulative impacts from the absence of grizzly bears as an ethnographic resource.

Alternative B: Ecosystem Evaluation Restoration

Under alternative B, the primary phase of grizzly bear restoration would release bears in the first 2 years, followed by 2 years of monitoring with the decision of future releases of grizzly bears and the age and sex ratios of those grizzly bears based on the results of monitoring. Depending on the outcome of monitoring, managers could decide to repeat the initial release and continue monitoring or transition to alternative C. If managers decide to move toward implementation of alternative C during the adaptive management phase of this alternative, the impacts would coincide with those described for alternative C below.

This alternative would have a beneficial impact on the ethnographic resource by ensuring that grizzly bears continue to be present within areas of traditional tribal use. The potential for short-term, negative impacts on some ethnographic resources, such as traditional tribal hunting and gathering areas, associated with the management activities proposed under this alternative is very small. The release of grizzlies may require the temporary closure of areas in the days immediately after the release. Alternative B would result in 5 days of bear releases per year for the first 2 years and would likely be spread out temporally based on when bears are captured from source populations. In addition, under alternative B, bears would be released in one remote location, which would be planned to minimize the need for any closure. If closures did occur, they would be short (for this analysis less than a few days for a maximum of 15 days per year). Consultation with the tribes prior to any releases to identify potential conflicts with proposed release areas and ethnographic resources could avoid any adverse impacts. The beneficial impacts of restoring an ethnographic resource could help offset any limited adverse effects related to limited access restrictions.

Cumulative Effects

Past, present, and reasonably foreseeable actions with the potential to contribute to cumulative effects on ethnographic resources under alternative B would be the same as those described for alternative A above. These actions could have both adverse and beneficial effects on ethnographic resources as described above. While slow, the restoration of grizzly bears to the NCE would be a benefit to ethnographic resources by ensuring that grizzly bears continue to be present. This, considered with other projects, would contribute to overall beneficial cumulative impacts on ethnographic resources. Given that the adverse impacts associated with management activities would be very temporary and could be avoided in many instances, they are not anticipated to contribute to adverse cumulative impacts.

Conclusion

The restoration of the grizzly bear would result in the restoration of an ethnographic resource largely absent from the NCE. Alternative B would result in benefits on ethnographic resources, but the rate of these benefits would take longer to fully achieve, based on the small number of bears released under alternative B. Some adverse impacts on other ethnographic resources could occur as a result of reduced access during the proposed management activities associated with the release of grizzly bears. However, bears would be released in one remote location with consideration of tribal access to that site, and those areas would be avoided to the extent possible. The benefits of the alternative would contribute to the beneficial impacts from other projects and result in overall beneficial cumulative effects by ensuring that grizzly bears continue to be present in the NCE. Overall, the benefits provided by alternative B would likely offset any minimal adverse impacts on ethnographic resources that may occur.

Alternative C: Incremental Restoration

Under this alternative, approximately 25 grizzly bears would be released into the NCE over the course of 5 to 10 years. This initial population would then be allowed to grow naturally, albeit most likely with some additional bears translocated during adaptive management, with the goal of achieving a population of around 200 grizzly bears. Subsequent releases of bears every few years may be necessary to further address restoration objectives. This alternative would have a beneficial impact on the ethnographic resource by ensuring that grizzly bears continue to be present within areas of traditional tribal use. However, the benefits from achieving the target population would not be achieved for 60 to 100 years, which could reduce the ability of the tribes to maintain important cultural connections and traditions and pass these traditions on to younger members.

Potential adverse impacts on other ethnographic resources, such as hunting and gathering areas, are anticipated to be similar to those described under alternative B; however, they would extend for additional years and would be distributed across several sites. Closures would be temporary, no more than a few days, and would occur after the release of a bear. Under this alternative, there could be a maximum of 75 days of temporary closures over the course of 5 to 10 years. Multiple, remote release sites would be used, which could increase the chance that one of these release sites affects an area of traditional use. As described under alternative B, the agencies would consider the potential effects of release sites on tribal use and avoid areas of tribal use to the extent possible.

Cumulative Effects

Past, present, and reasonably foreseeable actions with the potential to contribute to cumulative effects on ethnographic resources under alternative C would be the same as those described for alternative A above. These cumulative actions could have both adverse and beneficial effects on ethnographic resources as described above. Impacts from alternative C are anticipated to be the similar to those described under

alternative B but would be achieved at a different rate because more grizzly bears would be initially released—up to 25 bears over 5 to 10 years. Overall cumulative effects on ethnographic resources would be beneficial, and alternative C would contribute a beneficial increment to these cumulative impacts through the restoration of the grizzly bear as an ethnographic resource.

Conclusion

Alternative C would have long-term benefits on ethnographic resources by ensuring the continuation of the grizzly bear—an important ethnographic resource within the NCE; however, it would take many years (60 to 100) for the full benefits to be achieved. Some adverse impacts on other ethnographic resources could occur as a result of reduced access during the restoration activities associated with the release of grizzly bears. However, the agencies would take steps to reduce the potential conflict with tribal use of areas. Avoidance of tribal use areas during release site identification would help reduce potential adverse impacts. The overall benefits of restoring grizzly bears would contribute to the beneficial impacts from cumulative actions and result in beneficial cumulative effects. Overall, alternative C would largely result in beneficial impacts by restoring an ethnographic resource and would seek to limit adverse impacts associated with access limitations.

Alternative D: Expedited Restoration

This alternative would not limit the population goal for the primary restoration phase to 25 animals; rather, the number of suitable grizzly bears captured in a given year would be released into the NCE. It is anticipated that the logistics and capacity of management agencies to carry out capture and release would constrain the ability to release a large number of grizzly bears in any single year under this alternative (the actual number of grizzly bears to be released per year would likely be five to seven). Therefore, the target population of 200 grizzly bears would be achieved in a shorter time than under other alternatives—approximately 25 years. This alternative would benefit ethnographic resources by ensuring grizzly bears are present within the NCE in numbers that would increase their likelihood of being present within areas of tribal traditional use. The shorter time frame for these benefits would lead to an increased ability of the tribes to continue and maintain cultural traditions through generations.

The potential adverse impacts on other ethnographic resources, such as hunting and gathering areas are anticipated to be the same under this alternative as under alternative C on an annual basis, with a maximum of 15 to 21 days of temporary closures in limited areas per year. However, because active restoration would last approximately 15 years longer than under alternative C, the potential for adverse impacts would be highest under this alternative. Similar to alternative C, multiple, remote release sites would be identified. Given the number of bears to be released, additional sites could be required. The agencies would attempt to avoid tribal use areas and limit access restrictions to the extent possible. However, alternative D would have the highest potential for access restrictions given the number of bears released over a longer initial period.

Cumulative Effects

Past, present, and reasonably foreseeable actions with the potential to contribute to cumulative effects on ethnographic resources under alternative D would be the same as those described for alternative A above. These cumulative actions could have both adverse and beneficial effects on ethnographic resources as described above. The cumulative effects of alternative D are anticipated to be similar to those described under alternative C but could affect more ethnographic resources during active restoration because releases would occur over a 25-year period. Overall cumulative effects on ethnographic resources would be beneficial, and alternative D would contribute a beneficial increment to these cumulative impacts through the restoration of the grizzly bear as an ethnographic resource.

Conclusion

Under alternative D, impacts on ethnographic resource would be long term and beneficial because the grizzly bear population within the NCE would be restored. These beneficial impacts would be achieved within the lifetime of some tribal members—a faster rate than under other alternatives. Some adverse impacts on other ethnographic resources could occur as a result of limited access during the proposed management activities associated with the release of grizzly bears. As described above, efforts would be made to avoid areas of tribal use to the extent possible to help avoid access restrictions. Given the number of bears released and the years of active restoration needed, the likelihood of access restrictions that could affect tribal use areas is higher compared to the other action alternatives. Alternative D would contribute to the beneficial impacts from other projects and result in beneficial cumulative effects by ensuring that grizzly bears continue to be present. Overall, alternative D would benefit ethnographic resources in a way similar to that described for alternatives B and C, although it would achieve restoration at a faster rate. However, alternative D has a higher chance of adverse impacts related to access restrictions during the initial phase of restoration. Overall cumulative effects on ethnographic resources would be beneficial, and alternative D would contribute a beneficial increment to these cumulative impacts.

Areas outside the NCE

Ethnographic resources also occur outside the NCE, throughout Washington State. Bears moving out of the area would still contribute in a beneficial way as an ethnographic resource. However, actions taken to recapture grizzly bears if deemed necessary could result in some small, adverse impacts on ethnographic resources if they result in area closures as the agencies attempt to recapture the bear. Recaptured bears would likely be returned to the NCE if there was not a human-bear conflict that requires the bear to be removed from the population. However, even the removal of individual bears would not eliminate the overall restored population as an ethnographic resource once restored to the NCE.

In the event that the option to designate the NCE population of grizzly bears as a section 10(j) experimental population is implemented, additional management measures may become available to managers to further reduce impacts on ethnographic resources.

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