

Management Alternatives for the Unimak Island Caribou Herd

Environmental Assessment

Prepared by

Department of the Interior
U.S. Fish and Wildlife Service

In cooperation with
State of Alaska
Alaska Department of Fish and Game

DECEMBER 2010
GAP Solutions, Inc.
Washington, D.C.

Page intentionally left blank

TABLE of CONTENTS

	Page
ACRONYMS	
LIST OF TABLES AND FIGURES	
EXECUTIVE SUMMARY	
1. CHAPTER 1 – PURPOSE AND NEED FOR THE ACTION	1
1.1. INTRODUCTION	1
1.2. PURPOSE	2
1.3. THE NEED FOR ACTION	2
1.4. DECISION TO BE MADE	2
1.5. SCOPE OF THIS ANALYSIS	3
2. CHAPTER 2 – HISTORY OF UNIMAK ISLAND CARIBOU	4
2.1. HISTORICAL TRENDS	4
2.2. CAUSES FOR RECENT POPULATION DECLINE	6
3. CHAPTER 3 – ALTERNATIVES	10
3.1. INTRODUCTION	10
3.1.1. Introduction to Alternatives	10
3.1.2. Rationale Behind Selection of Alternatives	10
3.2. ALTERNATIVES CONSIDERED IN DETAIL	11
3.2.1. Alternative A – No Action (No Predator Control)	11
3.2.2. Alternative B – Selective Predator Management on the Calving Grounds and Calf Mortality Study with Helicopter Support (Alaska Department of Fish and Game Proposed Action)	12
3.2.3. Alternative C – Selective Predator Management on the Calving Grounds Using Either Fixed-wing Aircraft with Marksmen or Ground-based Teams Deployed by Helicopters to Take Wolves and Calf Mortality Study with Helicopter Support	14
3.2.4. Alternative D – Selective Predator Management on the Calving Grounds Using Ground-based Teams	15
3.2.5. Actions Common to Alternatives B, C and D – Supplement Unimak Caribou Herd with Bulls from the Southern Alaska Peninsula Herd	16
3.2.6. Adaptive Management Considerations Common to All Alternatives	17
3.3. SUMMARY TABLE OF ALTERNATIVES CONSIDERED IN DETAIL	18

TABLE of CONTENTS

	Page
3.4. ALTERNATIVES CONSIDERED BUT DISMISSED WITH RATIONALE	20
3.4.1. Capture and Relocate Wolves to Other Locations in Alaska: Zoos or Research Centers	20
3.4.2. Immuno-contraception and Surgical Sterilization of Wolves to Prevent Pregnancy	20
3.4.3. Predator Management of Wolves on Broad Scale	20
3.4.4. Predator Management of Brown Bears	20
3.4.5. Predator Management of Wolves Using Airplanes but No Helicopter	21
3.4.6. Supplement Caribou Bulls on Unimak Island Without Predator Control	21
4. CHAPTER 4 – AFFECTED ENVIRONMENT	23
4.1. INTRODUCTION	23
4.2. AFFECTED ENVIRONMENT	23
4.2.1. Physical Description and Climate	23
4.2.2. Biological Resources	24
4.2.2.1. Terrestrial Vegetation	24
4.2.2.2. Terrestrial Mammals	24
4.2.2.3. Birds	26
4.2.3. Threatened and Endangered Species	27
4.2.4. Cultural Resources	27
4.2.5. Human Uses	28
4.2.5.1. Subsistence Uses	28
4.2.5.2. Other Public Uses	29
4.2.6. Designated Wilderness	29
5. CHAPTER 5 – ENVIRONMENTAL CONSEQUENCES	31
5.1. ISSUES CONSIDERED	31
5.1.1. Issues Considered in Detail	31
5.1.2. Issues Not Considered in Detail, With Rationale	31
5.1.2.1. Brown Bears	31
5.1.2.2. Birds	31
5.1.2.3. Species Listed as Threatened or Endangered	31
5.1.2.4. Cultural Resources	32
5.2. ISSUES ANALYZED BY ALTERNATIVE	32
5.2.1. Alternative A – No Action (No Predator Control)	32
5.2.1.1. Impacts on the Natural Environment	32
5.2.1.2. Impacts on Subsistence Opportunity	33
5.2.1.3. Impacts on Other Public Uses	33
5.2.1.4. Impacts on Wilderness Character	33

TABLE of CONTENTS

	Page
5.2.2. Alternative B – Selective Predator Management on the Calving Grounds and Calf Mortality Study with Helicopter Support (Alaska Department of Fish and Game Proposed Action)	34
5.2.2.1. Impacts on the Natural Environment	34
5.2.2.2. Impacts on Subsistence Opportunities	35
5.2.2.3. Impacts on Other Public Uses	36
5.2.2.4. Impacts on Wilderness Character	36
5.2.3. Alternative C – Selective Predator Management on the Calving Grounds Using Either Fixed-wing Aircraft with Marksmen or Ground-based Teams Deployed by Helicopters to Take Wolves and Calf Mortality Study with Helicopter Support	37
5.2.3.1. Impacts on the Natural Environment	37
5.2.3.2. Impacts on Subsistence Opportunities	39
5.2.3.3. Impacts on Other Public Uses	39
5.2.3.4. Impacts on Wilderness Character	40
5.2.4. Alternative D – Selective Predator Management on the Calving Grounds Using Ground-based Teams	40
5.2.4.1. Impacts on the Natural Environment	40
5.2.4.2. Impacts on Subsistence Opportunities	42
5.2.4.3. Impacts on Other Public Uses	42
5.2.4.4. Impacts on Wilderness Character	43
5.3. SUMMARY OF IMPACTS	45
LITERATURE CITED	47
APPENDIX A – LIST OF PREPARERS AND REVIEWERS	51
APPENDIX B – CONSULTATION AND COORDINATION	55
APPENDIX C – ALASKA BOARD OF GAME WOLF MANAGEMENT AREA FOR UNIMAK ISLAND <u>and</u> MODIFICATION TO PREDATOR CONTROL AREAS IMPLEMENTATION PLANS	59
APPENDIX D – DRAFT MINIMUM REQUIREMENTS ANALYSIS FOR ACTIONS IN CONGRESSIONALLY DESIGNATED WILDERNESS	71

ACRONYMS

ANILCA	Alaska National Interest Lands Conservation Act
CFR	Code of Federal Regulations
DPS	Distinct Population Segment
EA	Environmental Assessment
MRA	Minimum Requirement Analysis
MRDG	Minimum Requirements Decision Guide
NAPCH	Northern Alaska Peninsula Caribou Herd
NEPA	National Environmental Policy Act
NWRS	National Wildlife Refuge System
SAPCH	Southern Alaska Peninsula Caribou Herd
UCH	Unimak Island Caribou Herd

LIST OF TABLES AND FIGURES

Table 1. Caribou population survey data from Unimak Island 1996-2010

Table 2. Reported Unimak Island caribou harvest 1997-2007

Table 3. Results of wolf control on calf recruitment, Southern Alaska Peninsula 2008-2010

Table 4. Comparison of Alternative Actions

Table 5. Summary of environmental consequences of the Alternative Actions

Figure 1. Caribou population counts and estimates from Unimak Island 1925-2009

Figure 2. Map of Proposed Action Operational Area

Figure 3. Map of Unimak Island

Figure 4. Location of caribou herds in southwestern Alaska

EXECUTIVE SUMMARY

The U.S. Fish and Wildlife Service (Service) has prepared this Environmental Assessment (EA) to analyze management options, including a No Action alternative, for responding to the declining Unimak Island caribou herd (UCH). The 1,572 square mile (4,071 square kilometer) Unimak Island, is the easternmost island of the Aleutian Islands, located 700 miles (1,127 kilometers) southwest of Anchorage. It is the only island among the Aleutians with naturally occurring populations of caribou (*Rangifer tarandus*), brown bear (*Ursus arctos*), and wolf (*Canis lupus*). Over 90% of Unimak Island is within the Alaska Maritime National Wildlife Refuge (Refuge) and is managed by the Izembek National Wildlife Refuge headquartered in Cold Bay, Alaska. Ninety-eight percent of the Refuge is congressionally designated wilderness.

The preparation of this EA has been prompted by the Alaska Department of Fish and Game (ADF&G) proposal to conduct a predator control management action on the Refuge to increase the UCH and restore it to sustainable numbers sufficient to allow hunting again by Federally-qualified subsistence users. The ADF&G is a cooperating agency with the Service in the preparation of this EA in accordance with the National Environmental Policy Act because of the broad authorities both agencies have for managing fish, wildlife, and habitat resources on Unimak Island.

This EA will be used as a resource to guide the Service decision for selecting a management action that addresses the declining UCH in a manner consistent with, and necessary to achieve, the Refuge mission and purposes under the Alaska National Interest Lands Conservation Act (ANILCA), Wilderness Act, and National Wildlife Refuge System Improvement Act (Improvement Act). The Service's decision will also, to the extent practical, be in accordance with the ADF&G's constitutional and statutory provisions to manage Alaska's fish and wildlife resources on a sustained yield basis. In addition to guiding a management decision for the UCH, this EA will also be used to determine whether or not the ADF&G's proposal would have a significant impact on the quality of the human environment.

The purpose and need of the ADF&G's proposal is to stop the decline and the possible loss of the entire caribou herd on Unimak Island in order to provide for continued subsistence hunting opportunities by Federally-qualified subsistence users and is intended to ensure that the UCH continues to be a viable component of the Unimak Island ecosystem.

In 2009, all hunting for caribou on Unimak Island, including subsistence hunting, was suspended for conservation reasons. While caribou herds throughout Alaska commonly undergo major fluctuations in population size, the current downward trend of the UCH may be noncyclic and irreversible without management intervention. Since 2005, there has been little calf recruitment into the UCH, and it now has an unusually low number of male caribou in proportion to females. From 2002 through 2009, the UCH declined from a population of approximately 1,261 to the present low of 400. While multiple factors (e.g., nutrition and habitat condition, disease, climate change, predation, and hunting) may have contributed to the recent UCH decline, predation is at least a major explanation. Other than suspension of caribou hunting, predation is the one factor that management intervention is best able to address in order to improve the UCH numbers in the future. To prevent the loss of the UCH, or a prolonged period with a depleted population, the ADF&G proposes to reduce predation by wolves on the UCH for a period of time sufficient to allow the herd to stop declining and begin to recover to a sustainable harvest level for subsistence users.

The alternatives described in detail in this EA, and analyzed for their impacts (i.e., natural environment, subsistence use, other public use, and wilderness character) represent three alternatives identified as being reasonable for achieving the purpose and need for the ADF&G's predator control proposal and a No Action alternative. The four alternatives are: (A) a No Action alternative without predator control; (B) the ADF&G's proposed action to use helicopters to selectively shoot wolves while airborne that are preying on caribou calves; (C) an alternative to use fixed-wing aircraft with marksman or ground-based teams dropped off by helicopter to selectively shoot wolves preying on caribou calves; and, (D) an alternative to use ground-based teams to shoot wolves in the area of the calving grounds, supported by reconnaissance airplanes. All predator control alternatives include the translocation of bulls from the Southern Alaska Peninsula caribou herd to Unimak Island to increase pregnancy rates among cows in the UCH. All four alternatives encompass ongoing monitoring and research activities in support of adaptive management. In addition to the four alternatives considered in detail, five other alternatives considered but not analyzed in detail are described along with rationale for their rejection.

The Proposed Action (Alternative B), the ADF&G believes provides the greatest likelihood of success and best meets the requirements for the minimum level of activity in the wilderness. The Service has determined that the ADF&G's proposal to conduct a predator control management on the Refuge is necessary, but has elected not to identify a preferred alternative pending public review of the EA. The EA will be used as a resource guide for the Service decision in selecting a management action that addresses the declining UCH in a manner that is consistent with, and necessary to achieve, the Refuge mission and purposes under the ANILCA, Wilderness Act, and Improvement Act.

Appendix D contains the Service's draft Minimum Requirements Analysis (MRA) for evaluating administrative uses in wilderness. In this draft MRA, we find that some action is needed for administering the area as wilderness and is necessary to accomplish the purposes of the Refuge, including Wilderness Act purposes. Before selecting an alternative, the Service will identify ways to minimize resultant impacts.

CHAPTER 1 – PURPOSE AND NEED FOR THE ACTION

1.1 INTRODUCTION

The U.S. Fish and Wildlife Service (Service) has prepared this Environmental Assessment (EA) to analyze management options, including a No Action alternative, for responding to the declining Unimak Island caribou herd (UCH). Unimak Island is the easternmost island of the Aleutian Islands located 700 miles (1127 kilometers) southwest of Anchorage, off the tip of the Alaska Peninsula, and is the only island among the Aleutians with naturally occurring populations of caribou (*Rangifer tarandus*), brown bear (*Ursus arctos*), and wolf (*Canis lupus*). Over 90% of the 1,572 square mile (4,071 square kilometer) of Unimak Island is within the Alaska Maritime National Wildlife Refuge (Refuge) and is managed by the Izembek National Wildlife Refuge headquartered in Cold Bay, Alaska. Ninety-eight percent of the Refuge is congressionally designated wilderness.

The preparation of this EA has been prompted by the Alaska Department of Fish and Game (ADF&G) proposal to conduct a predator control management action on the Refuge to increase the UCH and restore it to sustainable numbers sufficient to allow hunting again by Federally-qualified subsistence users. Since the ADF&G's proposal would take place on Service-managed refuge lands, it becomes a Federal action for the purpose of this EA in accordance with the National Environmental Policy Act (NEPA). The ADF&G is a cooperating agency with the Service in the preparation of this EA because of the broad authorities both agencies have for managing fish, wildlife, and habitat resources on Unimak Island. The Service supports these authorities and is committed by law and regulation (National Wildlife Refuge System Administration Act of 1966, Department of the Interior 43 CFR 24) to a cooperative management relationship with the ADF&G for the conservation of caribou on Unimak Island.

This EA is an analysis of the science underlying the ADF&G's proposal, and the consequences of the ADF&G's proposal and alternatives, on the human and natural environment of Unimak Island. This EA is not an analysis of Service mandates and policies or a decision document regarding the use of predator control as a management tool on a national wildlife refuge elsewhere in the region. The Service has determined that the ADF&G's proposed action to conduct predator control on the Refuge is necessary, but has elected not to identify a preferred alternative pending public review of the EA. Thus, the EA will be used as a resource to guide the Service decision for selecting a management action that addresses the declining UCH in a manner that is consistent with, and necessary to achieve, the Refuge mission and purposes under the Alaska National Interest Lands Conservation Act (ANILCA), Wilderness Act, and National Wildlife Refuge System Improvement Act. The Service's decision will also, to the extent practical (Department of the Interior 43 CFR 24), be in accordance with the ADF&G's constitutional and statutory provisions to manage Alaska's fish and wildlife resources on a sustained yield basis (Alaska Constitution, Alaska Statute 2007).

The Refuge purposes most applicable to a Service decision regarding the ADF&G's proposal are: 1) to conserve fish and wildlife populations and their habitats in their natural diversity, 2) to provide, in a manner consistent with the above purpose, the opportunity for continued subsistence uses by local residents, and 3) to preserve the Refuge's wilderness character. In addition to legal mandates, the Service will rely on its policy for maintaining and restoring, where appropriate, the biological integrity, diversity and environmental health of the National Wildlife Refuge System (U.S. Fish and Wildlife Service 2001) and its policy for wilderness

stewardship (U.S. Fish and Wildlife Service 2009). Finally, the Service's decision process for selecting a management alternative will use this EA to determine whether or not the ADF&G's proposal would have a significant impact on the quality of the human environment as required by NEPA.

1.2 PURPOSE

The purpose of the ADF&G's proposal is to stop the decline and the possible loss of the entire caribou herd on Unimak Island in order to provide for continued subsistence hunting opportunities by Federally-qualified subsistence users. Success of this proposal will occur when the UCH is no longer in decline, calf recruitment into the herd, as indicated by an increasing calf to cow ratio, and the bull to cow ratio is sufficient for herd growth and subsequent restoration of subsistence harvest.

1.3 THE NEED FOR ACTION

The ADF&G's predator control proposal is intended to ensure that the UCH continues to be a viable component of the Unimak Island ecosystem to provide the continued opportunity for Federally-qualified uses of caribou, along with natural diversity and biological integrity. Caribou herds throughout Alaska commonly undergo major fluctuations in population size; however, the current downward trend of the UCH may be noncyclic and has progressed to such low bull numbers that it may be irreversible without management intervention. Currently, there is little calf recruitment into the herd, and the herd has an extremely low number of male caribou in proportion to females. In 2009, the Alaska Board of Game and the Federal Subsistence Board suspended all hunting, including subsistence hunting, for conservation reasons. From 2002 through 2009, the UCH declined by approximately two-thirds and males (bulls) declined by about 97%. Limited calf recruitment into the UCH since 2005 largely explains the population's decline (Table 1). If these trends continue, the UCH would be lost entirely from the island. Either loss of the population, or a prolonged period with a depleted population, would extend indefinitely the current suspension of all hunting, including subsistence hunting, and could have long-term consequences for species diversity on Unimak Island. To prevent this from happening, the ADF&G proposes to reduce predation on the UCH for a period of time sufficient to allow the herd to stop declining and begin to recover to a sustainable harvest level for Federally-qualified subsistence users.

1.4 DECISION TO BE MADE

The decision to be made by the Service is twofold. First, is to determine which alternative addresses the current state of the UCH in the manner that is most consistent with, and necessary to achieve, the Refuge mission and purposes, and to the extent practical, is in accordance with the ADF&G's mission and mandates. Second, is to determine if the alternative chosen would be a major Federal action significantly affecting the quality of the human environment in accordance with NEPA. A positive finding on the latter decision would require the development of an Environmental Impact Statement before proceeding with a proposed action.

A decision about when to reopen subsistence hunting is not the subject of this EA, nor is it a decision that the Service can make on its own. However, when the Service believes that the UCH is once again able to provide a sustainable harvest in a manner supported by recognized

principles of wildlife management, the Service shall make a recommendation to the Federal Subsistence Board for their consideration and subsequent decision.

1.5 SCOPE OF THIS ANALYSIS

The analysis of alternatives is limited to the UCH and its associated species and habitat on Unimak Island, on a national wildlife refuge with congressionally designated wilderness. While the UCH may be considered part of a metapopulation (i.e., a regional group of connected populations of a species) with caribou herds on the Alaska Peninsula, its isolation, distinct genetic characteristics, and fidelity to calving grounds on the island warrant its separate treatment for the ADF&G's predator control proposal. See Chapter 2 for rationale on the scope of the analysis.

CHAPTER 2 - HISTORY OF UNIMAK ISLAND CARIBOU

2.1 HISTORICAL TRENDS

Valkenburg et al. (2003:136) reviewed the historical literature and summarized information on the UCH history:

Caribou were numerous on Unimak Island during the early 1900s, and they probably reached a population high of at least 7,000 in 1925 (Murie 1959). By the 1940s, caribou had declined, and during the first aerial survey of Unimak Island in November 1949, no caribou were observed (Skoog, 1968). In a 1953 survey, again no caribou were found on Unimak, but by 1960, almost 1,000 were present (Skoog 1968). In 1975, Irvine (1976) counted 3,334 caribou and estimated there were about 5,000 on the island. After the mid-1970s the population declined, and during most of the 1980s and early 1990s only about 300 caribou could be found. The current population decline was preceded by a slight increase during the early 2000s. In 2000, a hunting guide counted 981 caribou and estimated a population of at least 1,100 on the island (Schuh, pers. comm.).

Murie's (1959) estimate for 1925 was derived from his work on the ground, not aerial surveys, and is expert opinion rather than a population 'count.' Beals and Longworth (1941) also reported ground observations as well as anecdotal information on caribou abundance from Unimak Island in 1941. They reported individual observations between 10-15 and 300-400 at a time. "Residents of Unimak estimate from 8,000 to a minimum of 3,000 Caribou on the Island." (Beals and Longworth 1941:14). Skoog (1968) reported no caribou observed during aerial surveys in 1949 and 1953, but lacking information on the conditions and extent of those surveys we do not know if the lack of caribou observations in these years represents total absence, very low density, or incomplete coverage of the island. Skoog (1968) subsequently counted almost 1,000 caribou 'present' in a 1960 survey, so assuming his survey methods were comparable between years his observations indicate large fluctuations in UCH population size over as few as seven years. Valkenburg et al. (2003:138) concluded more generally for the southwestern Alaska herds "there is evidence for periodic population fluctuations with population highs occurring every 40-50 years. During the early 1900s, and also recently, population highs progressed from south to north, with the UCH peaking first, followed by the [Southern Alaska Peninsula caribou herd] SAPCH and the NAPCH [Northern Alaska Peninsula caribou herd] thereafter."

Since 1996-1997, Izembek National Wildlife Refuge has conducted seven aerial surveys to count caribou on systematic transects across Unimak Island in the winter when snow on the ground facilitates observation. These flights follow systematic transects crossing the entire island, yet they do not provide a precise census because some caribou may not be seen, and in years when flights are extended over more than one day due to weather or other conditions, caribou may move and are counted more than once. Generally, however, the counts provide estimates for minimum population size (Bruce Dale, pers. comm.). Between 1996-2002 the population counts doubled, from about 600 to over 1,200, but then the population declined again to about 400 in 2009. The UCH population counts and estimates from 1925-2009 are depicted in Figure 1. (Note, in this EA, winter count dates are for the calendar year of the prior breeding season even for years when the actual count did not occur until after January 1st of the following calendar year).

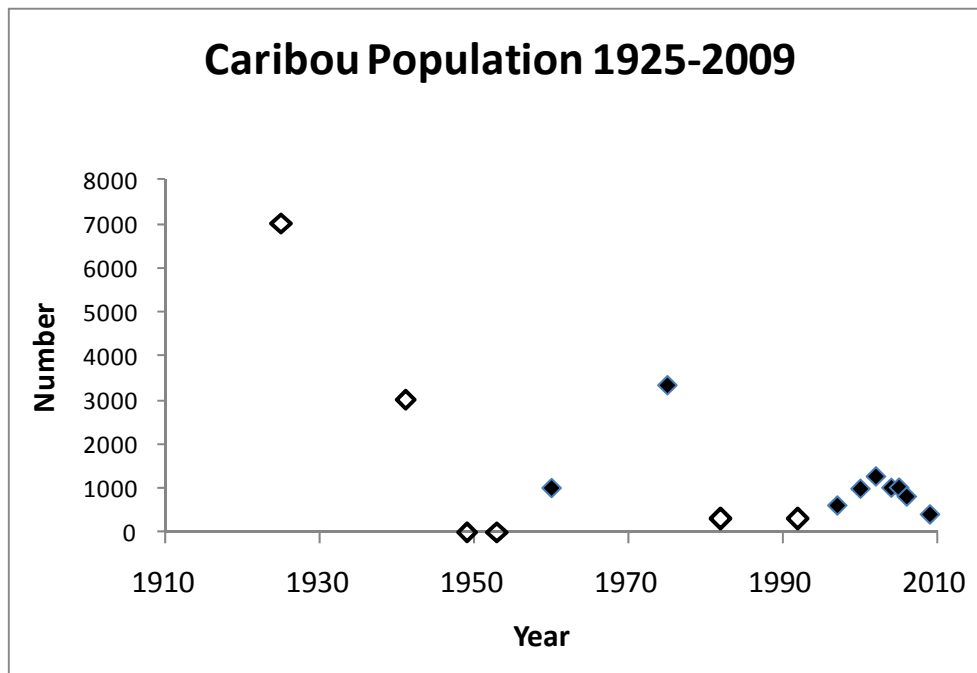


Figure 1. Caribou population counts and estimates from Unimak Island 1925-2009. Filled markers represent recorded counts from aerial surveys and open markers represent population estimates without supporting data. 1996-2009 count dates are for the calendar year of the prior breeding season even for years when the actual winter count did not occur until after January 1st of the following calendar year; thus, count dates in this EA differ from some reports (e.g., Butler 2007). See text for 1925-early 1990s sources cited in Valkenburg et al. (2003), except the 1941 marker is the local residents' minimum estimate from Beals and Longworth (1941); 1996-2009 aerial count data from Izembek National Wildlife Refuge (Butler 2007, Christine Peterson, pers. comm.).

In a separate effort, the ADF&G has conducted autumn (early to mid-October) herd composition counts on Unimak Island since 2000 (Table 1). Unlike the winter surveys, the fall composition counts do not attempt to provide a complete population count or census. The assumption in these fall counts is that the sample of animals observed is representative of herd composition such that they indicate relative proportions of the entire herd by age (calf to cow ratio), sex (bull to cow ratio), and bull size (small, medium, large; which indicates bull condition). Two indicators stand out in the herd composition data (Table 1): by the fall of 2009, the recruitment of calves into the population had fallen to 3 calves per 100 cows, which is far below the level for population stability, and the ratio of 5 bulls to 100 cows was extraordinarily low. In October 2010, the composition counts were 8 calves per 100 cows and 8 bulls per 100 cows, still well below recruitment numbers necessary to stop the population decline. Although these figures are imprecise, we assume the counts of abundance and herd composition proportion are approximately representative of actual population status across years so the estimated trends are believable.

Table 1. Caribou population survey data from Unimak Island 1996-2009.

Year	Winter Count	Comp Sample ¹	Fall Calf:Cow ¹	Fall Bull:Cow ¹	% Large Bulls ¹
1996-1997	603				
...					
1999-2000		126	46		
2000-2001	983	406	21	40	33
...					
2002-2003	1262	392	31	54	29
...					
2004-2005	1006				
2005-2006	1009	730	7	45	39
2006-2007	806				
2007-2008		433	6	31	
2008-2009		260	6	9	
2009-2010	400	221	3	5	40
2010-2011		284	8	8	37

¹Fall herd composition survey sample sizes and observed ratios of animals by age, sex, and bull size from Sellers (2001), Butler (2007, 2008), and Lem Butler (pers. comm.).

2.2 CAUSES FOR RECENT POPULATION DECLINE

Since the UCH has not been studied intensively, there is only indirect evidence to help explain why the herd declined by two-thirds during 2002-2009. The principal evidence comes from the changing population productivity and composition counts in Table 1. A direct cause for the UCH decline is reduced recruitment of calves into the population. The low bull numbers can also be explained as a by-product of multiple years with low calf recruitment. After a few years with poor recruitment into a caribou population, the remaining animals are increasingly older, on average, and the males decline before the females due to their naturally higher annual mortality rates, especially after about 5-6 years of age (Bergerud 1980, 2000). Thus, as the population declines it becomes increasingly skewed towards older individuals and females, and multiple years of poor recruitment could largely explain the rapid decline observed in the bull to cow ratio in the UCH since 2005-2007 (Table 1). The winter and fall composition counts indicate that bull numbers declined by approximately 97% from 2002 to 2009, from 680 bulls (54% of 1264 caribou) to only 20 bulls (5% of 400 caribou) in 7 years (Table 1).

Poor calf recruitment can be caused by depressed productivity (e.g., pregnancy rates), poor calf survival, or both. Cow condition, which affects pregnancy rates (especially for younger cows), and calf birth weights and survival, are influenced by habitat conditions and population density. Under current UCH conditions, with an unprecedented skew in the sex ratio, the low number of bulls, in relation to the number of cows, results in some cows remaining unmated, further depressing pregnancy rates. Pregnancy rates of cows that were 24 months of age or older

decreased from 85% in 2008 (n=113) to 68% in 2009 (n=40) (Lem Butler, pers. comm.). With decreased calf production, calf recruitment is further compromised.

Generally, however, when pregnancy rates decline in caribou populations, the principal driver is poor nutrition and it affects mostly 2-3 year-old cows (Bergerud 1980; Adams and Dale 1998a). The population fluctuations that characterize most barren-ground caribou populations are usually associated with changes in food supply and vegetation response to grazing intensity (Bergerud 1980). Valkenburg et al. (2003) reviewed evidence including natality (birth) rates and body weights of calves in the 3 caribou herds closest to the UCH, the Southern Alaska Peninsula (SAPCH), Northern Alaska Peninsula (NAPCH), and Mulchatna (MCH), and concluded that food supply and nutrition were significant limiting factors for caribou in southwestern Alaska.

“Previously, biologists have commented on the lack of lichens on the Alaska Peninsula... (Skoog 1968). We believe the primary reason for the obvious lack of lichens on the Alaska Peninsula is the virtually continuous grazing pressure to which the area has been subjected... During the recent population low in the SAPCH [in the 1990s], lichens became more noticeable than they were during and shortly after the population decline (Valkenburg et al. 2003:138-139).”

Habitat and vegetation conditions are not monitored on Unimak Island. However, body condition of cows and calves is an indirect measurement of animal nutrition, presumably correlated with habitat conditions and food supply. In 1999, Valkenburg et al. (2003) captured 12 female caribou calves on Unimak Island that averaged 123 pounds (56 kilograms), which is within an average range for 5-10 month old caribou calves in Alaska (Layne Adams, pers. comm.). In 2009, body condition indices of captured UCH animals were also consistent with good nutrition (Lem Butler, pers. comm.). Thus, the very limited evidence available from cow and calf body condition does not indicate poor nutrition as a principal cause for recent low recruitment of calves into the UCH, although it remains possible that some nutrient limitation has contributed to the poor calf survival and population decline.

Other potential sources of high caribou calf mortality since 2002 include disease, parasites, weather events, and predation. Disease and parasites have contributed to declines in caribou herds elsewhere, often interacting with poor nutrition and high densities of caribou. Valkenburg et al. (2003), for example, reported pneumonia prevalent in calves during declines of the NAPCH and Mulchatna herd, although they were not able to quantify the effects of disease on recruitment and survival. No information is available on disease or parasites in the UCH.

Data are also not available regarding patterns of weather events (e.g., icing) that may have contributed to population declines of caribou on Unimak Island. Valkenburg et al. (2003) discussed volcanic factors that likely affected the UCH: “There have been significant ash falls, however, and in April 1998, many of the caribou calves we handled in the range of the SAPCH had incisors worn to the gum line. We only observed these extremely worn incisors in one year, and these calves were still in moderately good condition. Whether this single event of extreme tooth wear in calves had an effect on mortality is unknown, but ash falls are a stochastic event that would only occasionally be of significance to the populations.” It is unlikely that the persistently high rate of calf mortality since 2005 in the UCH could have been caused primarily by stochastic weather or volcanic events, although such events could have been contributing factors.

Valkenburg et al. (2003) concluded that predation was a contributing factor for limiting Alaska Peninsula caribou populations. Predation is a factor that limits caribou herds in general, particularly in small, isolated herds (Bergerud 1980, 1988, 2000, Seip 1991, Wittmer et al. 2005, Haskell and Ballard 2007). Potential predators of caribou on Unimak Island include wolf, brown bear, wolverine (*Gulo gulo*), and Bald Eagle (*Haliaeetus leucocephalus*).

Wolves and bears were responsible for most calf mortality in a 1999 SAPCH study, but sample sizes were insufficient to determine mortality rates by predator (Sellers et al. 2003). Brown bears are opportunistic predators on caribou, in particular on neonate calves (Adams et al. 1995). Sellers et al. (2003) found that most calf mortality in the SAPCH study occurred in summer, after the neonate stage, and noted that predation by bears appeared to be well below levels found in Interior Alaska studies despite the high density of bears in the SAPCH area. The impact of predation by wolves in the SAPCH was demonstrated by marked increases in calf survival following wolf removals from calving grounds in 2008-2010. The removal of 20 adult wolves from caribou calving grounds over two years increased caribou calf survival from 1-71% (Lem Butler, pers. comm.). Wolverines can also be effective predators on caribou calves (Gustine et al. 2006), but only a single case wolverine predation was recorded in SAPCH calf mortality studies (Sellers et al. 2003). Sellers et al. (2003) also found that despite the high density of bald eagles on the calving area, they were not significant predators of calves; bald eagles were primarily scavengers.

In addition to low calf recruitment, increased bull mortality may have contributed to the low bull component in the UCH. Bull mortality within the UCH since 2000 has been high, likely due to combined effects of aging population structure (from poor recruitment), predation, and possibly hunting mortality. Depending on the harvest rate and other conditions, hunting has the potential to additively speed the loss of bulls from a caribou population (Bergerud 1974). Both Federal and State hunting seasons were closed on Unimak Island from 1993-1996. In 1997, the Federal Subsistence Board opened a Federal subsistence hunt. A study of subsistence activity by residents of False Pass, the only community on Unimak Island, found that caribou are hunted primarily on the Alaska Peninsula rather than on Unimak Island (Fall et al. 1990, 1996). Some unreported local harvest may occur, but limited access onto the island is believed to constrain UCH subsistence harvest (Bruce Dale, pers. comm.). In 2001, a state general hunt was established on Unimak Island with a one caribou harvest limit. Reported harvest since 1999 is shown in Table 2. All reported harvest was by non-local Alaska residents or by non-residents, the majority through 2 commercial guide services permitted to operate in the Refuge and required to report any caribou harvested.

While hunting can be additive to other mortality sources in caribou populations and thus affect population growth rates (Bergerud 1974, 1980; Hayes et al. 2003), the reported UCH harvest levels are low and within sustainable levels. Based on reported harvest and total population counts, both of which are minimum estimates, annual harvest averaged just over 1% of the population annually during 2000-2006 (Tables 1-2 using the five years with data on both harvest and population counts). Bergerud (1980) identified 3% per year as the generalized maximum sustainable harvest mortality for caribou populations in the presence of natural wolf and bear populations.

Table 2. Reported Unimak Island caribou harvest under Federal and State regulations 1997-2007 (data from Service and ADF&G databases, respectively).

Year	Federal Registration Permits			State Harvest Tickets		Total Reported Harvest
	Permits Issued	Bulls Harvested	Cows Harvested	Bulls Harvested	Cows Harvested	
1997	11	6				
1998	8	3				
1999						
2000	8	5				
2001	0	0	0	19	0	19
2002	4	0	0	11	1	12
2003	0	0	0	10	0	10
2004	0	0	0	15	0	15
2005	0	0	0	15	0	15
2006	1	1	0	12	1	14
2007	16	2	0	13	0	15

Another factor that could influence UCH trends is movement of animals between the island and the SAPCH. Unimak caribou are considered distinct and insular, but are connected with caribou on the Alaska Peninsula. Isanotski Strait, a ½ mile (0.8 kilometer) ocean passage that has strong tidal currents, separates Unimak Island from the Alaska Peninsula, yet caribou crossings have been reported (Beals and Longworth 1941, Skoog 1968, Sellers 1999, Valkenburg et al. 2003). Genetic sampling supports the understanding that the UCH has high fidelity to calving grounds and limited movements of animals to and from the peninsula. In a study to determine the genetic relationship among North American caribou herds, Zittlau (2004) found the UCH to be most closely related to herds on the Alaska Peninsula, but quite distinct from all other herds. Zittlau's (2004) findings are consistent with the hypothesis that Unimak caribou derived from the SAPCH, but were subsequently isolated (Sandy Talbot, pers. comm.) and thus immigration has not been a routine component of UCH population dynamics.

In summary, there are only indirect indicators for what caused the decline and current status of the UCH. Causes of caribou population changes can vary markedly over time and between regions and herds (Keech and Valkenburg 2007). While multiple factors may have contributed to the recent UCH decline, the immediate cause was poor calf recruitment.

CHAPTER 3 – ALTERNATIVES

3.1 INTRODUCTION

3.1.1 Introduction to Alternatives

The alternatives described in detail in this EA, and analyzed for their impacts (i.e., natural environment, subsistence use, other public use, and wilderness character) represent three alternatives identified as being reasonable for achieving the purpose and need for the ADF&G's predator control proposal and a No Action alternative. The four alternatives are: (A) a No Action alternative without predator control; (B) the ADF&G's proposed action to use helicopters to selectively shoot wolves while airborne that are preying on caribou calves; (C) an adaptation of the proposed action to use fixed-wing aircraft with marksman or ground-based teams dropped off by helicopter to selectively shoot wolves preying on caribou calves; and, (D) an alternative to use ground-based teams to shoot wolves in the area of the calving grounds, supported by reconnaissance airplanes. All predator control alternatives include the translocation of bulls from the Southern Alaska Peninsula caribou herd to Unimak Island to increase pregnancy rates among cows in the UCH. All four alternatives encompass ongoing monitoring and research activities in support of adaptive management. In addition to the four alternatives considered in detail, five other alternatives considered but not analyzed in detail are described along with rationale for their rejection. See Figure 2 for map of project area.

3.1.2 Rationale behind selection of alternatives

Predation on calves is believed to be a major factor in the decline of the UCH and the high probability of long-term low density or loss of caribou from Unimak Island, based on knowledge of caribou-predator relationships in general and particularly recent data from the nearby SAPCH. Other than harvest regulations, few management actions other than predator control are available that are feasible and have the capacity to directly influence caribou herd numbers in the short term. When caribou populations are at risk of local extirpation or chronic decline, predator control is an effective and efficient management tool (e.g., Wittmer et al. 2005). While other factors, such as habitat conditions, may be contributing to the UCH decline, manipulation of those factors to increase caribou recruitment would be unfeasible in the short term. Predator control should markedly reduce the probability that the herd may be lost and also reduce the time until it increases in size such that subsistence uses are possible again.

The rationale for supplementing the UCH with bulls from the SAPCH is to increase pregnancy and births rates in the herd much more quickly than would occur with natural recruitment of young bulls into the herd following predator control. Moving bulls into the UCH would not be sufficient to prevent population decline if predation on calves remains high and has effectively stopped all natural recruitment.

Limiting predator management to wolves that are killing calves in the calving grounds has multiple advantages over more intensive and broad-scale predator control strategies that could be applied to all of Unimak Island or to bears in addition to wolves. Wolves live in packs and hunt within mutually exclusive territories, from which they aggressively exclude other wolves. Individual wolf packs also develop consistent predation patterns, including preferred prey targets (Mech and Peterson 2003). Thus, any wolves killing calves in a calving ground are most likely from a territorial pack with an established pattern of calf predation. Removing those wolves immediately reduces predation on calves. While other wolves will likely recolonize the territory

within 1-2 years, and wolf abundance will likely completely recover from any reductions within 3 years, the caribou population temporarily experiences a release from high calf mortality (Wittmer et al. 2005). The goal of targeted wolf removal is to ‘jump start’ calf recruitment in the UCH as efficiently as possible.

Selective removal of individual wolves is a well-established technique in livestock depredation management in the Lower 48 (Ruid et al. 2009). Harper et al. (2008) reviewed the success of this approach in reducing depredation while minimizing wolf removals. A more direct parallel to UCH conditions is the recent control of wolves in the SAPCH calving grounds. In 2008, 2009, and 2010 the ADF&G killed 28, 6, and 2 wolves, respectively, after which calf recruitment increased from less than 1 to 39, 43, and 47 calves per 100 cows in the 3 wolf control years (Table 3; Butler pers. comm.). This dramatic improvement in calf to cow ratio observed in the SAPCH demonstrates that caribou calf survival can be influenced by the removal of a relatively small number of wolves (relative to total numbers within a caribou herd’s full range) from a limited area if key animals are removed during critical periods for calf survival, provided that the caribou aggregate in the control area.

Table 3. Results of targeted wolf control on calf recruitment on Southern Alaska Peninsula. Removals were 28, 6 and 2 wolves killed in the calving grounds, during calving season 2008, 2009 and 2010 (data from Lem Butler, pers. comm.).

	Pre-Wolf Removal	During Wolf Removal		
	2007	2008	2009	2010
Calf survival to one month of age	< 1%	57%	71%	63%
Fall calves:100 cows	< 1	39	43	47

3.2 ALTERNATIVES CONSIDERED IN DETAIL

3.2.1 Alternative A – No Action (No Predator Control)

Under this alternative, the Service and the ADF&G would continue to monitor Unimak Island large mammal populations, particularly caribou, using standard monitoring techniques such as population counts, age and sex composition estimates, birth rates, and calf survival surveys, through the use of radio telemetry collars. There would be no predator management actions directed at increasing UCH numbers, other than by means of harvest regulations established by the State and Federal regulatory boards. In addition, radio collars will be maintained on up to 25 female caribou to aid in locating caribou groups, improving survey results, and evaluating the importance of nutritional limitations in regulating population growth. Nutritional limitations would continue to be evaluated using information obtained from the UCH on body condition, weight, blood samples, and herd health.

The information from monitoring large mammal populations will be used by the ADF&G and the Service to advise the Federal Subsistence Board, the Alaska Board of Game and the public on harvest regulatory actions necessary to maintain sustainable populations of caribou, wolves, and bears. Current ADF&G objectives for Unimak Island are to maintain a wolf population of 8-

15 wolves with at least 2 breeding pairs and a caribou population of 1,000 caribou. The brown bear population objective is to maintain a high-density population with a sex and age structure that will sustain a harvest composed of 60% males (Bruce Dale, pers. comm.).

The Service will conduct research designed to add scientific information for making better decisions on the long-term management of the UCH and its habitat. By fitting 15 caribou with GIS/VHS ARGOS radio collars and using low level aerial photography and satellite imagery, the Service is planning to conduct studies to determine areas of Unimak Island used by the herd for forage, the quantity and quality of available forage, and estimates of Unimak Island’s carrying capacity for the herd. The Service will also conduct an inventory of flora and fauna to develop baseline information on the diverse array of plant and animal species occurring on Unimak Island. This information will be used to identify species at risk due to human use, climate change or other factors, and target them for further research and possible management action (Nancy Hoffman and Chris Peterson, pers. comm.).

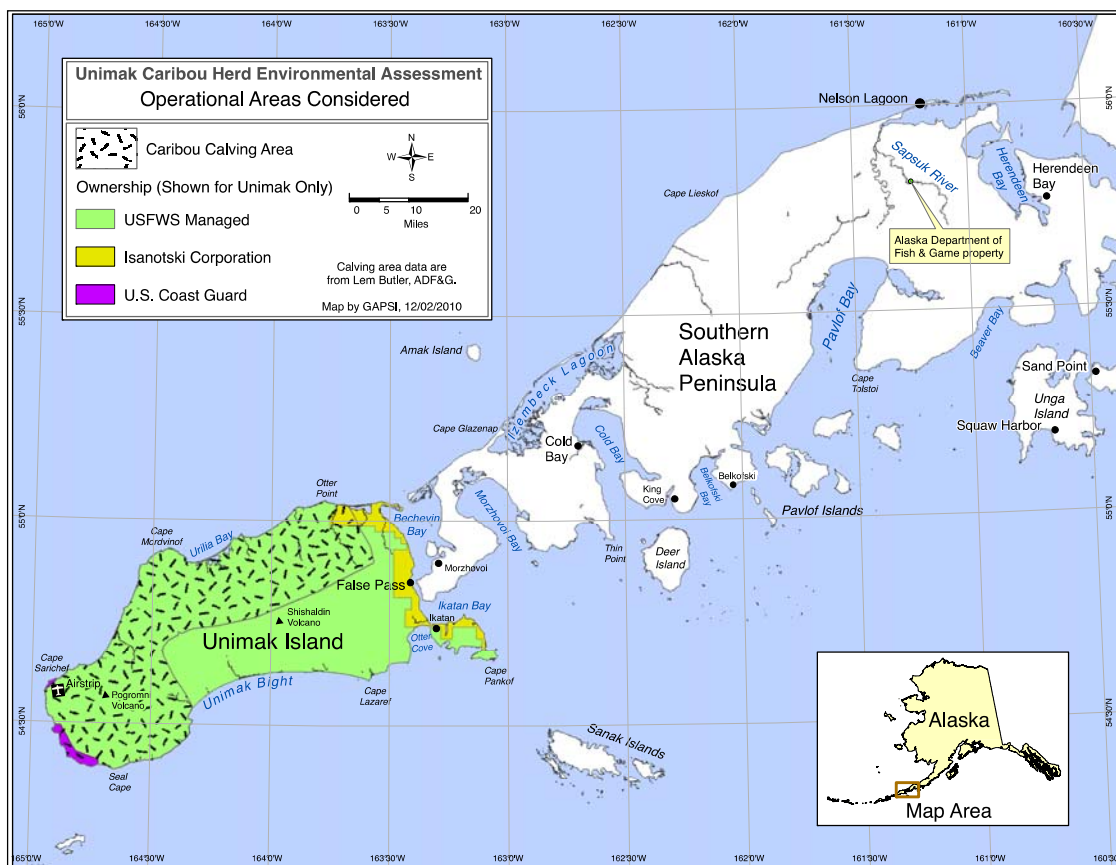


Figure 2. Proposed Action Operational Area

3.2.2 Alternative B – Selective Predator Management on the Calving Grounds and Calf Mortality Study with Helicopter Support (ADF&G Proposed Action)

In addition to the ongoing management and research activities in Alternative A, the No Action alternative, the ADF&G would conduct a wolf management action by shooting wolves from a helicopter, when the wolves are found on the calving grounds following calf predation events during the peak calving period. The calving grounds are almost entirely within the control area described in the Alaska Board of Game regulation that established the Unimak Wolf

Management Area (see Appendix C). The control area includes all lands on Unimak Island that are west of the 164 degree West longitude, which is approximately 57% of the Unimak Wolf Management Area that encompasses all of Unimak Island (Figure 2). Aerial reconnaissance, aided by female caribou with radio collars deployed to assist in monitoring pregnancy rates and annual herd composition surveys, would be the primary means for assessing calving activity.

This predator control action would be supported by a caribou calf mortality study conducted concurrently to identify individual wolves responsible for killing calves in the calving areas using radio telemetry equipment, fixed-winged aircraft, and a helicopter. The project team would be composed of 4 pilots and 2-3 biologists. The crew would be based in Cold Bay, Alaska, for the duration of the 3-week project. The project would begin in late May and conclude by June 20th. Each day 2-3 fixed-wing aircraft (Aviat Husky, Piper PA-18 Super Cub, Bellanca 8GCBC Scout, or similar aircraft) flying at low altitudes would search for caribou calves less than 2 days of age. Upon locating a calf, the helicopter (Robinson R44) capture team (pilot and biologist) would land and hand-capture each calf and fit it with a VHF radio collar. Processing time for each calf is expected to last 30-60 seconds from the time the biologist exits the aircraft to the time the biologist is in the helicopter departing the capture site. This fast handling results in low abandonment rates (less than 1% based on the capture of 250 caribou calves from other herds). Calf capture efforts would continue through the duration of calving (approximately 4 weeks with most calves born within 2 weeks; Adams and Dale 1998b) with up to 50 calves captured during this period.

Following collar deployment, the calves would be monitored daily for mortality. Upon locating a dead calf, the helicopter team would visit the mortality site to determine cause of death. Bear caused mortalities would be recorded and used to determine future predator management and research needs. Wolf caused mortalities would be used to pattern the activities of wolves killing calves in calving areas. Intensive aerial search efforts would be conducted to identify the wolf or wolves responsible for the mortalities. Aircraft flying at low levels would conduct the primary search for wolves. After a wolf thought to be killing calves is located, the helicopter team would kill it with a shotgun. After a wolf is killed, the helicopter team would land to collect biological samples and inspect the reproductive condition of each wolf. If a lactating female were killed, dens would be located, if possible, and orphaned pups would be euthanized in the den using CO gas. Using a helicopter for access to calving grounds and as a platform for locating and shooting wolves is the most effective and efficient means for successful identification and removal of calf-killing wolves.

After the initial treatment year of this alternative in 2011, selective removal of wolves on Unimak Island will occur only as needed but no later than the year 2020. Initial success of this proposed action would be achieved when the herd stops declining (fall calf:cow ratio above 20:100) and the bull to cow ratio stays above 10:100. In order to resume subsistence hunting, the UCH should demonstrate at least increasing numbers, improved bull to cow ratio, and/or improved calf survivorship (see Appendix C). The control effort would not likely continue for more than 2 years without indications of success within that period (Bruce Dale, pers. comm.).

Continuing this alternative beyond 2 years would depend on the Service reaffirming that wolf control remains necessary to achieve Refuge purposes for conserving caribou on Unimak Island and for providing hunting opportunities to Federally-qualified subsistence users. The ADF&G's population objectives for the UCH (1,000 caribou) and wolves (8-15 wolves with at least 2 breeding pairs) on Unimak Island are the same as found in Alternative A, the No Action

alternative. During the control action, the ADF&G will monitor the wolf population outside the UCH calving grounds to ensure its population objectives will be met.

This alternative also includes supplementing bulls to the UCH from the SAPCH to increase pregnancy rates. This part of the alternative is common to Alternatives C and D and is described below in Subsection 3.2.5.

3.2.3 Alternative C– Selective Predator Management on the Calving Grounds Using Either Fixed-wing Aircraft with Marksmen or Ground-based Teams Deployed by Helicopters to Take Wolves and Calf Mortality Study with Helicopter Support

In addition to the ongoing management and research activities in Alternative A, the No Action alternative, wolf management actions would be conducted by shooting wolves from a fixed-wing aircraft, and/or from ground-based teams deployed from helicopters when wolves are found on the calving grounds following calf predation events, during the calving period. The calving grounds are almost entirely within the control area described in the Alaska Board of Game regulation that established the Unimak Wolf Management Area (see Appendix C). The control area includes all lands on Unimak Island that are west of the 164 degree West longitude, which is approximately 57% of the Unimak Wolf Management Area that encompasses all of Unimak Island (Figure 2). Aerial reconnaissance, aided by female caribou with radio collars deployed to assist in monitoring pregnancy rates and annual herd composition surveys, would be the primary means for assessing calving activity.

This predator control action will be supported by a caribou calf mortality study conducted concurrently to identify individual wolves responsible for killing calves in the calving areas using radio telemetry equipment, fixed-winged aircraft, and a helicopter. The project team would be composed of 4 pilots and 2-3 biologists. This need may increase as selection of this alternative may necessitate a longer on-the-ground commitment to attain the ADF&G's goals, as identified in Alternative B (ADF&G Proposed Action).

The crew would be based in Cold Bay, Alaska, for the duration of the three-week project. The project would begin in late May and conclude by June 20th. Each day 2-3 fixed-wing aircraft (Aviat Husky, Piper PA-18 Super Cub, Bellanca 8GCBC Scout, or similar aircraft) flying at low altitudes would search for caribou calves less than 2 days of age. Upon locating a calf, the helicopter (Robinson R44) capture team (pilot and biologist) would land and hand-capture each calf and fit it with a VHF radio collar. Processing time for each calf is expected to last 30-60 seconds from the time the biologist exits the aircraft to the time the biologist is in the helicopter departing the capture site. This fast handling results in low abandonment rates (less than 1% based on the capture of 250 caribou calves from other herds). Calf capture efforts would continue through the duration of calving (approximately 4 weeks with most calves being born within 2 weeks; Adams and Dale 1998b) with up to 50 calves captured during this period.

Following collar deployment, the calves would be monitored daily for mortality. Upon locating a dead calf, the helicopter team would visit the mortality site to determine cause of death. Bear-caused mortalities would be recorded and used to determine future predator management and research needs. Wolf-caused mortalities would be used to pattern the activities of wolves killing calves in calving areas. Intensive low-altitude aerial search efforts by helicopter and fixed-wing aircraft would be conducted to identify the wolf or wolves responsible for the mortalities. After the wolf or wolves are located, a fixed-wing aircraft with a gunner/spotter would be directed to

kill the animal(s) with a shotgun, or the animals would be shot with rifles by staff on the ground deployed from a helicopter. After a wolf is killed, the helicopter team would land to collect biological samples and inspect the reproductive condition of each wolf. If a lactating female was killed, dens would be located, if possible, and orphaned pups would be euthanized in the den using CO gas. The use of a fixed-wing aircraft, instead of a helicopter as a shooting platform for wolves, could potentially reduce the efficiency and effectiveness due to the variable and unpredictable Unimak Island weather conditions, i.e., low clouds and high winds could limit available flying time using fixed-wing aircraft.

After the initial treatment year of this alternative in 2011, selective removal of wolves on Unimak Island will occur only as needed, but no later than the year 2020. Initial success of this proposed action would be achieved when the herd stops declining (fall calf:cow ratio above 20:100) and the bull to cow ratio stays above 10:100. However, in order to resume subsistence hunting, the bull to cow ratio would need to be at or above 35:100 (see Appendix C). The control effort would not likely continue for more than 2 years without indications of success within that period (Bruce Dale, pers. comm.).

Continuing this alternative beyond 2 years would depend on the Service reaffirming that wolf control remains necessary to achieve Refuge purposes for conserving caribou on Unimak Island and for providing hunting opportunities to Federally-qualified subsistence users. The population objectives for the UCH (1,000 caribou) and wolves (8-15 wolves with at least 2 breeding pairs) on Unimak Island are the same as found in Alternative A, the No Action alternative. During the control action, the wolf population outside the UCH calving ground would be monitored to ensure its population objectives will be met.

This alternative also includes supplementing bulls to the UCH from the SAPCH to increase pregnancy rates. This part of the alternative is common to Alternatives B and D and is described below in Subsection 3.2.5.

3.2.4 Alternative D – Selective Predator Management on the Calving Grounds Using Ground-based Teams

In addition to the ongoing management and research activities in Alternative A, the No Action alternative, ground-based teams would be used to shoot wolves in the area of the calving grounds. The teams consist of 2 pilots and 8 field staff. A base camp would be established on Unimak Island at False Pass or Cape Sarichef. Fixed-wing aircraft (Aviat Husky, Piper PA-18 Super Cub, Bellanca 8GCBC Scout, or similar aircraft) would be used to distribute hunters working in 2-person teams throughout the range of the UCH calving grounds. The calving grounds are almost entirely within the control area described in the Alaska Board of Game regulation that established the Unimak Wolf Management Area (see Appendix C). The control area includes all lands on Unimak Island that are west of the 164 degree West longitude, which is approximately 57% of the Unimak Wolf Management Area that encompasses all of Unimak Island (Figure 2). Aerial reconnaissance, aided by female caribou with radio collars used to monitor pregnancy rates and annual herd composition surveys, would be the primary means for pinpointing calving activity. Low-altitude reconnaissance flights would be flown each day to locate wolves and to search for wolf den sites. The pilots would assist the ground teams by providing logistical support, supplies, and information regarding wolf activities. Four ground-based teams would be assigned areas to search for wolves near caribou and would be deployed in the field for 7 weeks from May 1st to June 20th. Each team would be equipped with rifles,

shotguns, air-to-ground radios, binoculars, spotting scopes, and field camp provisions. Teams would select field camp locations that provide a strategic vantage point to locate wolves and access to their assigned search area. Once located, the team would move into position by foot or with the assistance of aircraft, and attempt to kill the wolf or wolves. If areas with repeated wolf activity can be identified (den site, mammal carcass, or natural travel corridor), the team would relocate their camp to that area and focus activities there.

After the initial treatment year of this alternative in 2011, selective removal of wolves on Unimak Island will occur only as needed, but no later than the year 2020. Initial success of this proposed action would be achieved when the herd stops declining (fall calf:cow ratio above 20:100) and the bull to cow ratio stays above 10:100. However, in order to resume subsistence hunting, the bull to cow ratio would need to be at or above 35:100 (see Appendix C).

Without the support of a helicopter, this alternative would be less efficient and less discriminating than Alternative B in locating and killing wolves responsible for preying on calves. As a result, it would likely take more years of predator control to achieve success in restoring the UCH to sustainable levels for subsistence hunting. It is unlikely the control effort will continue for more than 3 years without success in the first 3 years (Bruce Dale, pers. comm.).

Continuing this alternative beyond three years would depend on the Service reaffirming that wolf control remains necessary to achieve Refuge purposes for conserving caribou and wolves on Unimak Island and for providing hunting opportunities to Federally-qualified subsistence users. The ADF&G's population objectives for the UCH (1,000 caribou) and wolves (8-15 wolves with at least 2 breeding pairs) on Unimak Island are the same as found in Alternative A, the No Action alternative. During the control action, the ADF&G will monitor the wolf population outside the UCH calving grounds to ensure its population objectives are being met.

This alternative also includes supplementing bulls to the UCH from the SAPCH to increase pregnancy rates. This part of the alternative is common to Alternatives B and C and is described below in Subsection 3.2.5.

3.2.5 Actions Common to Alternatives B, C, and D – Supplement Unimak Caribou Herd with Bulls from the Southern Alaska Peninsula Herd

The ADF&G would supplement the UCH with 20, 1-2 year-old bull caribou transferred from the SAPCH with the intent to impregnate all available cows. The transfer would occur in August and involve 3 pilots, 1 veterinarian (pending availability), and 2 biologists. Field operations would be based out of the ADF&G's cabin on the Sapsuk River (see Figure 2). During each transfer event, caribou groups would be located using a spotter plane (Piper PA-18 Super Cub) flying at low altitude. Selected bulls would be immobilized by darting them from a Robinson R44 helicopter and then airlifted via sling, one caribou at a time, to an adjacent runway. Veterinary staff and experienced animal handlers would keep the animals in an immobilized state and continually monitor their condition until they arrive on Unimak Island. The bulls would be immobilized using a standard caribou immobilization drug combination. Administering standard reversal drugs would reverse this immobilization. During transit the bulls would be administered additional Xylazine as required to maintain sedation. The bulls would be fitted with VHF radio collars and transported in a DeHavilland Beaver from a runway on the mainland to a runway near Cape Sarichef on Unimak Island, where the immobilization would be reversed and the bulls

would be released. The project would last 3 days (4 caribou per flight, 2 flights per day, total of 20 transferred bulls) barring unforeseen delays, such as weather.

The ADF&G would verify pregnancy rates in the UCH of animals 2 years old or older. If pregnancy rates remain less than 75%, additional bulls would be transferred in future years as needed to maintain a minimum bull to cow ratio of 10 bulls:100 cows. While this action alone may improve pregnancy and birth rates, it will have little effect on improving calf survival and recruitment into the herd without controlling predator numbers (Lem Butler, pers. comm.).

3.2.6. Adaptive Management Considerations Common to All Alternatives

The management and research actions associated with these alternatives, including the No Action alternative, would provide significant new information upon which to base future decisions regarding the conservation of the UCH. Given the current state of the UCH, both the Service and the ADF&G are committed to closely monitor the herd and to review annually what has been learned the previous year in order to consider any appropriate changes in management actions by both agencies.

3.3 SUMMARY TABLE OF ALTERNATIVES CONSIDERED IN DETAIL

Table 4. Comparison of Alternatives

	ALTERNATIVE A NO ACTION	ALTERNATIVE B HELICOPTER WOLF CONTROL	ALTERNATIVE C FIXED-WING AND GROUND BASED WOLF CONTROL	ALTERNATIVE D GROUND BASED WOLF CONTROL
Surveys	Caribou population counts Caribou composition survey Tundra Swan Survey Stream/Brown bear Surveys	Same as Alternative A	Same as Alternative A	Same as Alternative A
Radio Collars	Adult caribou--25 collars for survey work (ADFG ¹) Adult caribou--15 collars for vegetation nutrition study (USFWS ²)	Same as Alternative A plus: Caribou calves--Up to 50 collars for mortality study	Same as Alternative A	Same as Alternative A
Vegetation/Caribou Nutrition Study	Study to determine range requirements and carrying capacity for caribou	Same as Alternative A	Same as Alternative A	Same as Alternative A
Species Inventory	Evaluate species ecology of the island flora and fauna	Same as Alternative A	Same as Alternative A	Same as Alternative A
Caribou Calf Mortality Study	No	Study to determine calf mortality due to predation and other causes during calving period	Same as Alternative B	No
Selective Wolf Control	No	Selectively shoot wolves believed to be directly associated with discovered calf mortality from helicopters	Selectively shoot wolves believed to be directly associated with discovered calf mortality by shooters on ground deployed from helicopters or shoot from fixed-wing aircraft	Shoot wolves found in the general area of the calving grounds
Bull Supplementation	No	Supplement UCH with up to 20 1-2 yr old bulls from the SAPCH	Same as Alternative B	Same as Alternative B
Period of Operation	Annual survey missions: ongoing Vegetation/Nutrition Study: 2yrs Species Inventory Project: 2 yrs	Wolf Control: 2-10 years Bull Supplementation: 1- 3 yrs	Same as Alternative B	Wolf control: 3-10 years Bull Supplementation: Same as Alternative B

¹ Alaska Department of Fish and Game

² U.S. Fish and Wildlife Service

	ALTERNATIVE A NO ACTION	ALTERNATIVE B HELICOPTER WOLF CONTROL	ALTERNATIVE C FIXE120D-WING AND GROUND BASED WOLF CONTROL	ALTERNATIVE D GOUND BASED WOLF CONTROL
Aircraft Support ³	ADFG: Helicopter --30 hrs/yr Fixed-wing--60 hrs/yr USFWS: Helicopter --5 hrs/yr. Fixed-wing--35 hrs/yr	Same as Alternative A plus: Wolf control: Helicopter--100 hrs/season Fixed-wing--200 hrs/season Bull supplementation: Fixed-wing-- 80 hrs/season	Same as Alternative A plus: Wolf control: Helicopter--to be determined Fixed-wing--to be determined Bull supplementation: Same as Alternative B	Same as Alternative A plus: Wolf control: Fixed-wing--200 hrs/season Bull supplementation: Same as Alternative B
Staffing/hours in the field ⁴	ADFG Surveys: 3 pilots--30hrs/yr 1 biologists--30hrs/yr USFWS Vegetation and Nutrition Study: Pilots--40 hrs/field season 3 Biologists--480 hrs/field season on the ground Inventory Study: Pilots-- 10hrs/field season 2 Biologists--1000 hrs/field season on the ground	Wolf control/calf study: 4 pilots--100 hrs/season 2 biologists--100 hrs/season Bull supplementation: 3 pilots--40 hrs/season 2 biologists--40 hrs/season 1 veterinarian--40 hrs/season	Wolf control/calf study: 4 pilots--100 hrs/season 2 biologists--100 hrs/season Bull supplementation: 3 pilots--40 hrs/season 2 biologists--40 hrs/season 1 veterinarian--40 hrs/season	Wolf control: 2 pilots--100 hrs/season 8 field staff--2000 hrs/season Bull supplementation: 3 pilots--40 hrs/season 2 biologists--40 hrs/season 1 veterinarian--40 hrs/season
Field Camps	Three: one located in each third of the island on the long axis (USFWS)	Same as Alternative A	Same as Alternative A	Same as Alternative A plus: One base camp 4 spike camps
Cooperating Agencies	USFWS/ADFG	Same as Alternative A	Same as Alternative A	Same as Alternative A

³ Estimated hours

⁴ Estimated hours

3.4 ALTERNATIVES CONSIDERED BUT DISMISSED WITH RATIONALE

3.4.1 Capture and Relocate Wolves to Other Locations in Alaska: Zoos or Research Centers

This action would involve capturing and moving wolves, either to captivity or to other parts of Alaska. It was not analyzed because currently there is no known demand for wolves by zoos or by approved conservation research centers. Since Unimak Island is a rabies enzootic area (i.e., naturally present in the area), wolves captured for removal to other wild habitats would need to be relocated to rabies enzootic areas. Currently no areas in Alaska meet this criterion and have unoccupied habitat to absorb transferred wolves, so this alternative was dismissed.

3.4.2 Immunocontraception and Surgical Sterilization of Wolves to Prevent Pregnancy

This action would involve capturing and treating at least 2 dominant adult pairs of wolves to prevent pregnancy. Subordinate wolves in the pack would be captured and euthanized. The goal would be smaller pack sizes to reduce predation on caribou, although the dominant wolves would remain in their territories and presumably would continue killing caribou calves. The number of wolves expected to be killed may or may not be less than with the proposed alternative of selective removal, but multiple wolves would still be killed with less benefit to calf survival. This alternative was dismissed because it would be substantially less efficient and less effective than the proposed alternative.

3.4.3 Predator Management of Wolves on a Broad Scale

This action would kill wolves across Unimak Island, using both a helicopter and fixed-wing aircraft during winter months with a goal to remove more than 80% of the wolf population. In a review of predator management techniques, the National Research Council (1997) concluded that wolf reduction was most likely to succeed if wolf numbers are seriously reduced below 55% for 4 or more years over a broad area (e.g., 4,000 mi²/10,360 km² or larger), because wolves have high natural mortality and reproduction rates, and human-caused mortality is largely compensatory with natural mortality. These conclusions were based on a review of broad-scale predator management programs intended to increase “harvestable surplus” of ungulates (i.e., Boertje et al. 2010).

This alternative was dismissed because many more wolves would be killed over a larger area with less certainty of immediately reducing calf predation, compared with the selective removal of documented calf-killing wolves in calving grounds. Broadscale wolf removal could also have the unintended effect of eliminating all wolves from Unimak Island because the population is relatively small to begin with (likely less than 30 animals). While the wolf population on Unimak Island was not generally believed to be connected to adjoining populations on the Alaska Peninsula, a radio collared wolf was reported migrating from the mainland to Unimak Island in 2010 (Lem Butler, pers. comm.).

3.4.4 Predator Management of Brown Bears

This alternative would involve shooting brown bears when they are moving through the caribou calving area during calving. Because of their large size, and the prohibitive costs of aircraft and other equipment necessary for translocation operations in remote locations, bears could not be

removed nonlethally. As brown bears move through calving grounds they kill caribou calves opportunistically. There is little evidence in this region of Alaska that individual bears deliberately seek out or specialize in killing caribou calves (Lem Butler, pers. comm.). Thus, targeted removal of bears seen on the calving grounds does not confirm that these bears are actually killing calves.

Bear removal would involve more animals than would wolf removal, because numerous bears may cross through the calving ground during calving, while wolves in calving areas will be limited to territorial pack members and can be confirmed as calf-killing. Further, bear removal will have less per-removal effects because of the chance that some removed bears were not killing caribou calves. Also, for caribou calves, killing rates per bear are well below killing rates per wolf on an island-wide basis. While calf mortality is attributable to both wolves and bear (in the SAPCH, the documented mortality was somewhat greater for wolves than bears, but conclusions are limited by small sample size; Sellers et al. 2003), bears outnumber wolves by 10:1 on Unimak Island (i.e., 300 vs. no more than 30) so per predator, wolves have far more impact on caribou mortality than do bears.

In summary, while removing bears would likely increase caribou calf recruitment, this alternative would be less efficient than wolf removal (more animals removed yet less impact on calf mortality). Experimental wolf removals have demonstrated that removal of wolves alone, without removing bears, can effectively reduce calf mortality rates even where both predators are common (Hayes et al. 2003; Butler 2008).

3.4.5 Predator Management of Wolves Using Airplanes but No Helicopter

This action is similar to Alternatives B and C, except that calves would not be collared or monitored to target specific wolves associated with killing calves. In addition, helicopters would not be used at all in this alternative. This reduces the probability of removing specific wolves that are killing calves. Wolves found generally in the calving grounds would be shot from airplanes with a shotgun, which lowers the probability of successful kills compared with using a helicopter as the shooting platform and limits the ability to take biological samples when a suitable landing site is not available. Without monitoring calf kills, wolves would be removed whether or not they were actually killing calves, thus likely having less effect on calf survival or requiring more treatments over a longer period of time to meet management objectives compared with calf-collaring and selective wolf removal. This alternative is dismissed as less feasible and effective than using helicopters to capture and collar calves and to identify and target wolves that are killing calves.

3.4.6 Supplement Caribou Bulls on Unimak Island Without Predator Control

Translocation of bulls to the UCH would immediately improve the bull to cow ratio and should increase pregnancy rates and calving synchrony while those bulls are alive (about 3-4 years post-relocation as 1-2 year-olds), while averting potential loss of all bulls from Unimak Island in the near term. However, if calf recruitment remains extremely low due to predation, the population will continue to decline and the sex ratio will 'skew' again within a few years. Thus, without predator control, bull translocation from the SAPCH would need to be repeated until some other limiting factors change (e.g., decline in wolves) to allow recruitment to recover. Because of this transient effectiveness, the ADF&G has dismissed bull translocation as an alternative absent

predator control. However, bull translocation is included as a component of predator control alternatives B, C, and D.

CHAPTER 4 – AFFECTED ENVIRONMENT

4.1 INTRODUCTION

Unimak Island is the easternmost island of the Aleutian Islands located 700 miles (1,127 kilometers) southwest of Anchorage just off the tip of the Alaska Peninsula (Figure 3), and is the only island among the Aleutians with natural populations of caribou, brown bear, and wolf. Ninety-three percent of the 1,572 square miles (4,071 square kilometers) of Unimak Island is within the Alaska Maritime National Wildlife Refuge (Refuge) and is managed by the Izembek National Wildlife Refuge out of its headquarters in Cold Bay, Alaska. Ninety-eight percent of the Refuge is congressionally designated wilderness (John Brewer, pers. comm.). The village of False Pass, with a population of 54 people (Alaska Census Data 2008), is the only permanent village on Unimak Island, located across from the mainland on Isonotski Strait.

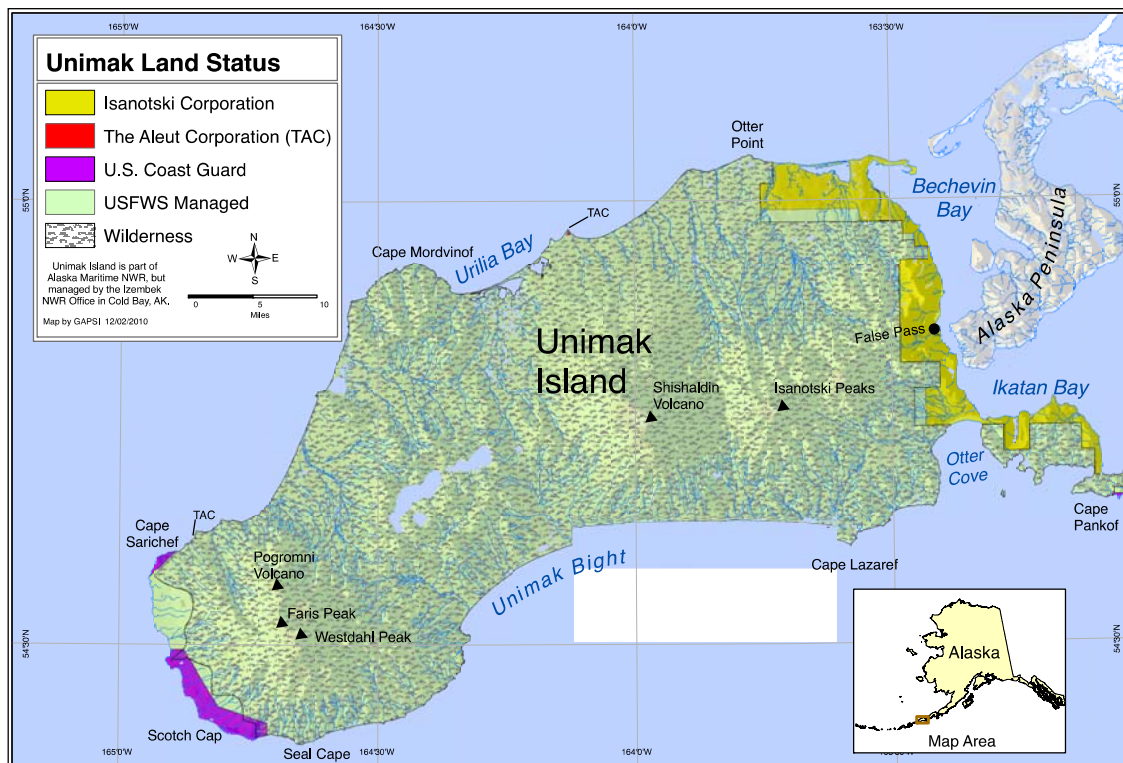


Figure 3. Map of Unimak Island.

4.2 AFFECTED ENVIRONMENT

4.2.1 Physical Description and Climate

Unimak Island is separated from the Alaska Peninsula by Isonotski Strait. At its narrowest point, near the Village of False Pass, Isonotski Strait is less than ½ miles (0.8 kilometers) wide and shallow. In contrast, Unimak Pass, which separates the Unimak Island from the remainder of the Aleutians, is up to 30 miles (48 kilometers) wide. The central portion of Unimak Island is dominated by several volcanoes, including the 9,372 feet (2,857 meters) elevation Shishaldin Volcano, which is a designated National Natural Landmark and one of the 10 most active volcanoes in the world. The Bearing Sea lowland on the north side of the island consists of a gently sloping plain rising gradually from the sea. It is continuous on the north side, ranging

from 5-12 miles (8-19 kilometers) in width and is characterized by a dense growth of vegetation, many hills and numerous lakes, streams, and marshes. A small part of the coastline is quite rugged and mountainous (Sekora 1971).

Unimak Island has a maritime climate with frequent cyclonic storms crossing the Pacific Ocean and Bering Sea. This accounts for the common occurrences of high winds, low clouds, and fog. Temperatures are cold, but not usually severe, due principally to the moderating effect of warm water transported into the area by the Japanese Current. Mean annual temperature is about 38 degrees Fahrenheit (3 degrees Celsius) and the mean annual maximum and minimum temperatures differ less than 10 degrees Fahrenheit (about 6 degrees Celsius). Temperature extremes range from 70 degrees to -10 degrees Fahrenheit (21 to -23 Celsius), but below zero temperatures are rare. Winter lasts 6-9 months and frost can be expected every month except July and August. Total precipitation averages 30-35 inches (76-89 centimeters) annually and is fairly evenly distributed throughout the year. Snowfall is low, averaging 40-45 inches (101-114 centimeters) but often accumulates to considerable depths in drifts. Sky cover averages 80% year round, with fog occurring mostly during the spring and summer months. Winds of high velocities are quite common with the average about 20 miles per hour (32 kilometers per hour). Maximums of over 100 miles per hour (161 kilometers per hour) have been recorded at Cape Sarichef. Winter winds are frequently from the northwest and prevailing summer winds are from the south-southeast. Winds of gale force may come from any direction any time of the year (Sekora 1971).

4.2.2 Biological Resources

This section briefly describes only those biological resources of Unimak Island that are important to describing the impacts to the natural environment by the alternatives under consideration.

4.2.2.1 Terrestrial Vegetation

There are no published studies of the vegetation on Unimak Island. However, the vegetation of Unimak Island may be predicted from the known vegetation of Unalaska Island (Talbot et al. 2010), 100 miles (161 kilometers) to the west and from the Izembek National Wildlife Refuge bordering Unimak a few miles to the east. The major community types to be expected on Unimak Island are (1) dry coastal meadows, including seaside sandplant (*Honckenya peploides*) and American dunegrass (*Leymus mollis*); (2) mesic meadows, with common ladyfern (*Athyrium filix-femina*), Kamchatka aconite (*Aconitum maximum*), Pacific reedgrass (*Calamagrostis nutkaensis*), subalpine fleabane (*Erigeron peregrinus*), and Queen's veil maiden fern (*Thelypteris quelpaertensis*); (3) wet snowbed meadow, with black alpine sedge (*Carex nigricans*); (4) heaths with "twinflower (*Linnaea borealis*), crowberry (*Empetrum nigrum*), Aleutian mountainheath (*Phyllodoce aleutica*), bog blueberry (*Vaccinium uliginosum*), whiteworm lichen (*Thamnolia vermicularis*); (5) mire (bog) with manyflower sedge (*Carex pluriflora*), seashore plantain (*Plantago macrocarpa*), and; (6) deciduous shrub thickets with Barclay's willow (*Salix barclayi*), common ladyfern (*Athyrium filix femina*), and green alder (*Alnus viridis*) thickets (Stephen Talbot, pers. comm.).

4.2.2.2 Terrestrial Mammals

Mammals found on the island include caribou, brown bear, wolf, wolverine, North American river otter (*Lontra canadensis*), red fox (*Vulpes vulpes*), mink (*Mustela vison*), weasels (*Mustela erminea*, *M. rixosa*), Arctic ground squirrel (*Citella parryii*), dusky shrew (*Sorex monticolus*),

collared lemming (*Dicrostonyx groenlandicus*), and root vole (*Microtus oeconomus*) (Sekora 1971; MacDonald and Cook 2009).

Caribou. The UCH is 1 of 6 caribou herds in southwestern Alaska, 5 of them naturally-occurring and 1 an introduced herd (Valkenburg 1998) (Fig. 4). Unimak Island is the only island in the Aleutian chain with native caribou. Presently the ADF&G recognizes the caribou on Unimak Island as a separate herd because of their geographical separation from the SAPCH, with associated fidelity to island calving grounds and genetic distinctions (Butler 2007). Separate harvest management for the UCH has only been in place since the mid-1990s, however. Information on historical UCH population trends and causes for recent declines was covered in Chapter 2.

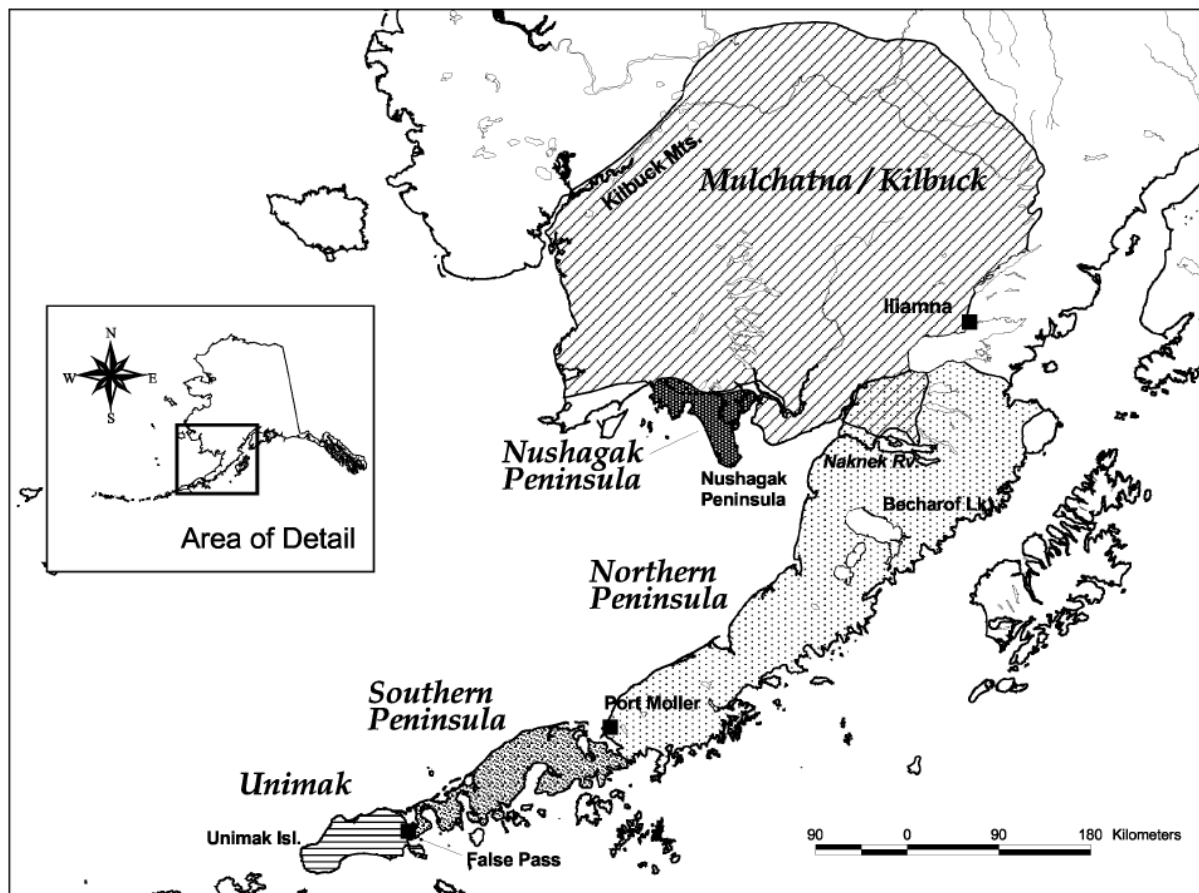


Figure 4. Location of caribou herds in southwestern Alaska (figure from Valkenburg et al. 2003).

Predators. Potential predators of caribou on Unimak Island include brown bear, wolf, and wolverine. Based on a spring 2002 line-transect survey, approximately 300 bears live on Unimak Island (Lem Butler, pers. comm.). Bears are supported by a rich variety of coastal and terrestrial food supplies, in particular, salmon. Wolves have not been surveyed on Unimak Island, but are frequently observed during caribou surveys (Lem Butler, pers. comm.). In 1994, Izembek National Wildlife Refuge staff provided a rough estimate of 15 wolves present on Unimak Island based on observations over 5 years and anecdotal information from activity at

known den sites (U.S. Fish and Wildlife Service 1994). Extrapolating from densities on the neighboring Alaska Peninsula and considering ungulate availability on the island, the ADF&G estimates between 20-30 wolves occupy Unimak Island in 2-5 packs (Lem Butler, pers. comm.). In general, wolf densities are correlated with ungulate biomass availability (Fuller et al. 2003), and caribou are the only ungulate species on Unimak Island. Marine foods (marine mammal carcasses and salmon), however, may constitute a sufficient alternative prey source on Unimak Island (Adams et al. 2010, Watts et al. 2010) to at least partially sustain wolf populations that otherwise would be expected to respond numerically (i.e., decrease) with caribou population declines (Mech and Peterson 2003).

As with caribou populations, predators are subject to population fluctuations due to stochastic and human causes. We have some information that wolf abundance has varied over time on Unimak Island. Beals and Longworth (1941) reported observations for a long list of mammals and birds on Unimak Island. Interestingly, they detailed regular brown bear and wolverine observations, but did not include wolves among mammals present on the island. Perhaps it is not entirely coincidental that caribou were seen in abundance on the island at that time (with estimated totals in the multiple thousands). Following the decline of the SAPCH in the 1940s, a Federal wolf control program operated there (Post and Klein 1999) and on Unimak Island in the 1950s (memo in files, Alaska Maritime National Wildlife Refuge), after which “wolves increased and thereafter were primarily affected by prey abundance and periodic outbreaks of rabies” (Alaska Department of Fish and Game 2003:66).

On Unimak, conditions favorable for wolf hunting and trapping have been rare over the last 25 years, so harvests have had relatively little influence on long-term wolf numbers (Alaska Department of Fish and Game 2003). In a 1987-88 study, 1 wolf was reported trapped on Unimak Island by False Pass residents (Fall et al. 1996), and from 1998-2009, registered guides reported clients taking 12 wolves (average 1 per year) (Franz Muller, pers. comm.) so wolf harvest on the island is far below levels needed to affect wolf density (Fuller et al. 2003). Canine rabies has not been prevalent on the SAPCH since a 1990 outbreak (Sellers et al. 2003, Lem Butler, pers. comm.).

Beals and Longworth (1941) reported regular observations of wolverines on Unimak Island. The U.S. Fish and Wildlife Service (1994) inferred that wolverine densities could be about 1 male and 2.5 females per 100 square mile (259 square kilometer) on Unimak Island and the SAP in 1994.

3.2.2.3 Birds

There are not any specific studies of the birds in the area of the proposed management action for wolf control on Unimak Island, but from aerial survey observations and what is generally known, there is a general sense of what occurs in the project area. The nesting species of birds that could likely be in the project area include two Species of Conservation Concern (U.S. Fish and Wildlife Service 2008): the Aleutian Tern (*Onychoprion aleutica*) and Short-eared Owl (*Asio flammeus*). Other species include Willow Ptarmigan (*Lagopus lagopus*), Golden Eagle (*Aquila chrysaetos*) (in the high country), Bald Eagle, and Peregrine Falcon (*Falco peregrinus*) (on coastal bluffs), Rough-legged Hawk (*Buteo lagopus*), Gyrfalcon (*Falco rusticolus*), Least Sandpiper (*Calidris minutilla*), Rock Sandpiper (*Calidris ptilocnemis*), Semi-palmated Plover (*Charadrius semipalmatus*), and possibly Mew gull (*Larus canus*), Glaucous-winged Gull (*Larus glaucescens*), and songbirds such as American Pipit (*Anthus rubescens*), Savannah Sparrow

(*Passerculus sandwichensis*), Song Sparrow (*Melospiza melodia*), Lapland Longspur (*Calcarius lapponicus*), and Snow Bunting (*Plectrophenax nivalis*). The endemic population of Tundra Swans (*Cygnus columbianus*) that is found in the project area might have a few nesting pairs, but most swan nesting occurs elsewhere on the island as does that for other waterfowl. Also, molting swans would be present in the Urilia Bay area, Cape Lapin River and Swanson's Lagoon. Black-legged Kittiwakes (*Rissa tridactyla*) and cormorants, including Red-faced Cormorant (*Phalacrocorax urile*), also a Species of Conservation Concern, have been recorded nesting at Cape Mordvinof (Vernon Byrd and Chris Dau, pers. comm.).

4.2.3 Threatened and Endangered Species

Northern Sea Otter. The southwest Alaska distinct population segment (DPS) of northern sea otters (*Enhydra lutris kenyoni*) is listed as threatened under the Endangered Species Act. The sea otter is the largest species in the mustelid family, and one of the smallest marine mammals. Sea otter habitat is partially defined by physiological limitations in diving depth, and the animals generally occur in or near shallow waters. The southwest Alaska DPS ranges from west to east across more than 1,500 miles (2,414 kilometers) of shoreline from Kodiak Island, on both sides of the Alaska Peninsula and along the entire Aleutian Island Archipelago. Critical habitat for the sea otter has been designated along the southern coast of Unimak Island, which is away from the predator control project area (U.S. Fish and Wildlife Service 2010).

Steller Sea Lion. The Western DPS of the Steller sea lion (*Eumetopias jubatus*), also known as the northern sea lion, is listed as endangered under the Endangered Species Act. Steller sea lion forage near shore and pelagic waters. They are capable of traveling long distances and can dive to approximately 1300 feet (396 meters) in depth. They also use terrestrial habitat as haul-out sites for periods of rest, molting, and as rookeries for mating and pupping during the breeding season. Steller Sea lion are known to use Cape Sarichef and Scotch Cap on the west side of Unimak as haul-out sites (G.V. Byrd and C.P. Dau, unpublished data). The Western DPS includes Steller sea lions, that reside in the central and western Gulf of Alaska and the Aleutian Islands (NOAA Fisheries, Office of Protected Species, 2010). Critical habitat has been designated for the Western DPS of the Steller sea lion adjacent to the predator control project area in waters that extend out from the northwest coast of Unimak Island.

Steller's Eider. The Steller's Eider (*Polysticta stelleri*) is the smallest of 4 eider duck species. Most Steller's Eiders breed in Russia and only the Alaska breeding population is listed as a threatened DPS under the U.S. Endangered Species Act. The North American breeding population nests on tundra in western and northern Alaska. After breeding, Steller's Eiders move to marine waters to molt, where they mix with the Russian breeding population, with the largest numbers concentrating along the north side of the Alaska Peninsula in Izembek Lagoon, Nelson Lagoon, Port Heiden, and the Seal Islands. After molting, many Steller's Eiders disperse to the Aleutian Islands, the south side of the Alaska Peninsula, Kodiak Island, and Cook Inlet. In the spring, the Alaska breeding population of Steller's Eider leaves the winter areas in the Aleutians and elsewhere and returns to its nesting areas in western and northern Alaska (U.S. Fish and Wildlife Service 2002).

4.2.4 Cultural Resources

Unimak Island was near the southern end of the Bering land bridge and probably played an important role in the migration of the Asiatic peoples to North America. Early occupants of

Unimak Island were the Aleuts. Archaeological data shows that the first inhabitants arrived in the area about 6,000 years ago. These people lived in a region with abundant marine mammals, salmon, waterfowl, and other food resources, which may have facilitated the transition from mobile hunter-gatherers to a more sedentary lifestyle. At the time of European contact, the region supported some of the most politically complex and sedentary hunter-gatherers known to anthropology. As a consequence of long occupation, there are numerous archaeological sites within the Unimak Island Unit, particularly along the coastline and lagoons. These sites are significant for information they contain or the associations they have with past people, events or ways of life. Cultural resources are mostly composed of pit houses. Some cultural resources or sites exist from the historical period; however, most are associated with the military occupation of the area during World War II (Taylor and Sowl 2008).

4.2.5 Human Uses

4.2.5.1 Subsistence Uses

Title VIII of ANILCA grants rural Alaskans a priority for the subsistence use of fish and wildlife on most Federal public lands and waters in the state. ANILCA recognized that the continued opportunity for subsistence uses of Federal public lands was important to the physical, economic, traditional, social, and cultural existence and way of life of rural Native and non-Native Alaskans. The Secretary of the Interior and Secretary of Agriculture have delegated the responsibility for administering the subsistence taking of and uses of fish and wildlife on public lands to the Federal Subsistence Board. The Board promulgates rules for: seasons, harvest limits, methods and means, customary and traditional use determinations, and rural determinations. While rural Alaskans are eligible for ANILCA protections, the Federal Subsistence Board identifies which communities have a customary and traditional pattern of use of a particular resource in a particular area. In the case of caribou on Unimak Island, residents of False Pass, King Cove, Akutan, and Sand Point have a positive customary and traditional use determination for caribou, and are eligible to harvest caribou under Federal subsistence regulations. Only False Pass, with a population of 54 in 2008 (Alaska Census Data) is located on Unimak Island.

Caribou are an important subsistence resource for these communities, but their use has varied in recent years as the regional caribou populations fluctuate. In 1993, Federal subsistence and state general hunts for caribou on Unimak Island were suspended because of a decline in the UCH and related conservation concerns. Both the Federal and State harvest opportunities were reopened in 1997 after surveys indicated there were a sufficient numbers of caribou to allow a limited harvest (Federal Subsistence Board Closure Proposal GMU 10). Reported harvest from the state's general hunt indicates that Alaskan residents reported harvesting approximately 10 caribou during 1997-2008. This information may not account for all local harvests, since a state general hunt only requires a harvest ticket and does not track the number of hunters in the field, as well as not all harvest by Federal subsistence users may be reported (Fall et al. 1990).

In 2009, caribou hunting on Unimak Island, including subsistence hunting was suspended again due to the UCH decline. Since 2007, subsistence hunting for caribou on the nearby Alaska Peninsula has also been closed due to low caribou numbers in the SAPCH. Residents of False Pass traditionally use both areas for subsistence hunting and both areas are now unavailable. Recently, local residents have expressed concerns that the declining UCH may be due to an increased number of bears and wolves on Unimak Island preying on young caribou. They have

also expressed concern over competition for caribou from guided non-resident and non-local resident hunters (Tom Hoblet, pers. comm.).

A comprehensive study of subsistence uses by local residents of False Pass reported on the hunting seasons from 1985-1988. The study describes subsistence use of the SAPCH, which at the time included the UCH (Fall et al. 1990, 1996). Researchers concluded that caribou was a major component of the total subsistence harvest by the communities of Cold Bay, False Pass, King Cove, Nelson Lagoon and Sand Point. In November 1988, interviews with representatives of 20 False Pass households found that 90% of the households used caribou, half of the households hunted caribou, and 35% of the households were successful harvesters. This suggests that caribou hunting is a specialized activity in the village, with a minority of the households supplying most of the caribou for the community (a common practice in many rural Alaskan communities). In terms of pounds edible weight, caribou comprised a larger portion of False Pass's 1987-1988 subsistence harvest than any other resource. During the study year, it was estimated that 34 caribou were harvested which equates to a mean household harvest of 232.5 pounds (105.5 kilograms) or 73.8 pounds (33.5 kilograms) per capita. Hunting occurred from August through November and boats were the most common means of transportation. Caribou hunters reported that most of their hunting occurred on the Alaska Peninsula, although Unimak Island was hunted as well (Fall et al. 1990, 1996).

4.2.5.2 Other Public Uses

Hunting is perhaps the most consistent public use activity on Unimak Island for visitors seeking a unique wilderness experience. Known for its dense brown bear population, Unimak Island offers one of the most sought after brown bear hunting opportunities in Alaska. Only 15 permits are issued each year and only 2 guiding services are permitted to operate on the Refuge. Trophy caribou and wolves are also highly sought by non-resident hunters. Between 1998 and 2009, the 2 guiding services reported 1,325 client use days on Unimak Island (Franz Muller, pers. comm.).

While there are no data on the amount of other visitor uses on Unimak Island, the next highest use is likely from local residents of False Pass and the communities on the Alaska Peninsula and other nearby Aleutian Islands for customary and traditional activities. Other public uses, primarily by non-resident visitors in very limited numbers, include mountain climbing (especially the Isanotski Peaks or Shishaldin Volcano), kite trekking on skis, and adventure hiking and camping to experience the solitude of a pristine wilderness. The breathtaking scenery and the ultimate experience of solitude with nature, away from any reminders of a highly technological world and only a remote chance of seeing another human being or even the evidence of previous visitors, reward visitors to Unimak Island.

4.2.6 Designated Wilderness

The Unimak Island Wilderness was designated in 1980 with the passage of ANILCA and in accordance with the provisions of the Wilderness Act of 1964. The definition of wilderness in section 2(c) of the Wilderness Act is:

“A wilderness, in contrast with those areas where man and his works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain. An area of wilderness is further defined to mean in this Act an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and

managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least five thousand acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and (4) may also contain ecological, geological, or other features of scientific, educational, scenic, or historic value.”

The Service manages Unimak Island Wilderness within the Refuge to preserve its wilderness character and to provide opportunities for public use and enjoyment. These Wilderness Act purposes are in addition to the purposes for which the Refuge was established by ANILCA. Both sets of statutory purposes are used to administer the Refuge in a manner consistent with maintaining the wilderness character of the area and leaving it unimpaired for future use and enjoyment as wilderness. Whenever a proposed management action on a refuge wilderness area potentially involves actions generally prohibited by the Wilderness Act, it is documented by the Service with a Minimum Requirements Analysis (MRA). The MRA determines whether or not the proposed activity is necessary within the wilderness area and if so, what is the least intrusive action (alternative) or “minimum tool” needed to achieve the proposed action. The impacts of a proposed management action are measured against an area’s level of naturalness and wildness at the time it was designated (U.S. Fish and Wildlife Service 2009). A completed MRA using the Minimum Requirements Decision Guide (MRDG) worksheet is included in this EA as Appendix D.

CHAPTER 5 – ENVIRONMENTAL CONSEQUENCES

5.1 ISSUES CONSIDERED

5.1.1 Issues Considered in Detail

In this chapter, we analyze the impacts of the 4 alternatives on the natural environment of the Refuge on Unimak Island, particularly the caribou and wolf populations. We also evaluate impacts on biological communities, subsistence use opportunities, other public uses and wilderness character.

5.1.2 Issues Not Considered in Detail with Rationale

5.1.2.1 Brown Bears

We have no information on the relative importance of caribou in brown bear diets on Unimak Island, but coastal Alaskan brown bears are opportunistic omnivores and consume a large variety of plant and animal foods that are abundant on Unimak Island (Sowl 2003). Although continued low abundance or loss of caribou, would reduce opportunities for bears to consume caribou, bear density is not likely to be strongly tied to caribou abundance or predation and the bear population should remain relatively abundant under all of the management alternatives. Annual counts of brown bears during stream surveys on Unimak Island, for example, do not indicate any marked population trends (Sowl 2003) or obvious association with changes in caribou numbers (Fig. 1). The direct effects of disturbance from all of the alternatives due to aircraft flights, landings, and field operations on brown bears will be temporary, with negligible effects anticipated for brown bears.

4.1.2.2 Birds

Under all of the alternatives, birds may experience temporary adverse effects due to low flying aircraft conducting surveys, aircraft landings, and field crews operating on the ground. Aircraft engaged in surveys, and radio-tracking or search flights, are typically greater than 300 feet (91 meters) above ground level, move quickly, and spend little time in any one location. Low-level flights close to the ground that may occasionally disturb individual birds are brief, lasting for only a few minutes (typically 1-3 minutes). Landings of helicopters in Alternative B will likely be less than 30 minutes in duration in any one location. Identifying areas to avoid such as seabird cliffs and specific swan use sites could mitigate adverse effects of wolf control operations. Generally, the effects on birds would be greater with Alternatives B and C compared with the ongoing monitoring and research activities under the No Action alternative, due to additional over-flights and landings, particularly with helicopter use in Alternative B. The overall effects of these activities on birds, however, would be negligible.

5.1.2.3 Species Listed as Threatened or Endangered

The Alaska breeding population of Steller's Eider and the southwest Alaska DPS of the northern sea otter are listed as threatened under the Endangered Species Act and are both found in the coastal waters of Unimak Island. The Steller's Eider is there only in the winter. The western DPS of the Steller sea lion is listed as endangered. It feeds in the coastal and deep ocean waters off of Unimak Island and has been observed using haul-out sites on the western side of the island (Chris Dau, pers. comm.). Proposed operations for alternatives B and C would take place inland from the areas used by these protected species and will not affect them. The Service is also conducting consultations concurrent with the analysis of this EA, pursuant to requirements in

Section 7 of the U.S. Endangered Species Act, to further determine if there would be any impacts on these species.

4.1.2.4 Cultural Resources

Under all alternatives, the impacts to cultural resources, which are primarily evidence of pit houses occurring along the coasts and near lagoons, would be negligible and temporary.

5.2 ISSUES ANALYZED BY ALTERNATIVE

5.2.1 Alternative A – No Action (No Predator Control)

5.2.1.1 Impacts on Natural Environment

Caribou Population. Recruitment into the UCH has been unsustainably low since at least 2005 and possibly earlier, indicating that predation rates have not declined despite the reduced abundance of caribou. Bull numbers are now so extremely low (approximately 20 bulls) that it may be affecting pregnancy rates and calf production and timing as the few bulls take longer to impregnate cows during an extended rut. The observed extension of the calving period reduces the density of newly born calves present at any moment during calving, thus exposing calves to greater predation risks (i.e., taking away the advantage of ‘predator swamping’). These worsening conditions are likely exacerbated by the isolation of the UCH, with limited capacity for immigration from neighboring herds to stabilize conditions, compared with mainland populations. These conditions may, however, be within the natural range of variability (Keane et al. 2009) for this small island population.

As long as recruitment remains low, the population is aging rapidly and will continue to decline. Even if bull survival stabilizes in the short term due to the hunting closure, so few bulls remain in the herd now that a stochastic (random natural) event such as a heavy snow or icing event following the rut could eliminate them all. Thus, without a marked change in recruitment and bull survival (improved sex ratio), or new immigrants from the SAPCH, the expected outcome for the UCH is “functional extirpation” or the loss of all males from this local population within a few years. This outcome would be consistent with recorded extinctions of other small, isolated caribou populations in multi-predator, multi-prey systems (e.g., Wittmer et al. 2005).

Extirpation processes in very small populations are highly stochastic and unpredictable (Gilpin and Soulé 1986), however; on Unimak Island, trends may change due to unforeseen events such as increased numbers and immigration of SAPCH caribou or an outbreak of rabies in wolves. Despite wolves’ use of alternative marine food sources, wolf survival and numbers could eventually decline due to reduced caribou abundance and food biomass available to wolves on Unimak Island though this is not highly likely (Layne Adams, pers. comm.). In other words, although loss of all bulls from the UCH within a few years is the most likely scenario given what we know about current conditions, natural events could still occur to prevent loss of all bulls and eventually all caribou from Unimak without any management intervention, in which case caribou will remain present on the island. They could remain at low numbers for a prolonged time or they could increase as the UCH did from 1996-2002 (average growth 13% per year). Under typical conditions with wolf predation, caribou populations grow only about 2% per year, though when released from predation caribou can increase at most by 30-35% per year (Bergerud 1980).

Wolf Population. In the expected scenario of continued decline and eventual loss of the UCH, wolves would lose the only ungulate prey available on the island and the wolf population could

decline in numerical response (Mech and Peterson 2003) unless they are able to persist on non-ungulate marine food supplies (Watts et al. 2010). In a scenario where the UCH persists, wolves could still decline if caribou abundance remains low for many more years.

Unimak Island Biological Communities. The No Action alternative will have negligible effects on the structure and function of the biological communities, because caribou population fluctuations are a natural historical component of functional processes in island ecosystems. The biomass of individual forage plants currently eaten by caribou may increase with cessation or low levels of grazing by caribou, with expected effects to the plant community as caribou are extirpated or persist at low densities for an extended time. However, forage species may not increase within plant communities since the UCH has already been at relatively low densities for a few decades and the principal vascular forages are well adapted to moderate levels of grazing.

5.2.1.2 Impacts on Subsistence Use Opportunities

Subsistence use opportunities on Unimak Island include, but are not limited to caribou. If caribou are lost, or remain at very low density for an extended time, opportunities for subsistence caribou harvest on the island would not be available for many years. Local residents would need to continue to seek alternate sources of red meat, which currently does not include caribou harvest from the SAPCH although that source will become available once the SAPCH increases. The effect of this alternative would be negative due to greater likelihood of persistent harvest closure than if caribou recruitment is increased in the short term and the herd has the ability to grow to harvestable levels again.

5.2.1.3 Impacts on Other Public Uses

Under this alternative, the state authorized general caribou hunts are anticipated to remain closed for an extended period of time. Caribou hunters and their guides would be affected, as no harvestable surplus of caribou would be available for many years. Visitors to the island including hunters, would not be disturbed by aircraft or biologists conducting predator control operations, although biological monitoring programs including aerial surveys and radio-collaring caribou will continue under the No Action alternative.

5.2.1.4 Impacts on Wilderness Character

Under this alternative, there is a small but temporary adverse effect on wilderness from the use of aircraft to deploy and maintain radio collars on caribou, and to conduct aerial surveys and research. Maintaining a minimum of 25 radio collars on adult female caribou to monitor the UCH on an ongoing basis requires the use of a helicopter for brief periods to capture caribou and fit them with collars, to recover collars from dead caribou, and to collect biological samples. Deploying an additional 15 collars on caribou, and associated fieldwork for a 3-year carrying capacity study will temporarily increase helicopter landings in the wilderness. These activities are planned for times when visitors are less likely to be present, thus will have very limited, if any, adverse impacts on opportunities for solitude and primitive recreation. These routine management and research activities will also have a positive impact on wilderness from additional scientific information to manage the Refuge's diverse array of fish, wildlife, and plant resources in their habitats. These research and management activities, using the minimum tool determined by previous minimum requirement analyses, will leave no permanent trace of human presence in the wilderness.

5.2.2 Alternative B – Selective Predator Management on the Calving Grounds and Calf Mortality Study with Helicopter Support (ADF&G Proposed Action)

5.2.2.1 Impacts on the Natural Environment

Caribou Population. If wolves that kill caribou calves can be successfully removed from the UCH calving grounds, calf recruitment should increase above 10 calves per 100 cows and possibly higher based on experience with the SAPCH (Butler 2008, Lem Butler, pers. comm.). This effect will last during the year(s) of wolf removal, and then predation could increase again as wolves return to the calving ground territory. Recruitment should, however, remain above 10 calves per 100 cows for a number of years and markedly help to restore the population from its depleted state and verge of bull extirpation as calves are able to recruit into the adult population. Subsequently the population is likely to experience slow to moderate growth initially and then natural fluctuations, though it could still remain at relatively lower abundance for some time if other limiting factors are operating. Ongoing studies common to all the alternatives will provide information on habitat conditions and population dynamics in the longer term.

Compared with the successful removal of wolves and restoration of calf recruitment in the SAPCH, implementation may not be as effective in the UCH in its current state. Numerous conditions on this remote island make field work challenging, including highly variable and unpredictable weather. In addition, observations of very low numbers of caribou, dispersed distribution during calving, and an apparent prolonged calving progression as observed on Unimak Island in June, 2010, may reduce the effectiveness of the proposed action (Bruce Dale, pers. comm.). These conditions will make it difficult to find calves to collar, which reduces the ability to find wolves that are preying on those calves. This is a different scenario than the SAPCH, which had calving that is more normally concentrated in space and time during the wolf control operation. It is also a change from previous observations at Unimak, where caribou calves were easily located in the proposed control area. By 2011, it may no longer be as effective to locate, capture and collar calves and to conduct the selective wolf removal in a relatively brief period (Bruce Dale, pers. comm.). Thus, the net effect of conducting this action on calf recruitment and stabilizing the UCH population is not certain due principally to uncertainty about implementation success.

The translocation of bulls from the SAPCH would increase the UCH sex ratio to at least 10 bulls per 100 cows and subsequently increase pregnancy rates to at least 75% for up to 5 years based on the projected life span of the bulls from time of relocation. This will markedly reduce the risk that bulls will disappear from the island within a few years. These effects will be temporary, however, if predation on calves continues to depress calf recruitment and bulls are not replaced with younger animals.

Moving bulls from the SAPCH to the UCH will alter the genetic composition of bulls on Unimak Island (the transferred bulls would comprise half of herd bull numbers). SAPCH animals are the original source for the UCH so they are closely related (Zittlau 2004) and the introduction effect may be negligible or comparable with documented natural migration patterns, particularly if male calf survival increases with predator control so UCH lineages are maintained. The 2 herds are considered continuous in terms of disease and parasite profiles (Lem Butler, pers. comm.).

The proposed operations to remove wolves, including aircraft and ground activities, would have temporary disturbance impacts on the caribou population. The associated helicopter and fixed-wing activities would consist of about 3 weeks of activity each year for 1 to several years

(maximum 10 years), depending on how wolves from outside the wolf reduction area move into the calving area and how caribou recruitment responds to the removals. Collaring adult and newly born caribou to evaluate survival and document predation will have temporary (a few hours to a few days) effects on up to 50 calves. Since handling time is kept to less than 1 minute per animal, the assumption is that they are not compromised by this treatment (Bruce Dale, pers. comm.). Monitoring the results of this program would likely have negligible effects on the caribou population.

Wolf Population. Over 2 or more years, the proposed action would directly kill up to 10-25% of the adult wolf population annually (thus, based on current estimates, 2-7 wolves per year and 4-14 wolves total over 2 years) although this number will depend on conditions encountered in the field. In addition, possibly 2 litters of pups would be euthanized if lactating female wolves have been killed and dens are located. These estimates are derived from the SAPCH wolf removal program (Lem Butler, pers. comm.). This rate of human-caused mortality is generally compensatory with natural mortality rates and dispersal rates in wolf populations (Fuller et al. 2003; Adams et al. 2008) and is not expected to result in persistent reduction in wolf numbers on Unimak Island. As part of the proposed activities, wolves will not be removed from at least 43% of the lands within the Wolf Management Area and the ADF&G will confirm that at least 2 breeding pairs of wolves remain on Unimak Island.

The disturbance effects from translocating bulls would be temporary and negligible for wolves, occurring over 2-3 days and consisting of a few landings on an established airfield each day and releasing the bulls. The net effect of bull translocation and reduced calf predation is expected to be improved status and growth of the caribou herd. Sustaining the caribou herd on Unimak will provide an ungulate food resource to wolves on the island.

Unimak Island Biological Communities. The direct effects of the proposed bull translocation and wolf removal actions on the structure and function of Unimak Island biological communities, including vegetation, will be negligible. Field crews and support aircraft landings are expected to cause only minor and local disturbance of soil and vegetation. Most aircraft landings are targeted on non-vegetated sites because this is safer and preferred by pilots. Helicopter landings for caribou calf collaring and wolf carcass collection will be of short duration (less than 30 minutes). The only substantial effects of the proposed actions will come from changes in caribou population density produced by the management action. If the actions are successful in restoring the UCH to slow to moderate growth, grazing pressure will increase and the biomass of individual forage plants will respond. Since the actions are not expected to result in high caribou densities, relative to historical abundance, effects on forage species should be moderate and within the range of natural variability.

5.2.2.2 Impacts on Subsistence Use Opportunities

Subsistence use opportunities on Unimak Island include, but are not limited to caribou. If caribou are lost or remain at very low density for an extended time, opportunities for subsistence caribou harvest on the island would not be available for many years. The effect of this alternative would be positive due to greater likelihood of increasing the abundance of caribou to the point where a subsistence harvest opportunity is restored in the long term. Reduction in calf predation is expected to stabilize the population decline and lead to slow to moderate population growth such that local area residents would be able to use the UCH as a source of red meat. The objective to conserve the UCH and restore subsistence opportunities is not certain with this alternative, particularly due to uncertainty about implementation success in locating and

collaring calves to identify mortality and target wolves since the population has become so depleted and calving has become dispersed in time and space. The probability of achieving these objectives, however, is greater than in the No Action alternative.

5.2.2.3 Impacts on Other Public Uses

Under this alternative, the state authorized general caribou hunts are anticipated to remain closed for some period of time, but have the potential to reopen when the caribou population returns to growth and larger numbers in future years following restoration of calf recruitment. Opportunities for hunters to harvest caribou within the next decade are greater with this alternative than with the No Action alternative.

Visitors to the island would be exposed to fixed-wing aircraft and helicopters in low-altitude flights and landings, and to biologists working on the ground conducting calf collaring and wolf sample collections, for up to 3 weeks in June during at least 2 years. Additional activity will accompany the bull translocation program, consisting of fixed-wing aircraft landings during 2-3 days to release the bulls in 2011, with possible duplication in subsequent years. These disturbances will be temporary and confined to the calving grounds in the northern portion of Unimak Island (Fig. 2) and an established airfield, respectively, and would occur in seasons with few if any visitors on the island (e.g., not during hunting or trapping seasons). Disturbance impacts from this alternative will occur in addition to the ongoing island-wide biological monitoring and research operations, which include aerial surveys, radio-collaring caribou, and biologists working on the ground.

5.2.2.4 Impacts on Wilderness Character

In addition to helicopter and airplane use in Alternative A, there will be an increase in airplane landings on the Refuge in this alternative to translocate up to 20 bulls from the SAPCH over a 3-day period in August at an established airfield near Cape Sarichef. There would also be an increase in helicopter landings to deploy radio collars on up to 50 calves for the calf mortality study, to investigate collared calf mortalities, and to shoot wolves and collect biological samples. The calf mortality and wolf control action would occur for a 3-week period from late May to June 20th and may recur annually for at least 2 years, and for up to 10 years, to meet the ADF&G's management objectives for the UCH (see Appendix C). The effect of these additional helicopter landings would be adverse, but temporary, and would not permanently change the untrammled wilderness character of the island. The Robinson R44 helicopter is equipped with special tundra pads on its landing skids to minimize damage when it is necessary to land on vegetated areas of the tundra. Choosing landing sites such as cinder, pumice or sand patches, gravel bars and beaches will further mitigate avoidable damage to vegetation.

The adverse effects from increased use of helicopters and airplanes above the level in Alternative A would be temporary and limited by the timeframe of field operations and to specific areas on the Refuge. Thus, impacts to opportunities for solitude and primitive recreation by visitors to the Refuge would remain limited. As experienced with a similar management action involving the SAPCH, early success of this alternative would further reduce adverse impacts to the wilderness by reducing the number of years for subsequent treatments.

This alternative would have an adverse effect on the natural predator/prey relationships by reducing the number of wolves preying on newly born caribou for a period long enough to stabilize and restore the UCH. This management intervention will be temporary (see impacts on wolves above) and will have no long-term adverse effects on the natural character of the Refuge.

This alternative would also have a limited adverse impact on natural processes from the introduction of bulls from the SAPCH, but would reduce the risk that bulls would disappear from the UCH in the near future (see impacts on caribou above). The combination of predator control and bull supplementation in this alternative would improve the chances that the UCH would persist as a unique and natural component of the Unimak Island Wilderness.

5.2.3 Alternative C - Selective Predator Management on the Calving Grounds Using Either Fixed-wing Aircraft with Marksmen or Ground-based Teams Deployed by Helicopters to Take Wolves and Calf Mortality Study with Helicopter Support

5.2.3.1 Impacts on the Natural Environment

Caribou Population. If wolves that kill caribou calves can be successfully removed from the UCH calving grounds, calf recruitment should increase above 10 calves per 100 cows and possibly higher based on experience with the SAPCH (Butler 2008, Lem Butler, pers. comm.). Alternative C may not have the same efficiency as locating and killing wolves from helicopters, but over time should provide a comparable level of effect as Alternative B. This effect will last during the year(s) of wolf removal, and then predation could increase again as wolves return to the calving ground territory. Recruitment should, however, remain above 10 calves per 100 cows for a number of years and markedly help to restore the population from its depleted state and verge of bull extirpation as calves are able to recruit into the adult population.

Subsequently the population is likely to experience slow to moderate growth initially and then natural fluctuations, though it could still remain at relatively lower abundance for some time if other limiting factors are operating. Ongoing studies common to all the alternatives will provide information on habitat conditions and population dynamics in the longer term.

Compared with the successful removal of wolves and restoration of calf recruitment in the SAPCH, implementation may not be as effective in the UCH in its current state. Numerous conditions on this remote island make field work challenging, including highly variable and unpredictable weather. In addition, observations of very low numbers of caribou, dispersed distribution during calving, and an apparent prolonged calving progression as observed on Unimak Island in June, 2010, may reduce the effectiveness of the proposed action (Bruce Dale, pers. comm.). These conditions will make it difficult to find calves to collar, which reduces the ability to find wolves that are preying on those calves. This is a different scenario than the SAPCH, which had calving that is more normally concentrated in space and time during the wolf control operation, and a change from previous observations at Unimak, where caribou calves were easily located in the proposed control area. By 2011, it may no longer be as effective to locate, capture, and collar calves and to conduct the selective wolf removal in a relatively brief period (Bruce Dale, pers. comm.). Thus, the net effect of conducting this action on calf recruitment and stabilizing the UCH population is not certain due principally to uncertainty about implementation success.

A key component of selective removal of wolves is to take the calf-killing wolves as early during the calving season as possible. Helicopters are the more efficient platform for accurately targeting specific wolves that are killing calves, during the time when caribou calves are most vulnerable, and for killing these wolves quickly. Robinson helicopters are relatively small and quiet, and were demonstrated to be very efficient platforms for spotting wolves during SAPCH operations. Shooting wolves from fixed-wing aircraft or from the ground may, depending on

weather conditions, reduce the efficiency and effectiveness of wolf removals. Low clouds and high winds could limit available flying time using fixed-wing aircraft.

The proposed operations require flying 1-1.5 hours from Cold Bay to Unimak Island, crossing Isonotski Strait. Poor weather conditions could reduce operational days available during the calving season. Compared to fixed-wing aircraft the cost per hour flown is more expensive using helicopters. This difference could be made up through increased efficiency and effectiveness. The costs for Alternative C could potentially be greater than for Alternative B.

The translocation of bulls from the SAPCH would increase the UCH sex ratio to at least 10 bulls per 100 cows and subsequently increase pregnancy rates to at least 75% for up to 5 years based on the projected life span of the bulls from time of relocation. This will markedly reduce the risk that bulls will disappear from the island within a few years. These effects will be temporary, however, if predation on calves continues to depress calf recruitment and bulls are not replaced with younger animals.

Moving bulls from the SAPCH to the UCH will alter the genetic composition of bulls on Unimak Island (the transferred bulls would comprise half of herd bull numbers). SAPCH animals are the original source for the UCH so they are closely related (Zittlau 2004) and the introduction effect may be negligible or comparable with documented natural migration patterns, particularly if male calf survival increases with predator control so UCH lineages are maintained. The 2 herds are considered continuous in terms of disease and parasite profiles (Lem Butler, pers. comm.).

The proposed operations to remove wolves, including aircraft and ground activities, would have temporary disturbance impacts on the caribou population. The associated helicopter and fixed-wing activities would consist of about 3 weeks of activity each year for 1 to several years (maximum 10 years), depending on how wolves from outside the wolf reduction area move into the calving area and how caribou recruitment responds to the removals. Collaring adult and newly born caribou to evaluate survival and document predation would have temporary (a few hours to a few days) effects on up to 50 calves. Since handling time is kept to less than 1 minute per animal, the assumption is that they are not compromised by this treatment (Bruce Dale, pers. comm.). Monitoring the results of this program would likely have negligible effects on the caribou population.

Wolf Population. Over 2 or more years, the proposed action would directly kill up to 10-25% of the adult wolf population annually (thus, based on current estimates, 2-7 wolves per year and 4-14 wolves total over 2 or more years) although this number will depend on conditions encountered in the field. One or more additional years may be required to achieve this level of removals compared with Alternative B. In addition, possibly 2 litters of pups would be euthanized if lactating female wolves have been killed and dens are located. These estimates are derived from the SAPCH wolf removal program (Lem Butler, pers. comm.). This rate of human-caused mortality is generally compensatory with natural mortality rates and dispersal rates in wolf populations (Fuller et al. 2003; Adams et al. 2008) and is not expected to result in persistent reduction in wolf numbers on Unimak Island. As part of the proposed activities, wolves will not be removed from at least 43% of the lands within the Wolf Management Area and it will be confirmed that at least 2 breeding pairs of wolves remain on Unimak Island.

The disturbance effects from translocating bulls would be temporary and negligible for wolves, occurring over 2-3 days and consisting of a few landings on an established airfield each day and

releasing the bulls. The net effect of bull translocation and reduced calf predation is expected to be improved status and growth of the caribou herd. Sustaining the caribou herd on Unimak will provide an ungulate food resource to wolves on the island.

Unimak Island Biological Communities. The direct effects of the proposed bull translocation and wolf removal actions on the structure and function of Unimak Island biological communities, including vegetation, will be negligible. Field crews and support aircraft landings are expected cause only minor and local disturbance of soil and vegetation. Most aircraft landings are targeted on non-vegetated sites because this is safer and preferred by pilots. Helicopter landings for caribou calf collaring and wolf carcass collection will be of short duration (less than ½ hour). The only substantial effects of the proposed actions will come from changes in caribou population density produced by the management actions. If the actions are successful in restoring the UCH to slow to moderate growth, grazing pressure will increase and the biomass of individual forage plants will respond. Since the actions are not expected to result in high caribou densities, relative to historical abundance, effects on forage species should be moderate and within the range of natural variability.

5.2.3.2 Impacts on Subsistence Use Opportunities

Subsistence use opportunities on Unimak Island include, but are not limited to caribou. If caribou are lost, or remain at very low density for an extended time, opportunities for subsistence caribou harvest on the island would not be available for many years. The effect of this alternative would be positive due to greater likelihood of increasing the abundance of caribou to the point where subsistence harvest opportunity is restored in the long term. Reduction in calf predation is expected to stabilize the population decline and lead to slow to moderate population growth such that local area residents would be able to use the UCH as a source of red meat. The objective to conserve the UCH and restore subsistence opportunities is not certain with this alternative, particularly due to uncertainty about implementation success in locating and collaring calves to identify mortality and target wolves since the population has become so depleted and calving has become dispersed in time and space. Compared with Alternative B, Alternative C may require additional time to achieve UCH recruitment objectives.

5.2.3.3 Impacts on Other Public Uses

Under this alternative, the state authorized general caribou hunts are anticipated to remain closed for some period of time, but have the potential to reopen if the wolf reduction program is successful and the caribou population returns to growth and larger numbers in future years following restoration of calf recruitment. Opportunities for hunters to harvest caribou within the next decade are greater with this alternative than with the No Action alternative, but less than with Alternative B due to not using helicopters as the platform to shoot targeted wolves.

Visitors to the island would be exposed to fixed-wing aircraft and helicopters in low-altitude flights and landings, and to biologists working on the ground conducting calf collaring and wolf sample collections, for up to 3 weeks in June during at least 2 and likely additional years. Additional activity will accompany the bull translocation program, consisting of fixed-wing aircraft landings during 2-3 days to release the bulls in 2011, with possible duplication in subsequent years. These disturbances will be temporary and confined to the calving grounds in the northern portion of Unimak Island (Fig. 2) and an established airfield, respectively, and would occur in seasons with few if any visitors on the island (e.g., not during hunting or trapping seasons). Disturbance impacts from this alternative will occur in addition to the ongoing island-

wide biological monitoring and research operations, which include aerial surveys, radio-collaring caribou, and biologists working on the ground.

5.2.3.4 Impacts on Wilderness Character

In addition to helicopter and airplane use in Alternative A, there will be an increase in airplane landings on the Refuge in this alternative to translocate up to 20 bulls from the SAPCH over a 3-day period in August at an established airfield near Cape Sarichef. There would also be the same increase as Alternative B in helicopter landings to deploy radio collars on up to 50 calves for the calf mortality study, to investigate collared calf mortalities, and to target wolves and collect biological samples. Since helicopters would not be used as a platform to shoot wolves from the air, fixed-wing aircraft use and landings will be greater than Alternative B. The calf mortality and wolf control action would occur for a 3-week period from late May to June 20th and may recur annually for at least 2 years, and likely additional years for up to 10 years, to meet the ADF&G's management objectives for the UCH (see Appendix C). The effect of additional helicopter landings compared with Alternative A would be adverse, but temporary, and would not permanently change the untrammeled wilderness character of the island. The Robinson R44 helicopter is equipped with special tundra pads on its landing skids to minimize damage when it is necessary to land on vegetated areas of the tundra. Choosing landing sites such as cinder, pumice or sand patches, gravel bars and beaches will further mitigate avoidable damage to vegetation.

The adverse effects from increased use of helicopters and airplanes above the level in Alternatives A and B would be temporary and limited by the timeframe of field operations and to specific areas on the Refuge. Thus, impacts to opportunities for solitude and primitive recreation by visitors to the Refuge would remain limited. Compared with Alternative B, this alternative may require additional time to achieve UCH recruitment objectives, primarily due to weather constraints, which would also increase associated impacts to the wilderness character of Unimak Island.

Alternative C would have an adverse effect on the natural predator/prey relationships by reducing the number of wolves preying on newly born caribou for a period long enough to stabilize and restore the UCH. This management intervention will be temporary (see impacts on wolves above) and will have no long-term adverse effects on the natural character of the Refuge. This alternative would also have a limited adverse impact on natural processes from the introduction of bulls from the SAPCH, but would reduce the risk that bulls would disappear from the UCH in the near future (see impacts on caribou above). The combination of predator control and bull supplementation in this alternative would improve the chances that the UCH would persist as a unique and natural component of the Unimak Island Wilderness.

5.2.4 Alternative D – Remove Wolves Selectively from Calving Areas, Using Ground-based Teams

5.2.4.1 Impacts on the Natural Environment

Caribou Population. If wolves can be successfully removed from the UCH calving grounds, calf recruitment should increase above 10 calves per 100 cows and possibly higher based on experience with the SAPCH (Butler 2008, Lem Butler, pers. comm.). Compared with Alternative B, this effect may not be achieved for an additional year or longer because of lower efficiency locating and killing wolves from the ground compared with helicopters. This effect will last during the year(s) of wolf removal, and then predation could increase again as wolves

return to the calving ground territory. Recruitment should remain above 10 calves per 100 cows for a number of years, however, and help markedly to restore the population from its depleted state and verge of bull extirpation, as calves are able to recruit into the adult population. Subsequently, the population is likely to experience slow to moderate growth initially and then typical fluctuations, though it could still remain at relatively lower abundance for some time if other limiting factors are operating. Ongoing studies common to all the alternatives will provide information on habitat conditions and population dynamics in the longer term.

Compared with the successful removal of wolves and restoration of calf recruitment in the SAPCH, implementation of this alternative may not be as effective because a ground-based operation is less efficient at actually killing wolves and the wolves killed are less certain to be the perpetrators of calf mortality. Without helicopter access (as in Alternative B and the SAPCH operation), calves cannot be captured and collared, so wolves would generally not be associated directly with calf mortality events. Shooting wolves from the ground is also less efficient than shooting from helicopters, so fewer wolves may be removed in a season requiring additional years of work to achieve the same outcome. Numerous conditions on this remote island make field work challenging, including highly variable and unpredictable weather. If wolf removal is not completed in the first year or 2, the likelihood of success is also diminished due to the population's precarious current state. Thus, the net effect of conducting this action on calf recruitment and stabilizing the UCH population is not certain – due to uncertainty regarding implementation success.

The translocation of bulls from the SAPCH would increase the UCH sex ratio to at least 10 bulls:100 cows and subsequently increase pregnancy rates to at least 75% for up to 5 years based on the projected life span of the bulls from time of relocation. This will markedly reduce the risk that bulls will disappear from the island within a few years. These effects will be temporary, however, if predation on calves continues to depress calf recruitment and bulls are not replaced with younger animals.

Moving bulls from the SAPCH to the UCH will alter the genetic composition of bulls on Unimak Island (the translocated bulls would comprise half of herd bull numbers). SAPCH animals are the original source for the UCH so they are closely related (Zittlau 2004) and the introduction effect may be negligible or comparable with documented natural movement patterns, particularly if male calf survival increases with predator control so UCH lineages are maintained. The 2 herds are considered continuous in terms of disease and parasite profiles (Lem Butler, pers. comm.).

The proposed operations to remove wolves, including aircraft and ground activities, would have temporary disturbance impacts on the caribou population. Helicopters would not be used, but the number of people and amount of time on the ground would be substantially greater than with Alternative B (2 months compared with 3 weeks, and possibly repeated for more years). The fixed-wing activities in this alternative would consist of about 2 months of activity each year for at least 2 and more likely 3 years, up to 10 years, depending on the success of killing wolves and how wolves from outside the wolf reduction area move into the calving area and how caribou recruitment responds to the removals. No effects would result from collaring neonate caribou since that action is omitted from Alternative D. Monitoring the results of this program would likely have negligible effects on the caribou population.

Wolf Population. Over 2 or more years, the proposed action is intended to kill up to 50% of Unimak Island wolves in total (thus, based on current population estimates, 10-15 wolves in total), plus euthanizing any litters of pups if lactating female wolves have been killed and dens are located. This rate of human-caused mortality spread over a number of years is below the level that is generally compensatory with natural mortality rates and dispersal rates in wolf populations (Fuller et al. 2003; Adams et al. 2008), and because it will be temporary is not expected result in a persistent reduction in wolf numbers on Unimak Island. As part of the proposed activities, wolves will not be removed from at least 43% of the lands within the Wolf Management Area and it will be confirmed that at least 2 breeding pairs of wolves remain on Unimak Island.

The disturbance effects from translocating bulls would be temporary and negligible for wolves, occurring over 2-3 days and consisting of a few landings on an established airfield each day and releasing the bulls. The net effect of bull translocation and reduced calf predation is expected to be improved status and growth of the caribou herd. Sustaining the caribou herd on Unimak will provide an ungulate food resource to wolves on the island.

Unimak Island Biological Communities. The direct effects of the proposed bull translocation and wolf removal actions on the structure and function of Unimak Island biological communities, including vegetation, will be negligible. Field crews and support aircraft landings are expected to cause only minor and local disturbance of soil and vegetation. Most aircraft landings are targeted on non-vegetated sites because this is safer and preferred by pilots. The only substantial effects of the proposed action will come from changes in caribou population density produced by the management actions. If the actions are successful in restoring the UCH to slow to moderate growth, grazing pressure will increase and the biomass of individual forage plants will respond. Since the actions are not expected to result in high caribou densities, relative to historical abundance, effects on forage species should be moderate and within the range of natural variability.

5.2.4.2 Impacts on Subsistence Use Opportunities

Subsistence use opportunities on Unimak Island include, but are not limited to caribou. If caribou are lost, or remain at very low density for an extended time, opportunities for subsistence caribou harvest on the island would not be available for many years. The effect of this alternative would be positive due to greater likelihood of increasing the abundance of caribou to the point where a subsistence harvest opportunity is restored in the long term. Reduction in calf predation is expected to stabilize the population decline and lead to slow to moderate population growth such that local area residents would be able to use the UCH as a source of red meat. The objective to conserve the UCH and restore subsistence opportunities is not certain with this alternative, particularly due to uncertainty about implementation success in targeting and killing wolves from the ground, and the probability of additional years needed to accomplish removal objectives. The probability of achieving the caribou population objectives is greater than in the No Action alternative.

5.2.4.3 Impacts on Other Public Uses

Under this alternative, the state authorized general caribou hunts are anticipated to remain closed for some period of time, but have the potential to reopen when the caribou population returns to growth and larger numbers in future years following restoration of calf recruitment. Opportunities for caribou hunters and their guides to harvest caribou within the next decade are greater with this alternative than with the No Action alternative.

Visitors to the island would be exposed to fixed-wing aircraft in low-altitude flights and landings, and to biologists working on the ground conducting calf collaring and wolf sample collections, for 2 months (May-June) during 3 years and up to 10 years. Additional activity will accompany the bull translocation program, consisting of fixed-wing aircraft landings during 2-3 days to release the bulls in 2011, with possible duplication in subsequent years. These disturbances will be temporary and concentrated within the calving grounds in the northern portion of Unimak Island (Figure 2) and an established airfield, respectively. While generally the Refuge receives few visitors during this season, fieldwork under this alternative will begin May 1 and overlap with the general season for brown bear hunting (May 10-May 25; with a total of 7 permits issued for Unimak Island). Thus, some brown bear hunters may observe ground crews in the field or aircraft flights, but these effects should be temporary as field operations will be of short duration and focused in the caribou calving area and on wolves and caribou, not brown bears. Disturbance impacts from this alternative will occur in addition to the ongoing island-wide biological monitoring and research operations, which include aerial surveys, radio-collaring caribou, and biologists working on the ground.

5.2.4.4 Impacts on Wilderness Character

In addition to helicopter and airplane use in Alternative A, there will be an increase in airplane landings on the Refuge in this alternative to translocate up to 20 bulls from the SAPCH over a 3-day period in August at an established airfield near Cape Sarichef. For the ground-based predator control operation, additional airplane landings at Cape Sarichef would be necessary to supply field camps and to lay over between reconnaissance missions. This alternative would have significantly more ground activity than Alternative B, due to wolf control activity by 8 personnel in the field, a base camp at Cape Sarichef, and several spike camps throughout the calving ground. The period of predator control operations would be approximately 7 weeks for each field season and would continue for at least 3 years and up to 10 (see Appendix C). The adverse effects from airplane landings and field camps are limited and temporary, and will not adversely impact the untrammeled wilderness character of the island. Camps will be removed at the end of each field season with adherence to the Leave No Trace goal for activities in wilderness areas.

Since the timing of ground-based predator control activity for this alternative overlaps the spring general hunt for brown bears, there is the chance of encounters between hunters, reconnaissance flights and management field teams. This may result in temporary adverse impacts of short duration for bear hunters seeking an undisturbed wilderness experience.

This alternative would have an adverse effect on the natural predator/prey relationships by reducing the number of wolves preying on newly born caribou for a period long enough to stabilize and restore the UCH. This management intervention will be temporary and will have no long-term adverse effects on the natural character of the Refuge. This alternative would also have a limited adverse impact on natural processes from the introduction of bulls from the SAPCH, but would reduce the risk that bulls would disappear from the UCH in the near future (see impacts on caribou above). The combination of predator control and bull supplementation in this alternative would improve the chances that the UCH would persist as a unique and natural component of the Unimak Island Wilderness.

Since this alternative does not involve shooting wolves from a helicopter, its effectiveness is expected to be lower, or to take more years than Alternative B. It would likely result in more

adverse impacts by killing wolves less discriminately and would thereby require additional treatment years to meet management objectives. However, these additional impacts are not expected to have lasting negative impacts on the wilderness character of the area.

5.3 SUMMARY OF IMPACTS

Table 5. Summary of environmental consequences for Alternative Actions

IMPACTS	ALTERNATIVE A NO ACTION	ALTERNATIVE B HELICOPTER WOLF CONTROL	ALTERNATIVE C FIXED-WING/GROUND BASED WOLF CONTROL	ALTERNATIVE D GROUND BASED WOLF CONTROL
Caribou population	Continued decline leading to loss of all bulls from the population within a few years is likely, unless calf recruitment increases markedly due to some unforeseen natural event or natural variability.	If successful, the population decline would stop and the herd would grow at a slow to moderate rate. Calf recruitment should increase above 10 calves:100 cows within a few years. The herd sex ratio should increase to at least 10 bulls:100 cows, and pregnancy rates to at least 75%. Translocate bulls will alter the genetic composition of the UCH, but the effect will be negligible.	If successful, the population decline would stop and the herd should grow at a slow to moderate rate, but take longer than Alt. B. Calf recruitment should increase above 10 calves:100 cows within a few years. The herd sex ratio should increase to at least 10 bulls:100 cows, and pregnancy rates to at least 75%. Translocated bulls will alter the genetic composition of the UCH, but the effect will be negligible.	If successful, the population decline would stop and the herd should grow at a slow to moderate rate, but take longer than Alt. B or C. Calf recruitment should increase above 10 calves:100 cows within a few years. The herd sex ratio should increase to at least 10 bulls:100 cows, and pregnancy rates to at least 75%. Translocated bulls will alter the genetic composition of the UCH, but the effect will be negligible.
Wolf population	May decline due to reduced ungulate prey biomass availability, but population is likely to persist due to marine food supply.	Up to 10-25% of the wolf population would be killed annually (estimated 4-14 animals total in 2 years), plus 1-2 litters of pups may be euthanized. Wolves would not be removed from 43% of the island. The population would recover to levels supported by prey availability within a few years after removals end.	Up to 10-25% of the wolf population would be killed annually (estimated 4-14 animals total in 2 or likely more years), plus 1-2 litters of pups may be euthanized. Wolves would not be removed from 43% of the island. The population would recover to levels supported by prey availability within a few years after removals end.	Up to 50% of the wolf population (estimated 10-15 animals total in 2-3 years) would be killed in total over a few years, plus 1-2 litters of pups may be euthanized. The population would recover to levels supported by prey availability within a few years after removals end.
Unimak Island biological communities	Negligible effects within the range of natural variability. Biomass of some forage plant species may increase in response to reduced caribou grazing.	Negligible effects within the range of natural variability. Grazing pressure may increase as the caribou herd returns to slow to moderate growth, and some forage plant biomass may decrease.	Same as Alternative B	Same as Alternative B

IMPACTS CONTINUED	ALTERNATIVE A NO ACTION	ALTERNATIVE B HELICOPTER WOLF CONTROL	ALTERNATIVE C FIXED-WING/GROUND BASED WOLF CONTROL	ALTERNATIVE D GROUND BASED WOLF CONTROL
Subsistence use opportunities	Caribou harvest will remain closed for extended time, possibly years. Local residents will continue to rely on other sources of red meat.	Increased probability that caribou harvest will be re-opened and that closure will not extend for as many years, compared with the No Action alternative.	Increased probability that caribou harvest will be re-opened and that closure will not extend for as many years, compared with the No Action alternative. Harvest opportunity may be delayed compared with Alternative B due to greater time needed to achieve wolf removal goals.	Increased probability that caribou harvest will be re-opened and that closure will not extend for as many years, compared with the No Action alternative. Harvest opportunity may be delayed compared with Alternative B and C due to greater time needed to achieve wolf removal goals.
Other public uses	General caribou hunt will remain closed for years, negatively affecting guides and hunters. Visitors will not be disturbed by predator management activities.	General caribou hunt will remain closed for some period of time, but increased caribou numbers will provide the potential to reopen the harvest within the next decade. Visitors will be exposed to low-level flights, landings, and predator control actions, including additional helicopter use; but not during any hunting or trapping seasons.	General caribou hunt will remain closed for some period of time, but increased caribou numbers will provide the potential to reopen the harvest within the next decade. Visitors will be exposed to low-level flights, landings, and predator control actions, including additional helicopter use; but not during any hunting or trapping seasons. Time until harvest is open and visitor impacts may be longer duration than under Alt B.	General caribou hunt will remain closed for some period of time, but increased caribou numbers will provide potential to reopen the harvest within the next decade though probably not as soon as under Alt B. Visitors will be exposed to low-level flights, landings, and predator control actions, but not additional helicopter use. Fieldwork will overlap with the general brown bear hunting season.
Wilderness character	No additional effects beyond small, temporary disturbance from ongoing aerial surveys and research activities, including use of aircraft and helicopters at times when visitors are less likely to be present on the island.	Increased number of airplane and helicopter flights and landings from late May through June 20 th , and briefly in August, annually for at least 2 years and up to 10 years, compared with the No Action alternative. Removing wolves and introducing caribou bulls will alter natural predator/prey relationships and thus island's untrammled character.	Increased number of airplane and helicopter flights and landings from late May through June 20 th , and briefly in August, annually for at 2 and likely additional years up to 10 years, compared with the No Action alternative. Additional aircraft landings and ground activity, and likely number of years of action compared with Alt B. Removing wolves and introducing caribou bulls will alter natural predator/prey relationships and thus island's untrammled character.	Increased number of airplane flights and landings, from May 1 through June, and briefly in August, annually for at least 3 years and up to 10 years, compared with the No Action alternative. Helicopters will not be used, but activity on the ground will increase, compared with Alternative B. Removing wolves and introducing caribou bulls will alter natural predator/prey relationships and thus island's untrammled character.

REFERENCES CITED

- Adams, L.G., and B.W. Dale. 1998a. Reproductive performance of female Alaskan caribou. *Journal of Wildlife Management* 62:1184-1195.
- Adams, L.G., and B.W. Dale. 1998b. Timing and synchrony of parturition in Alaskan caribou. *Journal of Mammalogy* 79:287-294.
- Adams, L.G., R.O. Stephenson, B.W. Dale, R.T. Ahgook, and D.J. Demma. 2008. Population dynamics and harvest characteristics of wolves in the central Brooks Range, Alaska. *Wildlife Monographs* 170:1-25.
- Adams, L.G., F.G. Singer, and B.W. Dale. 1995. Caribou calf mortality in Denali National Park, Alaska. *Journal of Wildlife Management* 59:584-594.
- Adams, L.G., S.D. Farley, C.A. Stricker, D.J. Demma, G.H. Roffler, D.C. Miller, and R.O. Rye. 2010. Are inland wolf-ungulate systems influenced by marine subsidies of Pacific salmon? *Ecological Applications* 20:251-262.
- Alaska Census Data 2000-2008. [On line] URL: <http://alaska.hometownlocator.com/census>
- Beals, F.E., and J.E. Longworth. 1941. Pages 11-25 [unnumbered] in *Wildlife observations from Unimak Island between Jan. and June 1941*. Unpublished USFWS "sea otter" report. Smithsonian Institution Archives, Record Unit 7176, Box 5, Folder 4. [Copy in files at Alaska Maritime National Wildlife Refuge.]
- Bergerud, A.T. 1974. Decline of caribou in North America following settlement. *Journal of Wildlife Management* 38(4):757-770.
- Bergerud, A.T. 1980. A review of the population dynamics of caribou and wild reindeer in North America. Pp. 556-581. In E. Reimers, E. Glare, and S. Skenneberg (eds.), *Proceedings of the Second International Reindeer/Caribou Symposium*, Direktoratet for vilt og frskvannsfisk, Trondheim, Norway.
- Bergerud, A.T. 1988. Caribou, wolves and man. *Trends in Ecology and Evolution* 3:68-72.
- Bergerud, A.T. 2000. Caribou. Pp. 658-693. In S. Demarias and P.R. Krausman (eds.), *Ecology and management of large mammals in North America*. Upper Saddle River, NJ; Prentice Hall.
- Boertje, R.D., M.A. Keech, and T.F. Paragi. 2010. Science and values influencing predator control for Alaska moose management. *Journal of Wildlife Management* 74(5):917-928.
- Butler, L. 2007. Unit 10 caribou management report. Pp. 51-55. In P. Harper (ed.), *Caribou management report of survey and inventory activities 1 July 2004-30 June 2006*. Juneau, AK: Alaska Department of Fish and Game.
- Bulter, L. 2008. Memorandum: Southern Alaska Peninsula Caribou Herd composition survey. King Salmon, AK: Alaska Department of Fish and Game.

- Eloranta, E., and M. Nieminen. 1986. Calving of the experimental herd in Kaamanen during 1970-1985. Rangifer Special Issue 1:115-121.
- Fall, J.A., R. Walker, and R.T. Stanek. 1990. Subsistence use of the Southern Alaska Peninsula caribou herd. Technical Paper No. 191. Juneau, AK: Alaska Department of Fish and Game, Division of Subsistence.
- Fall, J.A., L. Brown, and C. Utermohle. 1996. The harvest and use of plant, wildlife, and fish resources in False Pass, Unimak Island, Alaska. Technical Paper No. 183. Juneau, AK: Alaska Department of Fish and Game, Division of Subsistence.
- Federal Subsistence Board Closure Proposal GMU 10, ADFG and FWS, 4/29/09
- Fuller, T.K., L.D. Mech and J.F. Cochrane. 2003. Wolf population dynamics. Chapter 6 in Mech, L.D. and L. Boitani. Wolves: behavior, ecology, and conservation. Chicago: The University of Chicago Press.
- Gilpin, M.E., and M.E. Soulé. 1986. Minimum viable populations: process of species extinction. Pp. 19-32. In M.E. Soulé (ed.), Conservation biology: the science of scarcity and diversity. Sunderland, MA: Sinauer.
- Gustine, D.D., K.L. Parker, R.J. Lay, M.P. Gillingham, and D.C. Heard. 2006. Calf survival of woodland caribou in a multi-predator ecosystem. Wildlife Monograph 165:1-32.
- Harper, E.K., W.J. Paul, and L.D. Mech. 2008. Effectiveness of lethal, directed wolf-depredation control in Minnesota. Journal of Wildlife Management 72:778-784.
- Haskell, S.H., and W.B. Ballard. 2007. Modeling the western Arctic caribou herd during a positive growth phase: potential effects of wolves and radio collars. Journal of Wildlife Management 71(2):619-627.
- Hayes, R.D., R. Farnell, R.M.P. Ward, J.C. Carey, M. Dehn, G.W. Kuzyk, A.M. Baer, C.L. Gardner, and M. O'Donoghue. 2003. Experimental reduction of wolves in the Yukon: ungulate responses and management implications. Wildlife Monograph 152:1-35.
- Keane, R.E., P.F. Hessburg, P.B. Landres, and F.J. Swanson. 2009. The use of historical range and variability (HRV) in landscape management. Forest Ecology and Management 258:1025-1037.
- Keech, M., and P. Valkenburg. 2007. Population dynamics of Interior and Southwest Alaska caribou herds. Research Final Performance Report, 1 July 2001-30 June 2007, Federal Aid in Wildlife Restoration Grants W-27-5, W-33-1, W-33-2, W-33-3, W-33-4, W-33-5. Project 3.45. Juneau, AK: Alaska Department of Fish and Game.
- Loison, A., and R. Langvtan. 1998. Short- and long-term effects of winter and spring weather on growth and survival of red deer in Norway. Oecologia 116:489-500.

- MacDonald, S.O., and J.A. Cook. 2009. Recent mammals of Alaska. Fairbanks, AK: University of Alaska Press.
- Mech, L.D. and R.O. Peterson. 2003. Wolf-prey relations. Pp.131-160. In L.D Mech and L. Boitani (eds.), *Wolves: behavior, ecology, and conservation*. Chicago: University of Chicago Press.
- Murie, O.J. 1959. Fauna of the Aleutian Islands and Alaska Peninsula. *North American Fauna* 61:1-406.
- NOAA Fisheries: Office of Protected Species 2010. [On line] RRL: <http://www.nmfs.noaa.gov/pr/species/mammals/pinnipeds/stellersealion.htm>
- Post, E.S., and D. Klein. 1999. Caribou calf production and seasonal range quality during a population decline. *Journal of Wildlife Management* 63:335-345.
- Ruid, D.B., W.J. Paul, B.J. Roell, A.P. Wydeven, R.C. Willging, R.L. Jurewicz, and D.H. Lonsway. 2009. Wolf-human conflicts and management in Minnesota, Wisconsin, and Michigan. Pp. 279-350. In A.P. Wydeven, T.R. van Deelen, and E.J. Heske (eds.), *Recovery of gray wolves in the Great Lakes Region of the United States: an endangered species success story*. New York: Springer.
- Seip, D.R. 1991. Predation and caribou populations. *Rangifer*, Special Issue 7:46-52.
- Sellers, R.A. 1999. Southern Alaska Peninsula. Pp. 47-54. In M.V. Hicks (ed.), *Caribou herd management progress report of survey–inventory activities*. Juneau, AK: Alaska Department of Fish and Game.
- Sellers, R.A. 2001. Unit 10 caribou management report. Pp. 50-58. In C. Healy (ed.). *Caribou management report of survey and inventory activities 1 July 1998-30 June 2000*. Juneau, AK: Alaska Dept of Fish and Game.
- Sellers, R.A., P. Valkenburg, R.C. Squibb, B. Dale, and R.L. Zarnke. 2003. Natality and calf mortality of the Northern Alaska Peninsula and Southern Alaska Peninsula caribou herds. *Rangifer*, Special Issue 14:161-166
- Sekora, P. 1971. Unimak Island Wilderness Study, Aleutian Islands National Wildlife Refuge, Third Judicial District, Alaska: Wilderness Study Report, U.S. Department of the Interior, U.S. Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife [Washington or AK?]
- Skoog, R.O. 1968. Ecology of caribou (*Rangifer tarandus granti*) in Alaska. Ph.D. dissertation, University of California, Berkeley.
- Sowl, K. 2003. 2002 Aerial brown bear surveys on the Southern Alaska Peninsula and Unimak Island, U.S. Fish and Wildlife Service. Unpublished report, March 11, 2003. Cold Bay, AK: Izembek National Wildlife Refuge.
- Talbot, S.S., W.B. Schofield, S.L. Talbot and F.J.A. Daniels, 2010. Vegetation of eastern Unalaska Island, Aleutian Islands, Alaska. *Botany* 88:366-388.

- Taylor, E.J., and K.M. Sowl. 2008. Izembek National Wildlife Refuge Final Report of the 2004 Biological Program Review. Anchorage, AK: U.S. Dept. Interior, Fish and Wildlife Service.
- U.S. Fish and Wildlife Service. 1994. Memorandum from Refuge Manager, Izembek National Wildlife Refuge, to Associate Manager, Refuges and Wildlife, Region 7. "Wolf and Wolverine Numbers on Refuge Lands." Dated January 4, 1994. Copy on file, Anchorage, AK: U.S. Fish and Wildlife Service.
- U.S. Fish and Wildlife Service. 2001. National Wildlife Refuge System Biological Integrity, Diversity and Environmental Health Policy (601 FW 3) Washington, D.C.
- U.S. Fish and Wildlife Service. 2002. Steller's Eider recovery plan. Fairbanks, AK: U.S. Dept. Interior, Fish and Wildlife Service, Alaska Region. [On line] URL: http://ecos.fws.gov/docs/recovery_plans/2002/020930b.pdf
- U.S. Fish and Wildlife Service. 2008. Birds of conservation concern 2008. U.S. Department of Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Arlington, VA. [Online version available at <<http://www.fws.gov/>
- U.S. Fish and Wildlife Service 2009. Wilderness Stewardship Policy (610 FW 1) Washington, D.C.
- U.S. Fish and Wildlife Service. 2010. Southwest Alaska Distinct Population Segment of the Northern Sea Otter (*Enhydra lutris kenyoni*) Draft Recovery Plan. Prepared by Marine Mammal Management Office [On line] URL: http://alaska.fws.gov/fisheries/mmm/seaotters/pdf/draft_sea_otter_recovery_plan_small_file.pdf
- Valkenburg, P. 1998. Herd size, distribution, harvest, management issues, and research priorities relevant to caribou herds in Alaska. Rangifer Special Issue 10:125-130.
- Valkenburg, P., R.A. Sellers, R.C. Squibbs, J.D. Woolington, A.R. Aderman, and B.W. Dale. 2003. Population dynamics of caribou herds in southwestern Alaska. Rangifer, Special Issue 14:131-142.
- Watts, D. 2010. Summary of Unimak Island Caribou Herd Survey. Fish and Wildlife Service internal memorandum. Anchorage, AK: U.S. Dept. Interior, Fish and Wildlife Service.
- Wittmer, H.U., A.R.E. Sinclair, and B.N. McLellan. 2005. The role of predation in the decline and extirpation of woodland caribou. Oecologia 144:257-267.
- Zittlau, K. 2004. Population genetic analyses of North American caribou (*Rangifer tarandus*). Ph.D. dissertation, University of Alberta, Edmonton.

APPENDIX A
LIST OF PREPARERS
AND
REVIEWERS

Page intentionally left blank

APPENDIX A

LIST OF PREPARERS AND REVIEWERS

Preparers

Gap Solutions Inc.: Dave Allen, Jean Cochrane, Dick Munoz, and Roger Stone

Lead Reviewer

U.S. Fish and Wildlife Service: John Martin, Regional Refuge Ecologist

Reviewers

U.S. Fish and Wildlife Service: Todd Logan, Christine Peterson, Helen Clough, Stephanie Brady, Danielle Jerry, Gary Edwards, Dom Watts, Vernon Byrd, and Jessica Edmondson

Office of Subsistence Management: Pete Probasco, Poly Wheeler, Cole Brown, and Chuck Ardizzone

Fisheries and Ecological Services (Endangered Species): Judy Jacobs

U.S. Geological Survey: Layne Adams

Alaska Department of Fish and Game: Brad Palach, Bruce Dale, and Lem Butler

Page intentionally left blank

APPENDIX B

**CONSULTATION
AND
COORDINATION**

Page intentionally left blank

APPENDIX B – CONSULTATION AND COORDINATION

Agencies, Organizations and Individuals Consulted

U.S. Fish and Wildlife Service: Geoff Haskett, Laverne Smith, Gary Edwards, Todd Logan, John Martin, Pete Probosco, Mike Boylan, Ellen Lance, Helen Clough, Danielle Jerry, Debbie Corbett, Nancy Hoffman, Judy Jacobs, Christine Peterson, Mike Boylan, Larry Bell, Theo Matuskowitz, Brad Scotton, Chuck Ardizzone, Coleen Brown, Franz Muller, Stephen Talbot, Vernon Byrd, Brian Anderson, Jessica Edmondson.

Alaska Department of Fish and Game: Lem Butler, Brad Palach, Tina Cunning, and Bruce Dale

Alaska Native Organizations: Isonotski Corporation

Government Entities: City of False Pass, Kodiak/Aleutians Subsistence Regional Advisory Council (Della Trumble, Patrick Holmes, Tom Schwantes, Richard Koso), Department of Natural Resources Division of Coastal and Ocean Management, Citizen Advisory Commission on Federal Lands

Non-Governmental Organizations: Defenders of Wildlife (Teresa Fiorino), Safari Club International (Eddie Grasser), The Wilderness Society (Nicole Whittington-Evans), Friends of Alaska National Wildlife Refuges (Wendy Loya), and Alaska Audubon Society (John Schoen)

Individuals: Tom Hoblet, Richard Nelson, J. Kurnik, Jim Sackett, Christopher Emrick, Jan Kemmerer, M. Hartzell, Audry and Peter Hadfield, Duane Howe, Raymond Weldon, Mike Williams, Nicole Hoblet, Cindy Behmer, Issac Hoblet, Ruth Hoblet

Consultation and Public Participation

The ADF&G was a cooperating agency with the Service in accordance with NEPA guidelines to assist in the development of the EA. In meetings held in Cold Bay and Anchorage, Alaska, in September 2010 the Service consulted with stakeholders among subsistence and recreational users, and other wildlife conservation interest groups. A newsletter announcing the implementation of the development of an Environmental Assessment was mailed in early September 2010 to nearly 800 individuals and organizations. A total of 18 comments were received from this effort. Following the public comment period from the release of this Environmental Assessment, a decision by the Service on the findings will be made by February 2011.

Page intentionally left blank

APPENDIX C

**ALASKA BOARD OF GAME
UNIMAK WOLF MANAGEMENT AREA**

Page intentionally left blank

APPENDIX C – ALASKA BOARD OF GAME, UNIMAK WOLF MANAGEMENT AREA (5AAC 92.125 Intensive Management Plans)

(I) Unimak Wolf Management Area. Notwithstanding any other provisions in this title, and based on the following information contained in this subsection, the commissioner or the commissioner's designee may conduct a wolf population reduction or wolf population regulation program on Unimak Island in Unit 10:

- (1) the Unimak Wolf Management Area is established to reverse the population decline and facilitate population growth of the Unimak caribou herd (UCH) on Unimak Island in Unit 10; the UCH has been identified as an important resource for subsistence and other uses; the Unimak Wolf Management Area includes all of Unimak Island, encompassing approximately 1,571 square miles; active control will be confined to an area that is approximately 900 square miles and includes 57% of the lands within the management area;
- (2) the discussion of wildlife populations and human use information is as follows:
 - (A) the UCH population information is as follows:
 - (i) the UCH has occupied Unimak Island throughout recorded history and was estimated at 5,000 caribou in 1975; the UCR population size was estimated to include 1,200 caribou in 2002 before entering a population decline; the most recent estimate of herd size was 400 caribou based on surveys conducted by Izembek National Wildlife Refuge staff in February 2010;
 - (ii) the cause of the UCH population decline was not investigated initially; however, low caribou calf survival is the primary cause of the decline currently;
 - (iii) calf ratios in October averaged 5.5 calves per 100 cows during the period of 2005 - 2009 (range 3 - 7 calves);
 - (iv) bull ratios declined from 45 bulls per 100 cows to 5 bulls per 100 cows during the period of 2005 - 2009; the decreased bull ratio is attributed to the lack of calf recruitment and cannot be explained by caribou harvests;
 - (v) pregnancy rates of cows that were 24 months of age or older decreased from 85% in 2008 (n=113) to 68% in 2009 (n=40); the decreased pregnancy rate is attributed to the inability of some reproductive females to find mates for breeding, which is caused by the low bull ratio;
 - (vi) adult female caribou in the UCH have excellent body condition based on a study conducted in 2009; nutrition and range conditions are not limiting reproduction or caribou survival;
 - (vii) harvestable surplus is estimated to be 0 caribou based on chronic poor calf recruitment and reduced bull ratio;
 - (viii) state and federal caribou hunts were closed in 2009 due to the continued population decline and low calf recruitment; the closure remains in place as of 2010;
 - (B) the predator population and human use information is as follows:
 - (i) wolves are a major predator of caribou on Unimak Island;
 - (ii) research into the causes of caribou calf mortality indicates that wolf predation is a major cause of caribou calf deaths during the first two weeks of life and wolves continue to be a major predator throughout the year; wolf predation was the primary cause of calf deaths in the adjacent Southern Alaska Peninsula caribou herd in Unit 9(D); the removal of 20 adult wolves from caribou calving grounds in Unit 9(D) during two years of a wolf predation management program increased caribou calf survival from one 1-71%;

- (iii) wolf density on the Alaska Peninsula is estimated at seven wolves per 1,000 square kilometers; wolf densities in the Unimak Wolf Management Area is thought to be similar based on observations made by biologists during caribou surveys; anecdotal evidence obtained from pilots, hunters, and local residents indicates that wolves are abundant throughout the area;
 - (iv) no wolf surveys have been conducted in the Unimak Wolf Management Area; wolves are frequently observed in the UCH calving ground; the Unimak Wolf Management Area is thought to include 15 - 30 wolves in two to five packs based on ungulate biomass and densities of nearby populations;
 - (v) an average of two wolves (range of 0 - 4 wolves) have been harvested annually in the Unimak Wolf Management Area;
 - (vi) brown bears are considered to be an important predator of caribou on the Alaska Peninsula and on Unimak Island; while brown bears have been known to kill adult caribou opportunistically, brown bears are regarded as an effective predator of calves during the first 10 days of life;
 - (vii) research into the causes of caribou calf mortality indicates that brown bears can be an important predator of caribou calves during the first two weeks of life; brown bear predation was a less important cause of caribou calf mortality than wolf predation in the adjacent Northern Alaska Peninsula caribou herd in Units 9(C) and 9(E) and Southern Alaska Peninsula caribou herd in Unit 9(D), which have similar ecosystems;
 - (viii) brown bears are considered abundant on Unimak Island; the brown bear density is 100 bears per 1,000 square kilometers in the Unimak Wolf Management Area;
 - (ix) brown bear harvests in the Unimak Wolf Management Area have averaged 10 brown bear annually from 2000 - 2008;
- (3) predator and prey population levels and objectives and the basis for those objectives are as follows:
- (A) the management population objective for the UCH is to maintain a population of 1,000 caribou with a bull ratio of at least 35 bulls: 100 cows; the amount necessary for subsistence is 100 - 150 caribou annually and includes caribou harvested from the Southern Alaska Peninsula caribou herd in Unit 9(D); the caribou harvest objective required to meet the amount necessary for subsistence has not been met for 18 years; management objectives were established based on historic information regarding population numbers, habitat limitations, human use, and sustainable harvests; hunting seasons for the UCH were closed in March 2009; the UCH population contained a minimum of 400 caribou in February 2010;
 - (B) the wolf population objective for Unimak Island is to maintain a population of 8 - 15 wolves;
 - (C) the brown bear population objective for Unit 10 is to maintain a high density bear population with a sex and age structure that can sustain a harvest composed of at least 60% males; the brown bear population objective for Unit 10 is currently being met;
- (4) justification, objectives, and thresholds for the predator management implementation plan are as follows:
- (A) justification for the Unimak Wolf Management Area is based on the board's recognition of the UCH as being important for providing caribou for human consumptive use including subsistence; the board established objectives for population size and composition in Unit 10 consistent with multiple use and principles of sound conservation and management of habitat and all wildlife species in the area;

- (B) the objectives of the program are to halt the decline of the UCH and to achieve a sex and age structure that will sustain the population; the goal of this program is to reduce the number of wolves in a specified control area that demonstrates a history of repeated use by caribou; the control area includes all lands on Unimak Island that are west of the 164 degree West line of longitude; the control area includes 900 square miles and includes approximately 57% of the lands within the Unimak Wolf Management Area; the Department and the United States Fish and Wildlife Service are exploring the possibility of transplanting caribou bulls onto the island in order to improve the bull to cow ratio; wolf predation control is likely to be necessary in order to afford additional protection to these bulls and resulting calves;
- (C) the commissioner may initiate the reduction of wolf numbers in the Unimak Wolf Management Area according to the following thresholds:
- (i) the caribou population is below management objectives established by the board;
 - (ii) nutrition is not considered to be the primary factor limiting caribou population growth;
 - (iii) calf recruitment is an important factor limiting population growth and calf survival during the first four weeks of life is less than 50%;
- (D) the commissioner may continue to reduce wolf numbers in the Unimak Wolf Management Area until the following thresholds can be met without the benefit of wolf reduction:
- (i) the bull ratio can be sustained within management objectives and the fall calf ratio can be sustained above 25 calves per hundred cows;
 - (ii) the population can grow at a sustained rate of 5% annually;
 - (iii) harvest objectives can be met;
- (E) the commissioner will suspend the wolf reduction program if the following conditions are observed pending further review by the board to determine if the program can be modified to achieve the objectives of this program before reinstating the program, except that hunting and trapping by the public specified in other sections of this title may continue and are not subject to this subparagraph:
- (i) caribou nutritional indices such as pregnancy rates, calf and adult body mass, or other condition indices exhibit a declining trend from current values and the bull ratio is greater than 20 bulls: 100 cows;
 - (ii) fall caribou calf ratios remain below 20 calves per 100 cows for three consecutive years of wolf removal from the Unimak Wolf Management Area;
 - (iii) the bull ratio remains below the caribou population objectives and does not increase for three consecutive years of wolf removal from the Unimak Wolf Management Area;
 - (iv) the wolf population is reduced to two breeding pairs;
- (F) the wolf population objective for the Unimak Wolf Management Area is to reduce wolf numbers in the control area on Unimak Island in Unit 10 to the wolf population objective while maintaining at least two breeding pairs; wolves will not be removed from 43% of the lands within the management area that are outside the boundaries of the control area; because wolves will not be removed from all lands within the management area, logistic limitations prohibit public access to the majority of lands within the management area, wolf harvest by the public is low, and only wolves thought to be killing caribou calves will be removed, only a portion of the wolf population on Unimak Island will be affected by the management activities authorized by this plan; if the wolf population inadvertently declines to fewer than two breeding pairs, wolves may be translocated to the island from an adjacent population;

- (G) reduction of predators by humans is necessary to stop the caribou population decline and to promote population recovery;
- (H) reduction of wolf numbers in the prescribed control area is expected to increase caribou calf survival and recruitment and increase the caribou bull ratio to management objectives;
- (I) reduction of bear numbers remains problematic due to the high density of brown bears in Unit 10, logistical limitations, and competing management priorities;
- (5) the authorized methods and means used to take wolves are as follows:
 - (A) hunting and trapping of wolves by the public in treatment areas during the term of the management program may occur as provided in the hunting and trapping regulations set out elsewhere in this title;
 - (B) the commissioner may issue public aerial shooting permits, public land and shoot permits, or ground-based shooting permits, or allow agents of the state, or Department employees to conduct aerial, land and shoot, or ground-based shooting as a method of wolf removal under AS 16.05.783 , including the use of any type of aircraft;
 - (C) the commissioner may authorize the use of state employees or agents or state owned, privately owned, or charter equipment, including helicopters, as a method of wolf removal under AS 16.05.783 ;
- (6) the anticipated time frame and schedule for update and reevaluation are as follows:
 - (A) for up to 10 years beginning May 16, 2010, the commissioner may reduce the wolf populations in the Unimak Wolf Management Area;
 - (B) annually the Department shall, to the extent practicable, provide to the board a report of program activities conducted during the preceding 12 months, including implementation activities, the status of caribou and wolf populations, and recommendations for changes, if necessary to achieve the objectives of the plan;
- (7) other specifications that the board considers necessary:
 - (A) the commissioner shall suspend wolf control activities
 - (i) when prey population management objectives are obtained;
 - (ii) predation management objectives are met;
 - (iii) upon expiration of the period during which the commissioner is authorized to reduce predator numbers in the predator control plan area;
 - (B) the commissioner shall annually close wolf hunting and trapping seasons as appropriate to ensure that the minimum wolf population objectives are met.

APPENDIX C continued – ADF&G Proposal to Modify the ALASKA BOARD OF GAME, UNIMAK WOLF MANAGEMENT AREA (Modify 5 AAC 92.125. Predation Control Areas Implementation Plans), during the Spring 2011 Meeting

Part B – Predation control plan for Unit 10, Unimak Island:

5 AAC 92.125 is amended by to read:

(1) Unimak Wolf Management Area. Notwithstanding any other provisions in this title, and based on the following information contained in this subsection, the commissioner or the commissioner's designee may conduct a wolf population reduction or wolf population regulation on Unimak Island in Unit 10:

(1) The Unimak Wolf Management Area is established to reverse the population decline and facilitate population growth of the Unimak caribou herd (UCH) on Unimak Island in Unit 10; the UCH has been identified as an important resource for subsistence and other uses; the Unimak Wolf Management Area includes all of Unimak Island, encompassing approximately 1,571 square miles; active control will be confined to an area that is approximately [900] **800** square miles and includes [57] **50** percent of the lands within the management area;

(2) the discussion of wildlife populations and human use information is as follows:

(A) the UCH population information is as follows:

(i) the UCH has occupied Unimak Island throughout recorded history and was estimated at 5,000 caribou in 1975; the UCH population size was estimated to include 1,200 caribou in 2002 before entering a population decline; the most recent estimate of herd size was 400 caribou based on surveys conducted by Izembek National Wildlife Refuge staff in February 2010; **research studies indicate that the UCH is a unique population that does not have significant interchange with adjacent caribou population;**

(ii) in the cause of the UCH population was not investigated initially; however low caribou calf survival is the primary cause of the decline since currently;

(iii) calf ratios in October averaged 5.5 calves:100 cows during the period of 2005 - 2009 (range 3 - 7);

(iv) bull ratios declined from 45 bulls per 100 cows to 5 bulls per cows during the period of 2005 to 2009; the decreased bull ratio is attributed to the lack of calf recruitment and cannot be explained by caribou harvests;

(v) pregnancy rates of cows that were 24 months of age or older decreased from 85 percent in 2008 (n=113) to 68 percent in 2009 (n=40); the decreased pregnancy rate is attributed to the inability of some reproductive females to find mates for breeding, which is cause by the low bull ratio;

(vi) adult female caribou in the UCH have excellent body condition based on a study conducted in 2009; nutrition and range conditions are not limiting reproduction or caribou survival;

(vii) harvestable surplus is estimated to be 0 caribou based on chronic poor calf recruitment and reduced bull ratio;

(viii) state and federal caribou hunts were closed in 2009 due to the continued population decline and low calf recruitment; the closure remains in place as of 2010;

(B) the predator population and human use information is as follows:

(i) wolves are a major predator of caribou in the Unimak Wolf Management Area;

(ii) research into the causes of caribou calf mortality indicates that wolf predation is a major cause of caribou calf deaths during the first two weeks of life and wolves

- continue to be a major predator throughout the year; wolf predation was the primary cause of calf deaths in the adjacent Southern Alaska Peninsula caribou herd in Unit 9D; the removal of 20 adult wolves from the caribou calving grounds in Unit 9D during two years of a wolf predation management program increased caribou calf survival from 1 percent to 71 percent;
- (iii) wolf density on the Alaska Peninsula is estimated at seven wolves per 1,000 square kilometers; wolf densities in the Unimak Wolf Management Area is thought to be similar based on observations made by biologists during caribou surveys; anecdotal evidence obtained from pilots, hunters, and local residents indicates that wolves are abundant throughout the area;
 - (iv) no wolf surveys have been conducted in the Unimak Wolf Management Area; **research into the movement of wolves documented the movement of a wolf from the mainland to Unimak Island;** wolves are frequently observed within the UCH calving ground; the Unimak Wolf Management Area is thought to include 15 to 30 wolves and in two to five packs based on ungulate biomass and densities of nearby populations;
 - (v) an average of two wolves (range of 0-4 wolves) have been harvested annually in the Unimak Wolf Management Area;
 - (vi) brown bears are considered to be an important predator of caribou on the Alaska Peninsula and on Unimak Island; while brown bears have been known to kill adult caribou opportunistically, brown bears are regarded as an effective predator of calves during the first 10 days of life;
 - (vii) research into the causes of caribou calf mortality indicates that brown bears can be an important predator of caribou calves during the first two weeks of life; brown bear predation was a less important cause of caribou calf mortality than wolf predation in the adjacent Northern Alaska Peninsula caribou herd in Units 9(C) and 9(E) and the Southern Alaska Peninsula caribou herd in Unit 9(D), which have similar ecosystems;
 - (viii) brown bears are considered abundant on Unimak Island; the brown bear density is 100 bears per 1,000 square kilometers in the Unimak Wolf Management Area;
 - (ix) brown bear harvests in the Unimak Wolf Management Area have averaged 10 brown bear annually from 2000-2008;
- (3) predator and prey population levels and objectives and the basis for those objectives are as follows:
- (A) the management population objective for the UCH is to maintain a population of 1,000 caribou with a bull ratio of at least 35 bulls:100 cows; the amount necessary for subsistence is 100 - 150 caribou annually and includes caribou harvested from the Southern Alaska Peninsula caribou herd in Unit 9(D); the caribou harvest objective required to meet the amount necessary for subsistence has not been met for 18 years; management objectives were established based on historic information regarding population numbers, habitat limitation, human use, and sustainable harvests; hunting seasons for the UCH were closed March 2009; the UCH population contained a minimum of 400 caribou in February 2010;
 - (B) the wolf population objective for Unimak Island is to maintain a population of 8 – 15 wolves;
 - (C) the brown bear population objective for Unit 10 is to maintain a high density bear population with a sex and age structure that can sustain a harvest composed of at least 60 percent males; the brown bear population objective for Unit 10 is currently being met;

(4) justification, objectives, and thresholds for the predator management implementation plan are as follows:

- (A) justification for the Unimak Wolf Management Area is based on the board's recognition of the UCH as being important for providing caribou for human consumptive use including subsistence; the board established objectives for population size and composition in Unit 10 consistent with multiple use and principles of sound conservation and management of habitat and all wildlife species in the area;
- (B) the objectives of the program are to halt the decline of the UCH and to achieve a sex and age structure that will sustain the population; the goal of this program is to reduce the number of wolves in a specified control area that [DEMONSTRATES A HISTORY OF REPEATED USE BY] **is actively used by caribou for calving**; the control area [INCLUDES ALL LANDS ON UNIMAK ISLAND THAT ARE WEST OF THE 164 DEGREE WEST LINE OF LONGITUDE] **will be defined annually by the Department based on the distribution of calving**; the control area includes [900] **800** square miles and includes approximately [57] **50** percent of the lands within the Unimak Wolf Management Area; the Department and the United States Fish and Wildlife Service are exploring the possibility of transplanting caribou bulls onto the island in order to improve the bull to cow ratio; wolf predation is likely to be necessary in order to afford additional protection to these bulls and resulting calves;
- (C) The commissioner may initiate the reduction of wolf numbers in the Unimak Wolf Management Area according to the following thresholds:
 - (i) the caribou population is below management objectives established by the board;
 - (ii) nutrition is not considered to be the primary factor limiting caribou population growth;
 - (iii) calf recruitment is an important factor limiting population growth and calf survival during the first four weeks of life is less than 50;
- (D) the commissioner may continue to reduce wolf numbers in the Unimak Wolf Management area until the following thresholds can be met without the benefit of wolf reduction:
 - (i) the bull ratio can be sustained within management objectives and the fall calf ratio can be sustained above 25 calves per cows;
 - (ii) the population can grow at a sustained rate of five percent annually;
 - (iii) harvest objectives can be met;
- (E) the commissioner will suspend the wolf reduction program if the following conditions are observed pending further review by the board to determine if the program can be modified to achieve the objectives of this program before reinstating the program, except that hunting and trapping by the public specified in other sections of this title may continue and are not subject to this subparagraph:
 - (i) caribou nutritional indices such as pregnancy rates, calf and adult body mass, or other condition indices exhibit a declining trend from current values and the bull ratio is greater than 20 bulls:100 cows;
 - (ii) fall caribou calf ratios remain below 20 calves per100 cows for three consecutive years of wolf removal from the Unimak Wolf Management Area;
 - (iii) the bull ratio remains below the caribou population objectives and does not increase for three consecutive years of wolf removal from the Unimak Wolf Management Area;
 - (iv) the wolf population is reduced to two breeding pairs;
- (F) the wolf population objective for the Unimak Wolf Management Area is to reduce wolf numbers in the control area on Unimak Island in Unit 10 to the wolf population

- objective while maintaining at least two breeding pairs; wolves will not be removed from [43] **50** percent of the lands within the management area that are outside the boundaries of the control area **to maintain the wolf population on Unimak Island**; because wolves will not be removed from all lands within the management area, **wolf movement from the mainland to Unimak Island has been observed**, logistic limitations prohibit public access to the majority of lands within the management area, wolf harvest by the public is low, and only wolves thought to be killing caribou calves will be removed, [ONLY A PORTION OF] the **viability of the** wolf population on Unimak Island [WILL] **should not** be affected by the management activities authorized by this plan; if the wolf population inadvertently declines to fewer than two breeding pairs, wolves may be translocated to the island from an adjacent population;
- (G) reduction of predators by humans is necessary to stop the caribou population decline and to promote population recovery;
 - (H) reduction of wolf numbers in the prescribed control area is expected to increase caribou calf survival and recruitment and increase the caribou bull ratio to management objectives;
 - (I) reduction of bear numbers remains problematic due to the high density of brown bears in the Unit 10, logistical limitations, and competing management priorities;
- (5) the authorized methods and means used to take wolves are as follows:
- (A) hunting and trapping of wolves by the public in treatment areas during the term of the management program may occur as provided in the hunting and trapping regulations set out elsewhere in this title;
 - (B) the commissioner may issue public aerial shooting permits, public land and shoot permits, or ground-based shooting permits, or allow agents of the state or Department employees to conduct aerial, land and shoot, or ground-based shooting as a method of wolf removal under AS 16.05.783, including the use of any type of aircraft;
 - (C) the commissioner may authorize the use of state employees or agents or state owned, privately owned, or charter equipment, including helicopters, as a method of wolf removal under AS 16.05.783;
- (6) the anticipated time frame and schedule for update and reevaluation are as follows:
- (A) for up to 10 years beginning July 1, 2010, the commissioner may reduce the wolf populations in the Unimak Wolf Management Area;
 - (B) annually the Department shall, to the extent practicable, provide to the board a report of program activities conducted during the preceding 12 months, including implementation activities, the status of caribou and wolf populations, and recommendations for changes, if necessary to achieve the objectives of the plan;
- (7) other specifications that the Board considers necessary:
- (A) the commissioner shall suspend wolf control activities
 - (i) when prey population management objectives are obtained;
 - (ii) predation management objectives are met;
 - (iii) upon expiration of the period during which the commissioner is authorized to reduce predator numbers in the predator control plan area;
 - (B) the commissioner shall annually close wolf hunting and trapping seasons as appropriate to ensure that the minimum wolf population objectives are met.

ISSUE: The Unimak Caribou herd is declining and can no longer support use by resource users. The population's sex ratio and calf ratio are extremely low and are not expected to improve without active management of predators.

This proposal extends the wolf hunting and trapping season on Unimak Island and expands the area in which the ADF&G is authorized to conduct wolf control on the island. The ADF&G will annually select the active control area based on the current caribou calving distribution and limit the size of the active control area to no more than 50 percent of the island. Wolves occupying the remainder of the island will not be removed to aid in protecting and maintaining the wolf population.

Extension of the wolf hunting and trapping seasons will allow for additional harvest by the public at a time crucial for survival of caribou calves. The season extensions will provide the public additional opportunity to, in some measure, compensate for the delayed activation of targeted wolf reduction plan.

The season extensions under normal methods and means will probably not provide the level of mitigation necessary to meet board objectives for caribou calf survival and recruitment. However, the season extensions could serve to mitigate the declining trend in calf survival and recruitment. While normally there would be little expectation of increased wolf harvests under an extended hunting and trapping season, members of the public, including local hunters, have indicated they would undertake such efforts if it would benefit the caribou population.

The recommended changes in the Unimak Wolf Management Program are based on observations made during the 2010 field season. During the 2010 field season a significant number of caribou were observed calving outside of the currently authorized, wolf control area. Caribou calves born outside of the control area would not have received adequate protection if the program had been implemented and would be expected to die at a very high rate. The loss of these calves from the population increases the amount of time required to achieve the goals of this program and restore hunting opportunity.

The Unimak wolf management program is designed to increase caribou calf survival rates to facilitate herd recovery while simultaneously providing protection to the wolf population on Unimak Island. In this program wolves are selectively removed from calving areas during the period in which calves are most vulnerable to predation to increase calf survival. The method used to increase calf survival does not require the removal of all wolves from the wolf control area. The overall effectiveness of the program and duration of time over which the program must be executed depends solely on the removal of wolves actively preying on calves.

Because the wolf removal method in the management plan is not designed to remove all wolves from the control area, because the active control area will be limited to 50 percent of the island, and because the wolf population Unimak Island does not appear isolated from the adjacent mainland wolf population, authorizing the wolf control area to anywhere within the Unimak Management Area does not jeopardize the wolf population in and of itself. Steps will be taken to assure that the wolves persist on Unimak Island after the program has ended.

WHAT WILL HAPPEN IF NOTHING IS DONE? If the boundary is not adjusted caribou calves born outside of the control area will not be protected by this program and their survival rates are expected to remain low. The loss of these calves will increase the amount of time required to achieve the objectives of this program.

WILL THE QUALITY OF THE RESOURCE HARVESTED OR PRODUCTS PRODUCED BE IMPROVED? Expanding the wolf control area to the entire island is

expected to increase the effectiveness of the program and promote herd recovery. Harvest opportunity will be restored when the herd has recovered sufficiently to allow hunting.

WHO IS LIKELY TO BENEFIT? Future hunters

WHO IS LIKELY TO SUFFER? None

OTHER SOLUTIONS CONSIDERED? None

PROPOSED BY: Alaska Department of Fish and Game

LOG NUMBER: ADFG113010L

APPENDIX D

**DRAFT
MINIMUM REQUIREMENTS ANALYSIS
FOR ACTIONS IN
CONGRESSIONALLY DESIGNATED WILDERNESS**

Page intentionally left blank

APPENDIX D – DRAFT MINIMUM REQUIREMENTS ANALYSIS FOR ACTIONS IN CONGRESSIONALLY DESIGNATED WILDERNESS

Minimum Requirements Analysis for Management Alternatives for the Unimak Island Caribou Herd Unimak Wilderness Area, Alaska Maritime National Wildlife Refuge

The U.S. Fish and Wildlife Service (Service) policy identifies five key principles for administering wilderness, including:

610 FW 1.14(D). Use restraint in our administration of wilderness. As a place “where the earth and its community of life are untrammelled by man,” we minimize actions for administration of wilderness areas. We may allow exceptions to the generally prohibited uses if the uses are the minimum requirement for administering the area as wilderness and are necessary to accomplish the purposes of the refuge, including Wilderness Act purposes. We may limit even nonmotorized refuge management activities to protect wildness.

The Service determines “minimum requirements” by conducting a Minimum Requirements Analysis (MRA). An MRA is defined as:

610 FW 1.5(M). A decisionmaking process, documented in writing, that we use to determine if proposed refuge management activities conducted in wilderness are necessary to administer the area as wilderness and to accomplish the purposes of the refuge, including Wilderness Act purposes. If the activities are necessary, the MRA also describes how to minimize resultant impacts.

The Service conducted an MRA of management alternatives for the Unimak Island caribou herd using the Minimum Requirements Decision Guide (MRDG) developed by the Arthur Carhart National Wilderness Training Center (<http://www.wilderness.net/index.cfm?fuse=MRDG>). The MRDG involves two steps: (1) determine if any administrative action is necessary, and then if “yes,” (2) determine the minimum activity needed to meet the requirement.

The Service has completed Step 1 of the MRDG to determine if action is necessary to address the declining Unimak caribou herd. The Service concluded that action is indeed necessary to meet the Refuge’s ANILCA purpose to conserve fish and wildlife populations and habitats in their natural diversity.

Page intentionally left blank

APPENDIX D continued – DRAFT MINIMUM REQUIREMENTS ANALYSIS FOR ACTIONS IN CONGRESSIONALLY DESIGNATED WILDERNESS



ARTHUR CARHART NATIONAL WILDERNESS TRAINING CENTER

MINIMUM REQUIREMENTS DECISION GUIDE WORKSHEETS

“ . . . except as necessary to meet minimum requirements for the administration of the area for the purpose of this Act...”

– the Wilderness Act, 1964

Step 1: Determine if any administrative action is necessary.

Description: Briefly describe the situation that may prompt action.

In 2009, all hunting for caribou on Unimak Island, including subsistence hunting, was suspended for conservation reasons. While caribou herds throughout Alaska commonly undergo major fluctuations in population size, the current downward trend of the UCH may be noncyclic and irreversible without management intervention. Since 2005, there has been little calf recruitment into the UCH, and it now has an unusually low number of male caribou in proportion to females. From 2002 through 2009, the UCH declined from a population of approximately 1,261 to the present low of 400. While multiple factors (e.g., nutrition and habitat condition, disease, climate change, predation, and hunting) may have contributed to the recent UCH decline, predation is at least a major explanation. Other than suspension of caribou hunting, predation is the one factor that management intervention is best able to address in order to improve the UCH numbers in the future. To prevent the loss of the UCH, or a prolonged period with a depleted population, the Alaska Department of Fish and Game (ADF&G) proposes to reduce predation by wolves on the UCH for a period of time sufficient to allow the herd to stop declining and begin to recover to a sustainable harvest level for subsistence users. The U.S. Fish and Wildlife Service (Service) has prepared this Environmental Assessment (EA) to analyze management options associated with the ADF&G’s proposed action.

To determine if administrative action is necessary, answer the questions listed in A - F on the following pages.

A. Describe Options Outside of Wilderness

Yes: No:

Explain: The Unimak Island Wilderness area encompasses approximately 92% of the island, and nearly all of the UCH range. Therefore, any predator control action intended to benefit the UCH must necessarily occur within the wilderness area. There is no opportunity to conduct an effective predator control action on the remaining 8% of Unimak Island.

B. Describe Valid Existing Rights or Special Provisions of Wilderness Legislation

Is action necessary to satisfy valid existing rights or a special provision in wilderness legislation (the Wilderness Act of 1964 or subsequent wilderness laws) that allows consideration of the Section 4(c) prohibited uses? Cite law and section.

Yes: No: Not Applicable:

C. Describe Requirements of Other Legislation

Yes: No: Not Applicable:

Explain: Alaska National Interest Lands Conservation Act (ANILCA) established the Alaska Maritime National Wildlife Refuge and designated the Unimak Island Wilderness. The purposes for which the refuge was established and shall be managed include two purposes that are most applicable to the current state of the UCH. They are: (1) "... to conserve fish and wildlife populations and habitats in their natural diversity including, but not limited to ... bears, caribou, and other mammals..." and (2) "... to provide, in a manner consistent with the [former purpose] ...the opportunity for continued subsistence uses [of refuge resources] by local residents..." Since the current downward trend of the UCH may be irreversible without management intervention, a management action to restore the UCH to a sustainable level is necessary to achieve these refuge purposes.

The Fish and Wildlife Administration Act of 1966 as amended by the National Wildlife Refuge System Improvement Act of 1997 proclaims, "The mission of the [National Wildlife Refuge] System (NWRS) is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans." The Act defines the terms "conserve" and "manage" to mean, "... sustain and, where appropriate, restore and enhance, healthy populations of fish, wildlife, and plants utilizing, in accordance with applicable Federal and State laws, methods and procedures associated with modern scientific resource programs." The possible loss of the UCH due to predation warrants a management action targeting predators to fulfill the Service mission on Unimak Island.

D. Describe Other Guidance

Is action necessary to conform to direction contained in agency policy, unit and wilderness management plans, species recovery plans, or agreements with tribal, state and local governments or other federal agencies?

Yes: No: Not Applicable:

Explain: The Department of the Interior Fish and Wildlife Policy (43 CFR 24) supports the broad authorities and responsibilities of Federal and State agencies responsible for the management of the nation's fish and wildlife and promotes cooperative agency management relationships to advance scientifically based resource management programs. Thus, it is the policy of the Service, to manage the National Wildlife Refuge System, to the extent practicable and compatible with the purposes for which individual refuges were established, in accordance with State laws and regulations, comprehensive plans for fish and wildlife developed by the States, and Regional Resource Plans developed by the Fish and Wildlife Service in cooperation with the States. The Service and the ADF&G are obligated to work cooperatively and to identify an appropriate management action that prevents the loss of caribou on Unimak Island.

The Service's Biological Integrity, Diversity and Environmental Health Policy (601 FW 3) provides direction for maintaining and restoring, where appropriate, the biological integrity, diversity and environmental health of the Refuge System based on sound professional judgment. The policy directs the Service to design its wildlife population management strategies to fulfill refuge purposes, but to favor management that mimics natural processes and minimizes unnatural effects while restoring natural processes. The possible loss of the UCH due to predation warrants a management intervention that enables the Service to fulfill the goals set forth in this policy.

The Service's Wilderness Stewardship Policy (610 FW 1-5) provides guidance for managing wilderness areas within the NWRS, including specific guidance on how the Service will conserve wildlife and habitat in wilderness. For major ecosystem processes, such as predator/prey fluctuations the Service will not interfere unless necessary to accomplish refuge purposes, including Wilderness Act purposes or in cases where such processes become unnatural. Nor will the Service act to alter natural predator/prey relationships unless there is compelling evidence that the proposed action will correct or alleviate identified impacts on wildlife in compliance with the above guidance. Furthermore, control actions are to be directed at individual animals causing the problem using methods that are not likely to have an adverse effect non-target species. The possible loss of the UCH due to predation warrants action to achieve Refuge purposes on Unimak Island. A targeted intervention with good probability of success would fulfill the guidance of this policy.

In the 1982 Master Memorandum of Agreement between the Service and the ADF&G, both agencies agree to cooperate with the management of fish, wildlife and habitats in their natural diversity on the NWRS in Alaska. This agreement directs the Service and the ADF&G to work cooperatively and to identify an appropriate management action that prevents the loss of caribou on Unimak Island.

The Alaska Board of Game established by regulation (5AAC 92.125 Intensive Management Plans) in 2010 the "Unimak Island Wolf Management Area" which authorizes the ADF&G, "... to conduct a wolf population reduction or wolf population regulation program on Unimak Island...to reverse the population decline and facilitate population growth of the [UCH]... the UCH has been identified as an important resource for subsistence and other uses..."

E. Wilderness Character

Is action necessary to preserve one or more of the qualities of wilderness character including: untrammeled, undeveloped, natural, outstanding opportunities for solitude or a primitive and unconfined type of recreation, or unique components that reflect the character of this wilderness

Untrammeled: Yes: No: Not Applicable:

Explain: A management action to prevent the loss of the UCH due to predation is not necessary to preserve the untrammeled character of the Unimak Island Wilderness.

Undeveloped: Yes: No: Not Applicable:

Explain: An action to prevent the loss of the UCH due to predation is not necessary to preserve the undeveloped character of the Unimak Island Wilderness.

Natural: Yes: No: Not Applicable:

Explain: Independent of Refuge purposes, a management action to prevent the loss of the UCH due to predation may not be necessary to preserve the natural character of wilderness. Caribou herds throughout Alaska commonly undergo large swings in population size and there is evidence that the periodic loss of caribou from Unimak Island may have been within the historic and natural range of occurrence. However, the non-degradation principle from the Service's Wilderness Stewardship Policy sets the standard that the condition prevailing at the time of wilderness designation establishes a benchmark for that area's character. This standard is also consistent with the Refuge purpose to conserve fish and wildlife populations and their habitats in their natural diversity and the NWRS mission. Since the UCH has been part of the Unimak Island ecosystem since long before wilderness designation, a management action to prevent its loss now and in the future is warranted.

Outstanding opportunities for solitude or a primitive and unconfined type of recreation:

Yes: No: Not Applicable:

Other unique components that reflect the character of this wilderness:

Yes: No: Not Applicable:

Explain: Unimak Island is the only island of the Aleutian Islands with naturally occurring populations of caribou, brown bear, and wolf. Of the three species, the most is known about the UCH's distinctness as well as its traditional connection with caribou on the Alaska Peninsula in what may be a metapopulation. Management population surveys and genetic sampling support the understanding that the UCH has high fidelity to calving grounds on Unimak Island and minimal movements of individuals to and from the Alaska Peninsula. In a study to determine the genetic relationship among North American caribou herds, the UCH was found to be most closely related to the other four herds on the Alaska Peninsula, but quite distinct from all other herds. These findings are consistent with the hypothesis that Unimak caribou derived from the SAPCH, but were subsequently isolated. The reported periodic immigration of animals from the SAPCH may have contributed historically to sustaining or restoring caribou on the island during natural low fluctuations, but the genetic data indicate that immigration was not a routine component of the UCH. The possible loss of the UCH from Unimak Island due to predation warrants a management action that preserves this distinct population of caribou as a unique component of this Refuge.

F. Describe Effects to the Public Purposes of Wilderness

Is action necessary to support one or more of the public purposes for wilderness (as stated in Section 4(b) of the Wilderness Act) of recreation, scenic, scientific, education, conservation, and historical use?

Recreation: Yes: No: Not Applicable:

Explain: Not a major consideration for this action, but the UCH has provided limited opportunities for recreational hunters to harvest trophy caribou, thus its recovery to a sustainable harvest level supports a public recreation purpose.

Scenic: Yes: No: Not Applicable:

Explain: A management action to prevent the loss of the UCH will neither add nor detract from the scenic purpose of the Refuge.

Scientific: Yes: No: Not Applicable:

Explain: There is little scientific information on the life history dynamics of insular caribou herds and their relationship to predators. A management action on Unimak Island to preserve this unique herd presents an opportunity to gain scientific knowledge important for future management of the UCH and its island ecosystem.

Education: Yes: No: Not Applicable:

Explain: While this is not a major consideration for an action to prevent the loss of the UCH from Unimak Island, the knowledge gained from such an action will have educational benefits for professional resource managers as well as the general public.

Conservation: Yes: No: Not Applicable:

Explain: The Wilderness Act public purpose for conservation is supported by the Refuge purpose for maintaining species in their natural diversity. A management action to prevent the loss of the UCH from Unimak Island is warranted to achieve the Wilderness Act public purpose for conservation and the Refuge purpose for maintaining natural diversity.

Historical use: Yes: No: Not Applicable:

Explain: Subsistence hunting and recreational hunting of caribou are important historic uses of this Refuge resource on Unimak Island. These historic uses are presently suspended due to the declining trend and critically low numbers of caribou. A management action to prevent the loss of the UCH and restore it to a sustainable harvest level is warranted to preserve these historic uses.

Step 1 Decision: Is any administrative action necessary in wilderness?

Yes: No: More information needed:

Explain: Multiple factors, including hunting, habitat condition and climate change may have contributed to the recent UCH decline, but the most plausible source for poor recruitment since 2005, or at least a major explanation, is predation. Predator populations and predation rates have not been studied on Unimak Island, but the available information is consistent with wolves and bears being present at densities high enough to be responsible for most calf mortality. The capacity of predation to limit caribou calf recruitment during population declines is well established scientifically and most likely predation is at least a proximate cause for low calf survival on Unimak Island. If the current trend in low calf recruitment continues, the UCH will likely experience a prolonged period of a depleted population or be extirpated from the island. In either case, the current suspension of hunting, including subsistence hunting, would be extended indefinitely. Such a trend would also have long-term consequences for the continued presence of caribou on Unimak Island. Since predation on calves is presently the most plausible source of poor recruitment of calves into the UCH, a management action that targets the reduction of predators on the calving grounds is the most feasible management tool with the capacity to stabilize and recover the herd in the near term. Few management actions are available that are both feasible and have the capacity to directly influence caribou herd numbers in the short term. When caribou populations are at risk of extirpation, or chronic decline, predator control is an effective and efficient management tool. Predator control should markedly reduce the probability that the herd will be lost and significantly reduce the time until it increases in size such that subsistence uses are possible again. Consequently, a management action to reduce predation on the UCH is warranted in the Unimak Island Wilderness to provide the highest level of assurance (1) for achieving the Refuge purposes for species diversity and subsistence uses, (2) to preserve caribou as a unique component of this Refuge's wilderness character, and (3) to support the Wilderness Act public purposes, in particular, those for conservation and historic uses of the UCH.

If action is necessary, proceed to Step 2 to determine the minimum activity.

Step 2: Determine the minimum activity.

Description of Alternatives

For each alternative, describe what methods and techniques will be used, when the activity will take place, where the activity will take place, what mitigation measures are necessary, and the general effects to the wilderness resource and character.

Alternative A – No Action (No Predator Control)

Description: Under this alternative, the Service and the ADF&G would continue to monitor Unimak Island large mammal populations, particularly caribou, using standard monitoring techniques such as population counts, age and sex composition estimates, birth rates, and calf survival surveys, through the use of radio telemetry collars. There would be no predator management actions directed at increasing UCH numbers, other than by means of harvest regulations established by the State and Federal regulatory boards. In addition, radio collars will be maintained on up to 25 female caribou to aid in locating caribou groups, improving survey results, and evaluating the importance of nutritional limitations in regulating population growth. Nutritional limitations would continue to be evaluated using information obtained from the UCH on body condition, weight, blood samples, and herd health.

The information from monitoring large mammal populations will be used by the ADF&G and the Service to advise the Federal Subsistence Board, the Alaska Board of Game and the public on harvest

regulatory actions necessary to maintain sustainable populations of caribou, wolves, and bears. Current ADF&G objectives for Unimak Island are to maintain a wolf population of 8-15 wolves with at least 2 breeding pairs and a caribou population of 1,000 caribou. The brown bear population objective is to maintain a high-density population with a sex and age structure that will sustain a harvest composed of 60% males.

The Service will conduct research designed to add scientific information for making better decisions on the long-term management of the UCH and its habitat. By fitting 15 caribou with radio collars and using low level aerial photography and satellite imagery, the Service is planning to conduct studies to determine areas of Unimak Island used by the herd for forage, the quantity and quality of available forage, and estimates of Unimak Island's carrying capacity for the herd. The Service will also conduct an inventory of flora and fauna to develop baseline information on the diverse array of plant and animal species occurring on Unimak Island. This information will be used to identify species at risk due to human use, climate change or other factors, and target them for further research and possible management action.

Effects of Alternative A on Wilderness Character

Untrammelled: There is a small and temporary adverse effect from maintaining radio collars on caribou for monitoring, surveys, and research. Maintaining a minimum of 25 radio collars on adult female caribou to monitor the UCH requires the use of a helicopter for brief intermittent periods to capture caribou and fit them with collars, recover collars, and collect biological samples. In addition, fitting an additional 15 collars to caribou for a 2-year carrying capacity study requires additional helicopter landings for intermittent brief periods of time. These temporary interventions, using the minimum tool determined by previous analyses, will leave no permanent trace of human presence.

Undeveloped: The limited adverse effect due to intermittent helicopter landings is temporary and will leave no permanent change to the undeveloped character of the refuge.

Natural: There is a positive effect from biological inventory, monitoring, and research activities that add to the scientific knowledge for managing the Refuge's diverse array of fish, wildlife, and plant resources in their habitats. However, there would be a major negative effect if no management act is taken, to reduce predation on the UCH, and the result is the loss of the entire herd from Unimak Island.

Outstanding opportunities for solitude or a primitive and unconfined type of recreation: There is a very limited adverse effect from these management activities due to intermittent helicopter landings, survey airplanes for monitoring large mammal populations, and for fitting caribou with radio collars. To mitigate these effects, virtually all activities of this type are planned for times when visitors are not likely to be present.

Other unique components that reflect the character of this wilderness: Unimak Island is the only one of the Aleutian Islands with natural populations of caribou, brown bear, and wolf. However, Alternative A does not address the current threat to the long-term viability of the UCH. Failure to act with an appropriate and effective management intervention increases the risk of a prolonged population low or the possible loss of the entire UCH from Unimak Island. If the loss of this herd from the island does occur, it will have a significant adverse impact due to the loss of this unique component of the wilderness character of Unimak Island.

Effects of Alternative A on Heritage and Cultural Resources: There will be no effect to these resources. Unimak Island was near the southern end of the Bering land bridge and probably played an

important role in the migration of the Asiatic peoples to North America. Archaeological data show that the first inhabitants arrived in the area about 6,000 years ago. At the time of European contact, the region supported some of the most politically complex and sedentary hunter-gatherers known to anthropology. As a consequence of long occupation, there are numerous archaeological sites on Unimak Island, particularly along the coastline and lagoons. Maps of known archaeological sites are available from the Service should it be necessary for Service or ADF&G field staff to be aware of their presence when making helicopter landings, particularly in coastal areas.

Effects of Alternative A on Maintaining Traditional Skills: There will be no effect.

Effects of Alternative A on Special Provisions: There is no effect.

Effects of Alternative A on Economic and Time Constraints: No additional cost beyond inflationary increases to annual operating budgets for the Service and the ADF&G are necessary to continue this alternative. However, this alternative does not address the urgency for management action to avoid the risk of a prolonged population low or the possible loss of the entire UCH from Unimak Island.

Effects of Alternative A on Additional Wilderness-specific Comparison Criteria: None identified.

Effects of Alternative A on Safety of Visitors, Personnel, and Contractors: Fish and wildlife management activities on Alaska refuges, using aircraft in remote locations, are inherently hazardous. To mitigate for these hazards, Service mission activities must use only Department of the Interior, Office of Aircraft Safety, approved aircraft and pilots. Service employees and contract employees are required to take a wide array of safety training such as radio communications, aircraft safety, firearms safety, bear safety, wilderness survival and first aid. The ADF&G, while not bound to the same Federal requirements, has similar requirements for its personnel. There are no safety concerns for visitors from these management activities.

Alternative B: Helicopter-supported Selective Predator Management with Calf Mortality Study (ADF&G Proposed Action)

Description: In addition to the ongoing management and research activities in Alternative A, the No Action alternative, the ADF&G would conduct a wolf management action by shooting wolves from a helicopter, when the wolves are found on the calving grounds following calf predation events during the peak calving period. The calving grounds are almost entirely within the control area described in the Alaska Board of Game regulation that established the Unimak Wolf Management Area (see Appendix C). The control area includes all lands on Unimak Island that are west of the 164 degree West longitude, which is approximately 57% of the Unimak Wolf Management Area that encompasses all of Unimak Island. Aerial reconnaissance, aided by female caribou with radio collars deployed to assist in monitoring pregnancy rates and annual herd composition surveys, would be the primary means for assessing calving activity.

This predator control action would be supported by a caribou calf mortality study conducted concurrently to identify individual wolves responsible for killing calves in the calving areas using radio telemetry equipment, fixed-winged aircraft, and a helicopter. The project team would be composed of 4 pilots and 2-3 biologists. The crew would be based in Cold Bay, Alaska, for the duration of the 3-week project. The project would begin in late May and conclude by June 20th. Each day 2-3 fixed-wing aircraft (Aviat Husky, Piper PA-18 Super Cub, Bellanca 8GCBC Scout, or similar aircraft) flying at low altitudes would search for caribou calves less than 2 days of age. Upon locating a calf, the helicopter (Robinson R44)

capture team (pilot and biologist) would land and hand-capture each calf and fit it with a VHF radio collar. Processing time for each calf is expected to last 30-60 seconds from the time the biologist exits the aircraft to the time the biologist is in the helicopter departing the capture site. This fast handling results in low abandonment rates (less than 1% based on the capture of 250 caribou calves from other herds). Calf capture efforts would continue through the duration of calving (approximately 4 weeks with most calves born within 2 weeks) with up to 50 calves captured during this period.

Following collar deployment, the calves would be monitored daily for mortality. Upon locating a dead calf, the helicopter team would visit the mortality site to determine cause of death. Bear caused mortalities would be recorded and used to determine future predator management and research needs. Wolf caused mortalities would be used to pattern the activities of wolves killing calves in calving areas. Intensive aerial search efforts would be conducted to identify the wolf or wolves responsible for the mortalities. Aircraft flying at low levels would conduct the primary search for wolves. After a wolf thought to be killing calves is located, the helicopter team would kill it with a shotgun. After a wolf is killed, the helicopter team would land to collect biological samples and inspect the reproductive condition of each wolf. If a lactating female were killed, dens would be located, if possible, and orphaned pups would be euthanized in the den using CO gas. Using a helicopter for access to calving grounds and as a platform for locating and shooting wolves is the most effective and efficient means for successful identification and removal of calf-killing wolves.

After the initial treatment year of this alternative in 2011, selective removal of wolves on Unimak Island will occur only as needed but no later than the year 2020. Initial success of this proposed action would be achieved when the herd stops declining (fall calf:cow ratio above 20:100) and the bull to cow ratio stays above 10:100. In order to resume subsistence hunting, the UCH should demonstrate at least increasing numbers, improved bull to cow ratio, and/or improved calf survivorship. The control effort would not likely continue for more than 2 years without indications of success within that period.

Continuing this alternative beyond 2 years would depend on the Service reaffirming that wolf control remains necessary to achieve Refuge purposes for conserving caribou on Unimak Island and for providing hunting opportunities to Federally-qualified subsistence users. The ADF&G's population objectives for the UCH (1,000 caribou) and wolves (8-15 wolves with at least 2 breeding pairs) on Unimak Island are the same as found in Alternative A, the No Action alternative. During the control action, the ADF&G will monitor the wolf population outside the UCH calving grounds to ensure its population objectives will be met.

This alternative also includes supplementing bulls to the UCH from the SAPCH to increase pregnancy rates.

Effects of Alternative B on Wilderness Character

Untrammled: In addition to helicopter and airplane use in Alternative A, there will be an increase in airplane landings on the Refuge in this alternative to translocate up to 20 bulls from the SAPCH over a 3-day period in August at an established airfield near Cape Sarichef. There would also be an increase in helicopter landings to deploy radio collars on up to 50 calves for the calf mortality study, to investigate collared calf mortalities, and to shoot wolves and collect biological samples. This will occur for a 3-week period from late May to June 20th and may recur annually for at least 2 years, and for up to 10 years, to meet the ADF&G's management objectives for the UCH. The effect of additional helicopter landings compared with Alternative A would be adverse, but temporary, and would not permanently change the untrammled or undeveloped character of the Refuge. The Robinson R44 helicopter will be equipped with special tundra pads on its landing skids to minimize damage when it is necessary to land on vegetated areas of the tundra. Choosing landing sites such as cinder, pumice or sand patches, gravel bars and beaches will further mitigate avoidable damage to

vegetation.

Undeveloped: In addition to helicopter and airplane use for Alternative A, the adverse effect from added helicopter landings in this alternative remains limited in time and scope and will not permanently change the undeveloped character of the Refuge.

Natural: This alternative would have an adverse effect on the natural predator/prey fluctuations by reducing the number of wolves preying on newly born caribou for a period long enough to stabilize and restore the UCH. This management intervention will be temporary and will have no long-term adverse effects on the natural character of the Refuge. However, this alternative would significantly improve the chances that the UCH will persist as a viable population, able to support historic subsistence uses in the manner consistent with the conditions on Unimak Island at the time of wilderness designation.

Outstanding opportunities for solitude or a primitive and unconfined type of recreation: The adverse effects from the use of helicopters and airplanes would increase above the level in Alternative A. The increased adverse effects from this alternative would be temporary and limited by the area of operation on the Refuge. Visitors to the Refuge are not likely to be present when field operations are underway.

Other unique components that reflect the character of this wilderness: Unimak Island is the only one of the Aleutian Islands with natural populations of caribou, brown bear, and wolf. This alternative provides the greatest likelihood that this unique species diversity will be retained in the condition that existed at the time the Refuge became designated wilderness.

Effects of Alternative B on Heritage and Cultural Resources: As with Alternative A, there will be no effect to these resources. Maps of known archaeological sites are available from the Service, should it be necessary for field staff to be aware of their presence when making helicopter landings, particularly in coastal areas.

Effects of Alternative B on Maintaining Traditional Skills: There will be no effect.

Effects of Alternative B on Special Provisions: There is no effect.

Effects of Alternative B on Economic and Time Constraints: The cost of this alternative will be borne entirely by the ADF&G and is in addition to the cost of Alternative A. It will be moderately expensive (\$150,000 annually) due to the 4-week time commitment of 4 pilots and 2 biologists and the costs of operating 3 to 4 aircraft during each treatment year for a minimum of 2 years and up to 10 years. Given the current status of the UCH, there is an urgency to implement predator control at the earliest possible date to avoid the risk of a prolonged period of low population numbers for the UCH and possibly the loss of the entire herd from Unimak Island. As experienced with a similar management action involving the SAPCH, early success of this alternative would likely reduce the number of subsequent treatments and also significantly reduce the cost. This alternative provides the greatest likelihood of successfully stopping the decline of the UCH and allowing for its recovery in the shortest possible time. The urgent need for this action is further emphasized by the fact that the entire Alaska Peninsula is currently closed to caribou subsistence hunting due to critically low numbers.

Effects of Alternative B on Additional Wilderness-specific Comparison Criteria: None identified.

Effects of Alternative B on Safety of Visitors, Personnel, and Contractors: Fish and wildlife management activities on Alaska refuges, using aircraft in remote locations, are inherently hazardous. To mitigate for these hazards, Service mission activities must use only Department of the Interior, Office of Aircraft Safety, approved aircraft and pilots. Service employees and contract employees are required to take a wide array of safety training such as radio communications, aircraft safety, firearms safety, bear safety, wilderness survival and first aid. The ADF&G, while not bound to the same Federal requirements, has similar requirements for its personnel. The helicopter is well established as a minimum tool used by wildlife management agencies for darting and quickly attending to large mammals in order to minimize the risk of accidental mortality of sedated animals. Its safety is enhanced by the strict adherence to well tested techniques and protocols for handling large mammals in remote settings. There are no safety concerns for visitors from these management activities.

Alternative C: Selective Predator Management on the Calving Grounds Using Either Fixed-wing Aircraft with Marksmen or Ground-based Teams Deployed by Helicopters to Take Wolves and Calf Mortality Study with Helicopter Support

Description: In addition to the ongoing management and research activities in Alternative A, the No Action alternative, wolf management actions would be conducted by shooting wolves from a fixed-wing aircraft, and/or from ground-based teams deployed from helicopters when wolves are found on the calving grounds following calf predation events, during the calving period. The calving grounds are almost entirely within the control area described in the Alaska Board of Game regulation that established the Unimak Wolf Management Area. The control area includes all lands on Unimak Island that are west of the 164 degree West longitude, which is approximately 57% of the Unimak Wolf Management Area that encompasses all of Unimak Island (Figure 2). Aerial reconnaissance, aided by female caribou with radio collars deployed to assist in monitoring pregnancy rates and annual herd composition surveys, would be the primary means for assessing calving activity.

This predator control action will be supported by a caribou calf mortality study conducted concurrently to identify individual wolves responsible for killing calves in the calving areas using radio telemetry equipment, fixed-winged aircraft, and a helicopter. The project team would be composed of 4 pilots and 2-3 biologists. This need may increase as selection of this alternative may necessitate a longer on-the-ground commitment to attain the ADF&G's goals, as identified in Alternative B (ADF&G Proposed Action).

The crew would be based in Cold Bay, Alaska, for the duration of the three-week project. The project would begin in late May and conclude by June 20th. Each day 2-3 fixed-wing aircraft (Aviat Husky, Piper PA-18 Super Cub, Bellanca 8GCBC Scout, or similar aircraft) flying at low altitudes would search for caribou calves less than 2 days of age. Upon locating a calf, the helicopter (Robinson R44) capture team (pilot and biologist) would land and hand-capture each calf and fit it with a VHF radio collar. Processing time for each calf is expected to last 30-60 seconds from the time the biologist exits the aircraft to the time the biologist is in the helicopter departing the capture site. This fast handling results in low abandonment rates (less than 1% based on the capture of 250 caribou calves from other herds). Calf capture efforts would continue through the duration of calving (approximately 4 weeks with most calves being born within 2 weeks) with up to 50 calves captured during this period.

Following collar deployment, the calves would be monitored daily for mortality. Upon locating a dead calf, the helicopter team would visit the mortality site to determine cause of death. Bear-caused mortalities would be recorded and used to determine future predator management and research needs. Wolf-caused mortalities would be used to pattern the activities of wolves killing calves in calving areas. Intensive low-altitude aerial search efforts by helicopter and fixed-wing aircraft would be conducted to

identify the wolf or wolves responsible for the mortalities. After the wolf or wolves are located, a fixed-wing aircraft with a gunner/spotter would be directed to kill the animal(s) with a shotgun, or the animals would be shot with rifles by staff on the ground deployed from a helicopter. After a wolf is killed, the helicopter team would land to collect biological samples and inspect the reproductive condition of each wolf. If a lactating female was killed, dens would be located, if possible, and orphaned pups would be euthanized in the den using CO gas. The use of a fixed-wing aircraft, instead of a helicopter as a shooting platform for wolves, could potentially reduce the efficiency and effectiveness due to the variable and unpredictable Unimak Island weather conditions, i.e., low clouds and high winds could limit available flying time using fixed-wing aircraft.

After the initial treatment year of this alternative in 2011, selective removal of wolves on Unimak Island will occur only as needed, but no later than the year 2020. Initial success of this proposed action would be achieved when the herd stops declining (fall calf:cow ratio above 20:100) and the bull to cow ratio stays above 10:100. However, in order to resume subsistence hunting, the bull to cow ratio would need to be at or above 35:100. The control effort would not likely continue for more than 2 years without indications of success within that period.

Continuing this alternative beyond 2 years would depend on the Service reaffirming that wolf control remains necessary to achieve Refuge purposes for conserving caribou on Unimak Island and for providing hunting opportunities to Federally-qualified subsistence users. The population objectives for the UCH (1,000 caribou) and wolves (8-15 wolves with at least 2 breeding pairs) on Unimak Island are the same as found in Alternative A, the No Action alternative. During the control action, the wolf population outside the UCH calving ground would be monitored to ensure its population objectives will be met.

This alternative also includes supplementing bulls to the UCH from the SAPCH to increase pregnancy rates.

Effects of Alternative C on Wilderness Character

Untrammled: In addition to helicopter and airplane use in Alternative A, there will be an increase in airplane landings on the Refuge in this alternative to translocate up to 20 bulls from the SAPCH over a 3-day period in August at an established airfield near Cape Sarichef. There would also be the same increase as Alternative B in helicopter landings to deploy radio collars on up to 50 calves for the calf mortality study, to investigate collared-calf mortalities, and to target wolves and collect biological samples. Since helicopters would not be used as a platform to shoot wolves from the air, fixed-wing aircraft use and landings will be greater than Alternative B. The success of this alternative in targeting wolves that kill caribou calves could be less than Alternative B and thus would possibly increase the number of years for subsequent treatments and associated impacts to the wilderness to achieve caribou recruitment objectives. The predator control action would occur, for a 3-week period from late May to June 20th and may recur annually for at least 2 years, and for up to 10 years, to meet the ADF&G's management objectives for the UCH. The effect of additional helicopter landings compared with Alternative A and B would be adverse, but temporary, and would not permanently change the untrammled or undeveloped character of the Refuge. The Robinson R44 helicopter will be equipped with special tundra pads on its landing skids to minimize damage when it is necessary to land on vegetated areas of the tundra. Choosing landing sites such as cinder, pumice or sand patches, gravel bars and beaches will further mitigate avoidable damage to vegetation.

Undeveloped: In addition to helicopter and airplane use for Alternative A, the adverse effect from added helicopter and airplane landings in this alternative remains limited in time and scope and will not permanently change the undeveloped character of the refuge.

Natural: This alternative would have an adverse effect on the natural predator/prey fluctuations by reducing the number of wolves preying on newly born caribou for a period long enough to stabilize and restore the UCH. This management intervention will be temporary and will have no long-term adverse effects on the natural character of the Refuge. However, this alternative would significantly improve the chances that the UCH will persist as a viable population, able to support historic subsistence uses in the manner consistent with the conditions on Unimak Island at the time of wilderness designation.

Outstanding opportunities for solitude or a primitive and unconfined type of recreation: The adverse effects from the use of helicopters and airplanes would increase above the level in Alternative A. The increased adverse effects from this alternative would be temporary and limited by the area of operation on the Refuge. Visitors to the Refuge are not likely to be present when field operations are underway.

Other unique components that reflect the character of this wilderness: Unimak Island is the only one of the Aleutian Islands with natural populations of caribou, brown bear, and wolf. This alternative provides the greatest likelihood that this unique species diversity will be retained in the condition that existed at the time the Refuge became designated wilderness.

Effects of Alternative C on Heritage and Cultural Resources: As with Alternative A, there will be no effect to these resources. Maps of known archaeological sites are available from the Service, should it be necessary for field staff to be aware of their presence when making helicopter landings, particularly in coastal areas.

Effects of Alternative C on Maintaining Traditional Skills: There will be no effect.

Effects of Alternative C on Special Provisions: There is no effect.

Effects of Alternative C on Economic and Time Constraints: The cost of this alternative is additive to the cost of Alternative A. It would be more expensive than Alternative B due to increased use of fixed-winged aircraft for shooting wolves. Given the current status of the UCH, there is an urgency to implement this wolf control at the earliest possible date to avoid the risk of a prolonged period of low population numbers for the UCH and possibly the loss of the entire herd from Unimak Island. As experienced with a similar management action involving the SAPCH, early success of this alternative would likely reduce the number of subsequent treatments and also significantly reduce the cost. However, compared with Alternative B, wolves would not be shot from helicopters, and success of this alternative in targeting wolves that kill caribou calves could be reduced, possibly increasing the number of years for subsequent treatments and associated impacts to the wilderness to achieve caribou recruitment objectives. The urgent need for this action is further emphasized by the fact that the entire Alaska Peninsula is currently closed to caribou subsistence hunting due to critically low numbers.

Effects of Alternative C on Additional Wilderness-specific Comparison Criteria: None identified.

Effects of Alternative C on Safety of Visitors, Personnel, and Contractors: Fish and wildlife management activities on Alaska refuges, using aircraft in remote locations, are inherently hazardous. To mitigate for these hazards, Service mission activities must use only Department of the Interior, Office of Aircraft Safety, approved aircraft and pilots. Service employees and contract employees are required to take a wide array of safety training such as radio communications, aircraft safety, firearms safety, bear safety, wilderness survival and first aid. The ADF&G, while not bound to the same Federal

requirements, has similar requirements for its personnel. The helicopter is well established as a minimum tool used by wildlife management agencies for darting and quickly attending to large mammals in order to minimize the risk of accidentally mortality of sedated animals. Its safety is enhanced by the strict adherence to well tested techniques and protocols for handling large mammals in remote settings. There are no safety concerns for visitors from these management activities.

Alternative D: Selective Predator Management on the Calving Grounds Using Ground-based Teams

Description: In addition to the ongoing management and research activities in Alternative A, the No Action alternative, ground-based teams would be used to shoot wolves in the area of the calving grounds. The teams consist of 2 pilots and 8 field staff. A base camp would be established on Unimak Island at False Pass or Cape Sarichef. Fixed-wing aircraft (Aviat Husky, Piper PA-18 Super Cub, Bellanca 8GCBC Scout, or similar aircraft) would be used to distribute hunters working in 2-person teams throughout the range of the UCH calving grounds. The calving grounds are almost entirely within the control area described in the Alaska Board of Game regulation that established the Unimak Wolf Management Area (see Appendix C). The control area includes all lands on Unimak Island that are west of the 164 degree West longitude, which is approximately 57% of the Unimak Wolf Management Area that encompasses all of Unimak Island (Figure 2). Aerial reconnaissance, aided by female caribou with radio collars used to monitor pregnancy rates and annual herd composition surveys, would be the primary means for pinpointing calving activity. Low-altitude reconnaissance flights would be flown each day to locate wolves and to search for wolf den sites. The pilots would assist the ground teams by providing logistical support, supplies, and information regarding wolf activities. Four ground-based teams would be assigned areas to search for wolves near caribou and would be deployed in the field for 7 weeks from May 1st to June 20th. Each team would be equipped with rifles, shotguns, air-to-ground radios, binoculars, spotting scopes, and field camp provisions. Teams would select field camp locations that provide a strategic vantage point to locate wolves and access to their assigned search area. Once located, the team would move into position by foot or with the assistance of aircraft, and attempt to kill the wolf or wolves. If areas with repeated wolf activity can be identified (den site, mammal carcass, or natural travel corridor), the team would relocate their camp to that area and focus activities there.

After the initial treatment year of this alternative in 2011, selective removal of wolves on Unimak Island will occur only as needed, but no later than the year 2020. Initial success of this proposed action would be achieved when the herd stops declining (fall calf:cow ratio above 20:100) and the bull to cow ratio stays above 10:100. However, in order to resume subsistence hunting, the bull to cow ratio would need to be at or above 35:100 (see Appendix C).

Without the support of a helicopter, this alternative would be less efficient and less discriminating than Alternative B in locating and killing wolves responsible for preying on calves. As a result, it would likely take more years of predator control to achieve success in restoring the UCH to sustainable levels for subsistence hunting. It is unlikely the control effort will continue for more than 3 years without success in the first 3 years (Bruce Dale, pers. comm.).

Continuing this alternative beyond three years would depend on the Service reaffirming that wolf control remains necessary to achieve Refuge purposes for conserving caribou and wolves on Unimak Island and for providing hunting opportunities to Federally-qualified subsistence users. The ADF&G's population objectives for the UCH (1,000 caribou) and wolves (8-15 wolves with at least 2 breeding pairs) on Unimak Island are the same as found in Alternative A, the No Action alternative. During the control

action, the ADF&G will monitor the wolf population outside the UCH calving grounds to ensure its population objectives are being met.

This alternative also includes supplementing bulls to the UCH from the SAPCH to increase pregnancy rates.

Effects of Alternative D on Wilderness Character

Untrammled: In addition to helicopter and airplane use in Alternative A, there would be an increase in airplane landings with this alternative, on an established airstrip to supply/resupply the field camps and to layover between reconnaissance missions. There will also be significantly more ground activity with 8 personnel in the field along with the establishment of a base camp at Cape Sarichef and several spike camps throughout the calving ground area. The period of operations is approximately 7 weeks for each season and would continue for at least 3 years and up to 10. The adverse effects from airplane landings and field camps are limited and temporary. Camps will be removed at the end of each field season with adherence to the Leave No Trace goal for activities in wilderness areas.

Undeveloped: Alternative D has limited and temporary adverse effects, due to increased airplane reconnaissance flights and landings and due to field camps and airplane landings.

Natural: This alternative would have an adverse effect on the natural predator/prey fluctuations by reducing the number of wolves preying on newly born caribou for a period long enough to stabilize and restore the UCH. This management intervention will be temporary and will have no long-term adverse effects on the natural character of the Refuge. However, this alternative would significantly improve the chances that the UCH will persist as a viable population able to support historic subsistence uses in the manner consistent with the conditions on Unimak Island at the time of wilderness designation.

Outstanding opportunities for solitude or a primitive and unconfined type of recreation: Since the timing of the 7 weeks of ground-based field activity for this alternative entirely overlaps the spring general hunt for brown bears, there is the chance of encounters between hunters and reconnaissance flights and/or field teams. This would result in temporary adverse effects of short duration for bear hunters seeking an undisturbed wilderness experience.

Other unique components that reflect the character of this wilderness: Unimak Island is the only one of the Aleutian Islands with natural populations of caribou, brown bear, and wolf. Like Alternatives B and C, this alternative provides assurances that unique components of the wilderness character will be retained in the condition that existed at the time the Refuge became designated wilderness. However, it is likely to be a far less effective without the use of a helicopter or fixed-wing aircraft, and precludes the opportunity for collecting valuable information on calf mortality for managing predators and their prey.

Effects of Alternative D on Heritage and Cultural Resources: There will be no effect to these resources. Maps of known archaeological sites are available from the Service should it be necessary for field staff to be aware of their presence when making airplane landings, particularly in coastal areas.

Effects of Alternative D on Maintaining Traditional Skills: There will be no effect.

Effects of Alternative D on Special Provisions: There is no effect.

Effects of Alternative D on Economic and Time Constraints: The cost of this alternative would be additive to Alternative A and would be moderately expensive due to 7 weeks of field work by 4 2-person field crews and the support of 3 to 4 aircraft and pilots during each treatment year. Because this alternative is less efficient than Alternative B and C at finding and shooting wolves preying on calves, it will likely require more treatment years to meet management objectives. Since this alternative does not involve shooting wolves from a helicopter or airplanes, its effectiveness in killing wolves is expected to be lower. Therefore, this action is likely to require killing wolves in a less discriminating manner over a larger area and for a longer time period to meet management objectives. In addition, since the calf mortality study cannot be conducted without helicopter support, a significant opportunity will be lost to collect valuable scientific information on predator and prey relationships and related biological factors. Not being able to combine a necessary management action concurrently with important scientific research would result in an inefficient use of scarce natural resource funds.

Effects of Alternative D on Additional Wilderness-specific Comparison Criteria: None identified.

Effects of Alternative D on Safety of Visitors, Personnel, and Contractors: Fish and wildlife management activities on Alaska refuges, using aircraft in remote locations, are inherently hazardous. To mitigate for these hazards, Service mission activities must use only Department of the Interior, Office of Aircraft Safety, approved aircraft and pilots. Service employees and contract employees are required to take a wide array of safety training such as, radio communications, aircraft safety, firearms safety, bear safety, wilderness survival and first aid. The ADF&G, while not bound to the same Federal requirements, has similar requirements for its personnel. Since the timing of the seven weeks of ground based field activity entirely overlaps the spring general hunt for bears, there is the chance of encounters between hunters and ADF&G field teams. To mitigate the potential for safety concerns from such possible encounters, information on the ADF&G's activities would be provided in advance to the 2 authorized hunting guides for Unimak Island. The establishment of a temporary base camp at Cape Sarichef and spike camps throughout the calving area for 7 weeks, increases safety concerns for both personnel and expensive equipment due to bear encounters and storms common to the area. Using experienced field personnel, with training in bear safety and wilderness survival, would mitigate these safety concerns.

Management Action Common to Alternative B, C, and D: Supplement UCH with Bulls from UCH

Description: The ADF&G would supplement the UCH with 20, 1-2 year-old bull caribou transferred from the SAPCH with the intent to impregnate all available cows. The transfer would occur in August and involve 3 pilots, 1 veterinarian (pending availability), and 2 biologists. Field operations would be based out of the ADF&G's cabin on the Sapsuk River. During each transfer event, caribou groups would be located using a spotter plane (Piper PA-18 Super Cub) flying at low altitude. Selected bulls would be immobilized by darting them from a Robinson R44 helicopter and then airlifted via sling, one caribou at a time, to an adjacent runway. Veterinary staff and experienced animal handlers would keep the animals in an immobilized state and continually monitor their condition until they arrive on Unimak Island. The bulls would be immobilized using a standard caribou immobilization drug combination. Administering standard reversal drugs would reverse this immobilization. During transit the bulls would be administered additional Xylazine as required to maintain sedation. The bulls would be fitted with VHF radio collars and transported in a DeHavilland Beaver from a runway on the mainland to a runway near Cape Sarichef on Unimak Island, where the immobilization would be reversed and the bulls would be released. The project would last 3 days (4 caribou per flight, 2 flights per day, total of 20 transferred bulls) barring

unforeseen delays, such as weather.

The ADF&G would verify pregnancy rates in the UCH of animals 2 years old or older. If pregnancy rates remain less than 75%, additional bulls would be transferred in future years as needed to maintain a minimum bull to cow ratio of 10 bulls:100 cows. While this action alone may improve pregnancy and birth rates, it will have little effect on improving calf survival and recruitment into the herd without controlling predator numbers.

Effects on Wilderness Character

Untrammeled: In addition to helicopter and airplane use in Alternative A, there would be 6 airplane landings, over a period of 3 days in August at the airstrip near Cape Sarichef. Landings would possibly occur for up to 3 additional years. These adverse effects are temporary and negligible.

Undeveloped: No effect.

Natural: Relocating bulls from the SAPCH would have a temporary and limited adverse effect to natural ecosystem processes. However, any attempt to enhance the pregnancy rate in the UCH by relocating bulls from the SAPCH is not likely to result in increased calf survival or improve the chances for the herd's recovery as long as predators continue to be the primary reason for failed recruitment. In combination with Alternative B or C this management action will improve the chances of quickly stabilizing the UCH for a more rapid recovery to a sustainable level that supports historic subsistence uses.

Outstanding opportunities for solitude or a primitive and unconfined type of recreation: There will be no additive adverse effect.

Other unique components that reflect the character of this wilderness: Unimak Island is the only one of the Aleutian Islands with natural populations of caribou, brown bear, and wolf. This management action would have a limited adverse effect on natural processes from the introduction of bulls from another herd, and will likely have no effect on the fate of the continued viability of the distinct UCH as long as predators continue to be the primary reason for the herd's failed recruitment. In combination with Alternative B or C this management action will improve the chances of quickly stabilizing the UCH for a more rapid recovery to a sustainable level that supports historic subsistence uses.

Effects on Heritage and Cultural Resources: There will be no effect to these resources.

Effects on Maintaining Traditional Skills: There will be no effect.

Effects on Special Provisions: There is no effect.

Effects on Economic and Time Constraints: The cost of this action is in addition to Alternatives A, B, D and will be borne entirely by the ADF&G. In order to have a positive effect on stabilizing the UCH, supplementation of the herd with SAPCH bulls would need to be done in conjunction with Alternatives B, C, or D.

Effects on Additional Wilderness-specific Comparison Criteria: None identified.

Effects on Safety of Visitors, Personnel, and Contractors: Fish and wildlife management activities on Alaska refuges, using aircraft in remote locations, are inherently hazardous. To mitigate for these hazards, Service mission activities must use only Department of the Interior, Office of Aircraft Safety,

approved aircraft and pilots. Service employees and contract employees are required to take a wide array of safety training such as radio communications, aircraft safety, firearms safety, bear safety, wilderness survival and first aid. The ADF&G is the Service's primary cooperator for fish and wildlife management on refuges in Alaska, has similar requirements for its personnel. There are no safety concerns for visitors from these management activities.

Comparison of Alternatives

Compare each alternative's positive and negative effects on preserving wilderness character.

	Alternative A No Action	Alternative B	Alternative C	Alternative D
Untrammeled	--	--	--	--
Undeveloped	--	--	--	--
Natural	+/--	+/--	+/--	+/--
Solitude or Primitive Recreation	NA	NA	NA	--
Unique components	--	+/--	+/--	+/--
WILDERNESS CHARACTER	+/------	++/------	++/------	++/------

	Alternative A No Action	Alternative B	Alternative C	Alternative D
Heritage & Cultural Resources	NA	NA	NA	NA
Maintaining Traditional Skills	NA	NA	NA	NA
Special Provisions	NA	NA	NA	NA
Economics & Time	--	+	--	--
Additional Wilderness Criteria	NA	NA	NA	NA
OTHER CRITERIA SUMMARY	--	+	--	--

	Alternative A No Action	Alternative B	Alternative C	Alternative D
SAFETY	NA	NA	NA	NA

If safety issues override impacts to wilderness character or other criteria, provide documentation that the use of motorized equipment or other prohibited uses is necessary because to do otherwise would cause increased risks to workers or visitors that cannot be satisfactorily mitigated through training, use of personal protective equipment (PPE), or other requirements to alleviate the safety risk.

Step 2 Determination: What is the Minimum Activity?

Selected alternative: Pending completion of the current Environmental Assessment.

Rationale for selecting this alternative: To be determined.

Monitoring and reporting requirements: To be determined.

Check any Wilderness Act Section 4(c) uses approved in this alternative:

- mechanical transport
- landing of aircraft
- motorized equipment
- temporary road
- motor vehicles
- structure or installation
- motorboats

Record and report any authorizations of Wilderness Act Section 4(c) uses according to agency procedures.

Approvals	Signature	Name	Position	Date
Prepared by:				
Recommended:				
Recommended:				
Approved:				