CONSERVATION PLAN

for the

EASTERN PACIFIC STOCK OF NORTHERN FUR SEAL (*Callorhinus ursinus*)

December 2007

U.S. Department of Commerce
National Oceanic and Atmospheric Administration

NATIONAL MARINE FISHERIES SERVICE
Protected Resources Division, Alaska Region

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PREFACE

On June 17, 1988, the National Marine Fisheries Service (NMFS) declared the northern fur seal stock of the Pribilof Islands, Alaska (St. Paul and St. George Islands) (*Callorhinus ursinus*), to be depleted under the Marine Mammal Protection Act (MMPA) of 1972. NMFS designated the Pribilof Islands northern fur seal population depleted because it declined to less than 50 percent of levels observed in the late 1950s. Amendments to the MMPA on November 23, 1988 (Public Law 100-711), directed the Secretary of Commerce to develop a conservation plan on northern fur seals for "conserving and restoring the species or stock to its optimum sustainable population." The amendments further specified that the plan include information on the status of fur seals on the Pribilof Islands, causes of declines, threats to the species, critical information gaps, and research and management recommendations for meeting the objectives of the plan.

Accordingly, NMFS published a conservation plan for the northern fur seal in 1993. Having acquired substantial new information and with the greater inclusion of tribal governments in management of the stock, NMFS now publishes this revision of the 1993 conservation plan. This revision has been prepared with valuable input from the Tribal Governments of St. Paul and St. George Island and incorporates substantial new information, research results, and management structures to serve as a guide for interested parties to assist in the implementation of conservation actions.

In 1994, NMFS used the phylogeographic stock definition approach proposed by Dizon et al. (1992) to reclassify the Pribilof Islands population into the Eastern Pacific Stock (Pribilof Islands and Bogoslof Island) and the San Miguel Island Stock. The Eastern Pacific stock is presently declining for unknown reasons after a period of stability in pup production from 1984 to 1998. Harvest practices contributed significantly to the declines of fur seal abundance in the Pribilof Islands prior to the 1970s; however, they do not appear to be currently limiting the population.

The goal of this revised conservation plan will be met when northern fur seals are at abundance levels that justify their re-designation as a non-depleted stock. The shared resources and cooperative involvement of federal, state, and local governments, fishing industry, Alaska Natives, academia, non-governmental organizations, and other interested individuals will be required throughout the recovery period. NMFS makes this conservation plan available to the public for reference.

Disclaimer

Conservation plans delineate reasonable actions that, according to the best available science, are required to recover and/or protect listed species. Plans are published by the National Marine Fisheries Service, sometimes prepared with the assistance of other stakeholders, State agencies, and contractors. Objectives will be attained and any necessary funds made available subject to budgetary and other constraints affecting the parties involved, as well as the need to address other priorities. Nothing in the this plan should be construed as a commitment or requirement that any federal agency obligate or pay funds in contravention of the Anti-Deficiency Act, 31 U.S.C. 1341, or any other law or regulation. Conservation plans do not necessarily represent the views or the official positions or approval of any individuals or agencies involved in the plan formulation, other than the National Marine Fisheries Service. They represent the official position of the National Marine Fisheries Service only after they have been signed by the Assistant Administrator. Approved conservation plans are subject to modification as dictated by new findings, changes in species status, and the completion of conservation actions.

This plan should be cited as follows:

National Marine Fisheries Service. 2007. Conservation plan for the Eastern Pacific stock of northern fur seal (*Callorhinus ursinus*). National Marine Fisheries Service, Juneau, Alaska.

Additional copies may be obtained from:

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EXECUTIVE SUMMARY

On June 17, 1988, the National Marine Fisheries Service (NMFS) declared the stock of northern fur seals (*Callorhinus ursinus*) on the Pribilof Islands, Alaska (St. Paul and St. George Islands) to be depleted under the Marine Mammal Protection Act (MMPA) of 1972. The MMPA defines a species, population, or stock as depleted if it falls below its optimum sustainable population (OSP). The lower bound of OSP for northern fur seals is thought to be at least 60 percent of the carrying capacity level. The Pribilof Islands population was designated depleted because it had declined to less than 50 percent of levels observed in the late 1950s, and no compelling evidence suggested that carrying capacity has changed substantially since the late 1950s.

Amendments to the MMPA on November 23, 1988 (Public Law 100-711), directed the Secretary of Commerce to develop a conservation plan on northern fur seals for "conserving and restoring the species or stock to its optimum sustainable population." The amendments further specified that the plan include information on the status of fur seals on the Pribilof Islands, possible causes of declines, threats to the species, critical information gaps, and research and management recommendations for meeting the objectives of the plan.

Accordingly, NMFS published a conservation plan for the northern fur seal stock of the Pribilof Islands in 1993. In 1994 NMFS redefined the Pribilof Islands population as the Eastern Pacific stock to include the new population on Bogoslof Island identified as separate from those populations on islands in the western Bering Sea, Sea of Okhotsk, and Pacific Ocean. In addition, MMPA amendments included numerous changes in management structure including the development of agreements with Alaska Native Organizations for co-management of subsistence use of marine mammal species used by Alaska Natives for subsistence. NMFS has studied and supported studies of numerous aspects of the ecology of northern fur seals and obtained substantial new information about the stock. With the additional science and new management structures to consider, NMFS has prepared this revised Northern Fur Seal Conservation Plan with valuable input from the Tribal Governments of St. Paul and St. George Island. This revision reflects the new management structure, interpretation of new information, identification of important research, and continued management of human activities that are thought to affect the Eastern Pacific stock of northern fur seals.

The Pribilof Islands population has continued to decline since the depleted listing. Between 1998 and 2004 estimated pup production declined at 6.2 percent per year on St. Paul Island, and at 4.5 percent per year on St. George Island (Towel et al., 2006). The 2006 estimate of pup production on St. Paul Island is 10.5% lower than 2004, while on St. George it is 1.2% greater than 2004. NMFS estimates Pribilof pup production declined by 9.1% from 2004 to 2006. Recent satellite telemetry studies indicate that lactating female and juvenile male northern fur seals behave as central place foragers while in the Bering Sea. Satellite telemetry and diet studies also suggest separation of Bering Sea foraging areas defined by the central breeding area of departure.

Harvest has played a significant role in the historic abundance of northern fur seals in the Pribilof Islands. Pelagic and terrestrial harvests of fur seals contributed to major declines in historic

abundance. From 1956 to 1968 the commercial harvest of adult females contributed to a majority of the subsequent decline of fur seal abundance in the Pribilof Islands. Subsistence harvest levels are currently below levels believed to influence the Pribilof Island fur seals.

Scientists observed an increase in the number of fur seals entangled in marine debris following the mid-1960s when fishing effort in the North Pacific Ocean and Bering Sea increased. Concurrently, the fishing industry began using fishing gear (nets and line) and associated fishing materials (packaging bands, bait containers) made more from plastics than from other materials, at a level at least two orders of magnitude greater than that observed in the 1940s. Between 1970 and 1982, the increased rates of entanglement in marine debris resulted in additional mortality of 2- to 5-year-old male fur seals. Fowler (2002) reported a significant correlation between the juvenile male entanglement rate and rate of change in pup production. Fowler (2002) suggests that entanglement in marine debris may have contributed significantly to declining trends of the population on the Pribilof Islands during the late 1970s.

Changes in the quantity and quality of available prey also influence the health and fitness of individual fur seals. Important fur seal prey includes pollock, small schooling fish, and gonatid squid. Biases associated with sampling location and method influence quantitative estimates of northern fur seal prey use. Walleye pollock and squid are important fur seal prey in the eastern Bering Sea, and Pacific herring, Pacific sandlance, and capelin in the Gulf of Alaska and Pacific Ocean. The abundance and relative proportion have changed for major fish species across the entire range of fur seals. Whether and what extent fish abundance was affected by fishing or environmental change is unknown. Nor do researchers know how alteration of fish abundance influences fur seal population trends of the Eastern Pacific stock. Recent fur seal diet studies suggest a more direct overlap between fur seal prey and commercial fisheries (Zeppelin and Ream, 2006). The complexity of ecosystem interactions and limitations of data and models make it difficult to determine specific effects on the fur seal population.

This Conservation Plan reviews and assesses the known and possible factors influencing northern fur seals in Alaska; it also contains pertinent information on fur seals breeding in California and Russia. Natural factors influencing the population include predation, parasitism, disease, and environmental change. Human-related factors that may, or do, influence the population include subsistence harvests, direct and indirect effects of commercial fishing, marine debris, poaching, pollution, vessel and aircraft traffic, tourism, coastal development, noise, and oil and gas activities.

Four objectives are proposed to restore and maintain the Eastern Pacific stock of fur seals to its OSP level, consistent with the 1988 amendments to the MMPA.

Objective 1. Identify and eliminate or mitigate the cause or causes of human related mortality of the Eastern Pacific stock of northern fur seals;

Objective 2. Assess and avoid or mitigate adverse effects of human related activities on or near the Pribilof Islands and other habitat essential to the survival and recovery of the Eastern Pacific stock of northern fur seals;

Objective 3. Continue and, as necessary, expand research or management programs to monitor trends and detect natural or human-related causes of change in the northern fur seal stock and habitats essential to its survival and recovery;

Objective 4. Coordinate and assess the implementation of the conservation plan, based on implementation of conservation actions and completion of high priority studies.

The goal of this Plan is to recover the Eastern Pacific stock of northern fur seals so the stock is no longer designated as depleted. NMFS notes that as of the writing of this plan the stock is declining and stopping this decline is of paramount importance. Meeting the goal of recovery to OSP and reclassification as not depleted may take many decades.

I. Background

Amendments to the MMPA on November 23, 1988 (Public Law 100-711) directed the Secretary of Commerce to develop a Conservation Plan for the northern fur seal (*Callorhinus ursinus*). Conservation Plans identify specific management actions that must be taken to ensure that the species of concern recovers to the point that it is no longer depleted. Conservation plans also serve as advisory documents to identify conservation threats and to recommend research and management actions to promote recovery. The Senate report accompanying the 1998 amendments (Senate 100-592, October 7, 1998) further stated that conservation plans include the following essential elements:

(1) an assessment of the status of the stock;

(2) a description of the causes of any population declines or loss of essential habitat, including rookeries, beaches, and offshore foraging habitats;

(3) an assessment of existing and possible threats to the species or its habitat;

(4) a discussion of critical information gaps;

(5) a description of research and management to be undertaken to meet the objectives of the plan; and

(6) an implementation schedule of the proposed actions to promote recovery activities.

The National Marine Fisheries Service (NMFS) published the first northern fur seal conservation plan in 1993 after the depleted designation. NMFS has now prepared a revision of that conservation plan to incorporate substantial new information and account for changes in the management structure to include co-management agreements with the Tribal Governments. NMFS will continue to revise this plan at regular intervals as new information is accumulated, management actions are evaluated, and population status changes.

Some of the decline in the northern fur seal population since the 1950s can be explained as a direct result of harvesting practices that caused high adult female mortality on land or at sea (York and Hartley, 1981). However, more recent declining trends in fur seal abundance cannot be explained solely as a result of commercial harvesting or other known sources of adult female or juvenile mortality. The decline in fur seal abundance is similar to the decline in Steller sea lion (*Eumetopias jubatus*) abundance throughout the Gulf of Alaska and Bering Sea (Merrick et al., 1987; Sease and Gudmundson 2002) in that causes cannot be easily identified due to the ecological complexity of the problem and lack of a continuous time-series of relevant biological data (e.g., population vital rates). Holmes and York (2003) developed a model suggesting increased survival and decreased fecundity in the 1990s was the best predictor of Steller sea lion

abundance and given the similarity in life history this may prove informative for northern fur seals.

NMFS manages numerous human activities known or suspected to influence the northern fur seal population. Appropriate management is predicated on understanding the contribution of human and natural influences on the Eastern Pacific northern fur seal stock status, and on managing those human influences using the best available science. NMFS recommends continuation of ongoing research and development of new programs designed to improve our understanding of fur seal ecology, to provide a basis for management actions, and to identify conservation needs. It will take many years before we understand the role of most factors that influence the population. NMFS recommends continued harvest and fisheries management incorporating ecosystem approaches to management. NMFS also recommends continued investigations into reducing poaching and marine debris.

To evaluate the trend and status of fur seals, NMFS has monitored the populations on St. Paul and St. George Islands to create a near-continuous data record. The fur seal population breeding on Bogoslof Island has been monitored and studied intermittently since 1980. Bogoslof Island fur seals provide a unique opportunity to study and gain important insight into the ecology of a growing population. NMFS has also studied or supported studies of various aspects of the life history of Pribilof and San Miguel fur seals, and these studies have contributed to our understanding of their ecology. It is important that relevant programs continue, data be analyzed and interpreted, and that the information from all studies continue to be made available to stakeholders in a timely manner.

A. Brief Overview

Northern fur seals are colonial breeding pinnipeds that exhibit strong site fidelity and currently breed on a few islands in the North Pacific Ocean and Bering Sea. Over 50 percent of the worldwide population of fur seals is found on the Pribilof Islands. Adult male fur seals, about 3-5 times larger than females, arrive at rookeries prior to the breeding season and defend territories within the rookery. Beginning in mid-June the rookeries are occupied by breeding females, who within a few days give birth and begin nursing their single pup. Lactating females cycle between on shore attendance and at-sea foraging trips for the ~4-month nursing period (July-October).

Northern fur seals have been harvested across their range, with a majority of the harvest occurring on the Pribilof Islands. Prior to contact by Russia, the Aleut people and other coastal indigenous peoples harvested fur seals for food, clothing and raw materials. Aleuts and other indigenous peoples were captured by Russians and enslaved on the Pribilof Islands to harvest fur seals for their pelts. The United States government continued the commercial harvest of fur seals, developed the North Pacific Fur Seal Convention, and subsequently passed the Fur Seal Act to provide for the management of the fur seal population, administration of the islands and Pribilovians, and enforcement of the regulations to implement the Act. Management of the fur seal population included the development of the Fur Seal Commission and later the Standing Scientific Committee to help prioritize research and exchange results among the signatories. The harvest was primarily focused on juvenile males due to their high quality fur and because dense

aggregations on land facilitated harvesting and processing. Harvests also occurred intermittently at sea and, relative to harvests on land, often resulted in high numbers of animals killed but not retrieved, including a high mortality of females. About 40,000 to 126,000 fur seals were harvested annually on land during the peak harvest from about 1943 to 1968. Adult females comprised from 50 to less than 1 percent of the on-land harvest during this same period. Commercial harvest of fur seals for their pelts was discontinued on St. George in 1972 and on St. Paul in 1984. Since the cessation of the commercial harvests on the Pribilof Islands, local residents have harvested fur seals to meet their subsistence needs. Pribilovians have harvested fewer than 1000 juvenile male fur seals annually since 2000.

Commercial fishery interactions and subsistence harvests are the primary manageable sources of mortality to the northern fur seal population. Fishery interactions can include direct bycatch, entanglement in derelict fishing gear, and indirect effects more difficult to detect. Other manageable threats include oil spills, chronic pollution, collisions, habitat degradation, illegal harvests, and harassment. Research, vehicles, vessels, and noise in general can cause harassment of fur seals. Natural factors also strongly influence fur seal behavior and ultimately survival and reproductive rates.

Studies of northern fur seal behavior, growth, mortality, migration, and foraging ecology have been an important component of fur seal management. Regular abundance estimation is critical to identifying population trends. The integration of comprehensive population abundance estimates with concurrent behavioral and ecological studies gives researchers and managers the potential for insight into the mechanisms that may be changing the population. Current fur seal population vital rates are unknown and historic estimates of age class survival and reproduction are not appropriate to use on a declining population with a small harvest. Estimating survival and reproduction of females will be an important aspect to evaluate possible mechanisms underlying the current population decline on the Pribilof Islands.

NMFS designated the Pribilof Islands northern fur seal population depleted on 17 June 1988 because it declined to less than 50 percent of levels observed in the late 1950s and no compelling evidence suggested that the northern fur seal carrying capacity (K) of the Bering Sea had changed substantially since the late 1950s. The MMPA defines the term "depletion" or "depleted" (16 U.S.C.1362 (1)) as meaning any case in which:

A. the Secretary of Commerce, after consultation with the Marine Mammal Commission and the Committee of Scientific Advisors on Marine Mammals, determines that a species or population stock is below its optimum sustainable population;
B. a State, to which authority for the conservation and management of a species or population stock is transferred under section 1379 of this title, determines that such species or stock is below its optimum sustainable population; or
C. a species or population stock is listed as an endangered species or a threatened species under the Endangered Species Act of 1973 (16 U.S.C. §1531).

B. Description and Taxonomy

Northern fur seals belong to the Order Carnivora, Suborder Pinnipedia, Family Otariidae, and Subfamily Otariinae. The family contains the extant genera Arctocephalus, Callorhinus, Eumetopias, Neophoca, Otaria, Phocarctos, and Zalophus. The genus Callorhinus contains one species, the northern fur seal, *C. ursinus* (Rice, 1998). Little evidence of genetic differentiation among breeding sites has been found (Ream, 2002; Rice, 1998), but for management purposes five stocks (populations) of northern fur seals are recognized that breed on at least six island groups in the North Pacific (Figure 1); the Eastern Pacific stock includes the Pribilof Islands and Bogoslof Island, San Miguel Island stock located off the coast of southern California, the Commander Islands stock (Russia), the Kuril Islands stock (Russia), and the Robben (Tuleniy) Island stock in the Okhotsk Sea (Russia). Stock designation is based principally on geographic separation during the breeding season (Dizon et al., 1992) but considerable interchange of individuals takes place between rookeries; therefore, northern fur seals are considered one biological species. This conservation plan pertains to the Eastern Pacific stock, with relevant information from other stocks included. Unless noted otherwise, all references to fur seals in this document are to northern fur seals.

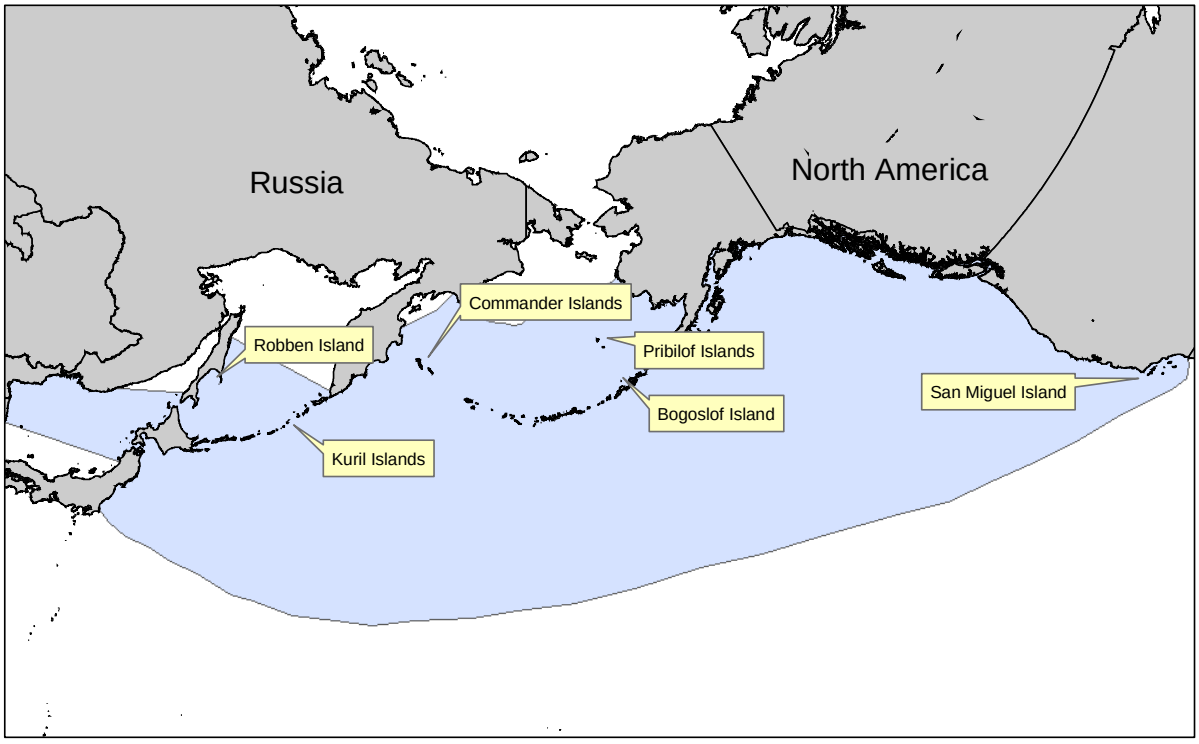
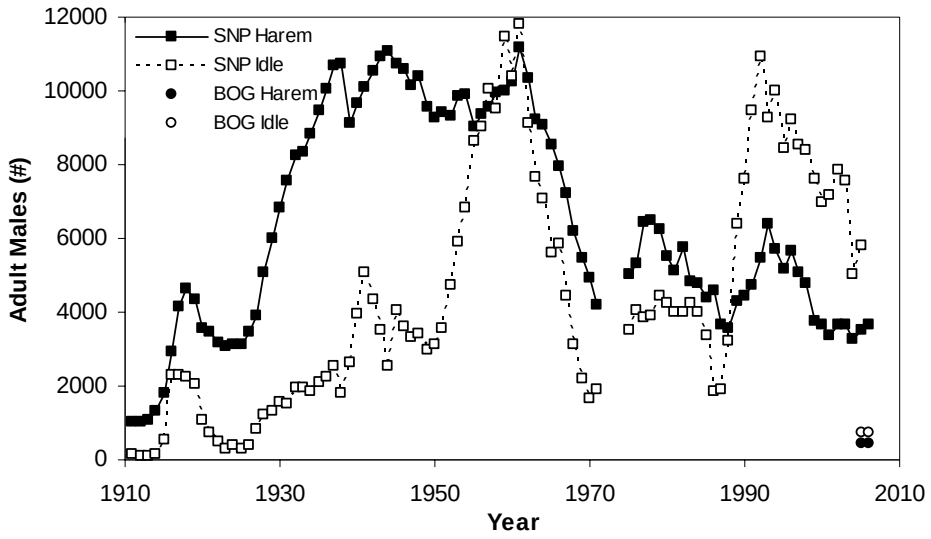


FIGURE 1. NORTHERN FUR SEAL BREEDING COLONIES AND EXTENT OF THEIR WINTER RANGE.

C. Abundance and Trends

Kenyon et al. (1954) presented the history of fur seal population estimation and the reliability of methods for the first half of the 20th century. York and Kozloff (1987) described the mark-recapture (shear-sampling) method for estimating pup production and York (1989) presented biases of the method. Pup production, the most accurate indicator of population size, is estimated every two years. Adult male fur seals are counted every year, and this count serves as a very rudimentary index of population size. Adult males have been counted since 1911 (Lander, 1980) on St. Paul and St. George (Figure 2a, b). NMML computes a total population estimate from the pup production estimate using a multiplier adjusted for the cessation of the commercial harvest.

A.



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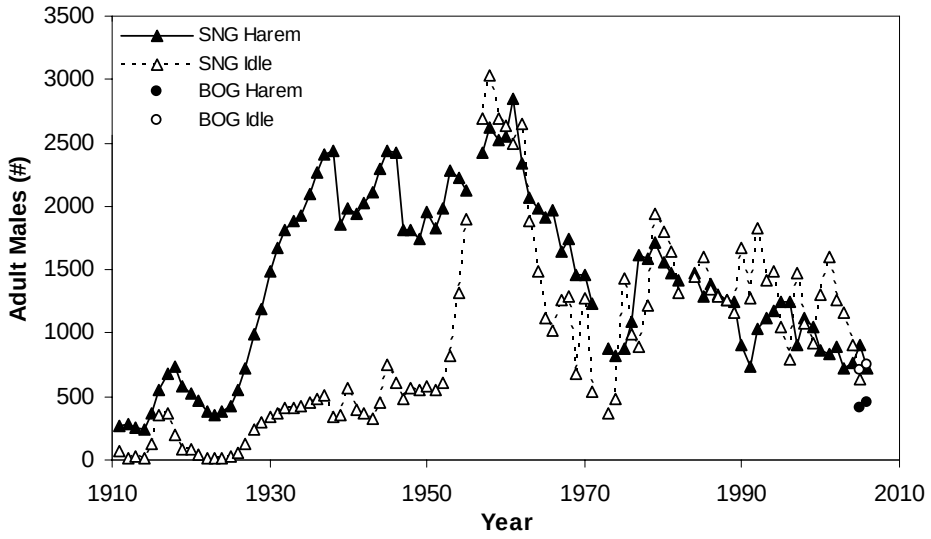


FIGURE 2. ADULT MALE COUNTS ON (A.) ST. PAUL (SNP) AND (B.) ST. GEORGE (SNG) FROM 1911-2006. BOGOSLOF ISLAND (BOG) COUNTS IN 2005 & 2006 ARE INCLUDED FOR REFERENCE.

C.1. Current Trends

The Eastern Pacific stock of fur seals has declined to an estimated 721,935 in 2006 (draft Stock Assessment Report) from a historical high of about 2.1 million during the late 1940s and early 1950s (Briggs and Fowler, 1984). Towell et al. (2006) report that the 2004 pup production estimate for St. Paul Island was 15.7 percent less than the estimate in 2002 and 22.6 percent less than the estimate in 2000 (Table 1; Figure 3a). The 2004 pup production estimate for St. George Island was 4.1 percent less than the estimate in 2002 and 16.4 percent less than the estimate in 2000 (Figure 3b). Estimated pup production has declined at 6.2 percent per year (SE = 0.78 percent, P = 0.01) on St. Paul Island, and at 4.5 percent per year (SE = 0.45 percent, P = 0.01) on St. George Island, from the estimated pup production in 1998 (Table 1). The 2006 estimate of pup production on St. Paul Island is 10.5% lower than 2004, while on St. George it is 1.2% greater than 2004. NMFS estimates that Pribilof pup production declined by 9.1% from 2004 to 2006. Estimated pup production is now below the 1917 level on St. Paul Island and below the 1916 level on St. George. During those years the northern fur seal population was increasing at about 8 percent per year as it was recovering from a pelagic harvest that took place in the 19th and early 20th centuries (Figure 3a, b).

TABLE 1. ESTIMATE OF THE NUMBER OF PUPS BORN ON THE PRIBILOF ISLANDS 1998-2006, INCLUDING THE COUNT STANDARD ERROR AND THE 95% CONFIDENCE INTERVAL. TOTAL INCLUDES LIVE AND DEAD PUPS COUNTED. (FROM TOWELL ET AL., 2006 AND NMFS UNPUBLISHED)

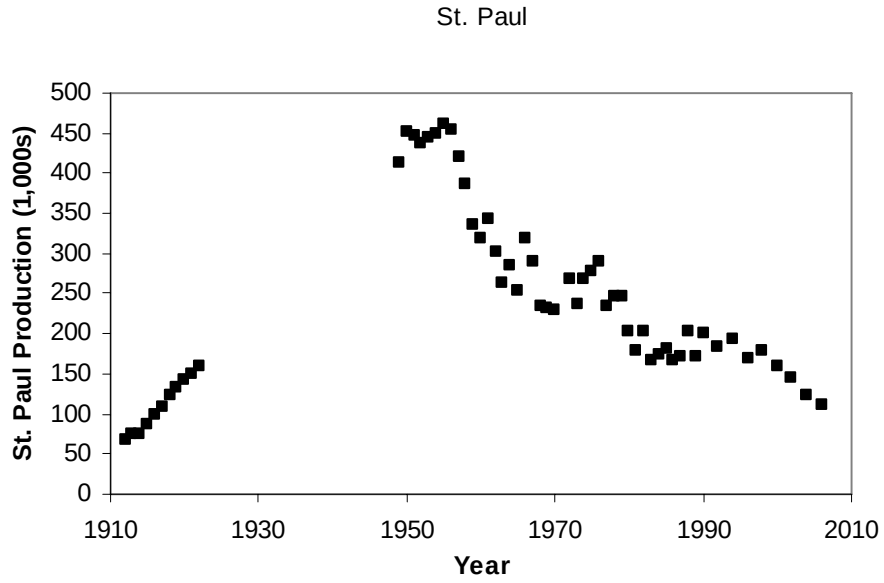
Location and year	Estimated number of pups born	Standard error	95% Confidence interval
St. Paul Island			
1998	179,149	6,193	164,503-193,795
2000	158,766	17,248	116,445-201,027
2002	145,701	1,629	142,182-149,220
2004	122,825	1,289	120,039-125,611
2006	109,937	1,522	106,743-113,229
St. George Island			
1998	22,090	222	21,547-22,633
2000	20,176	271	19,513-20,839
2002	17,593	527	15,890-18,238
2004	16,876	238	16,291-17,461
2006	17,070	144	16,742-17,404

Adult males are counted annually and categorized as territorial with females (harem), territorial without females and non-territorial (idle; Figure 2a, b). Numbers of harem males are highly correlated with the number of pups born (York et al., 2005). Fowler and Robson (1994) reported an increase in the total number of adult males from 1985 through 1993 related to the cessation of the commercial harvest on St. Paul Island. Recent adult male counts on St. Paul and St. George are lower than any period in the last 50 to 100 years (Figure 2a, b).

Fur seal pup production on Bogoslof Island (Figure 3c) is increasing rapidly in contrast to the

Pribilof Island population trend (Figure 3a, b). From 1976 to 1981, small numbers of fur seals were observed on Bogoslof Island (Loughlin and Miller, 1989). Since the first evidence of pup production in 1980 (Lloyd et al., 1981), the population has continued to grow rapidly (Ream et al., 1999; Figure 3c). Ream et al. (1999) speculated that such a rapid growth rate is largely influenced by immigration from the Pribilof Island populations.

A.



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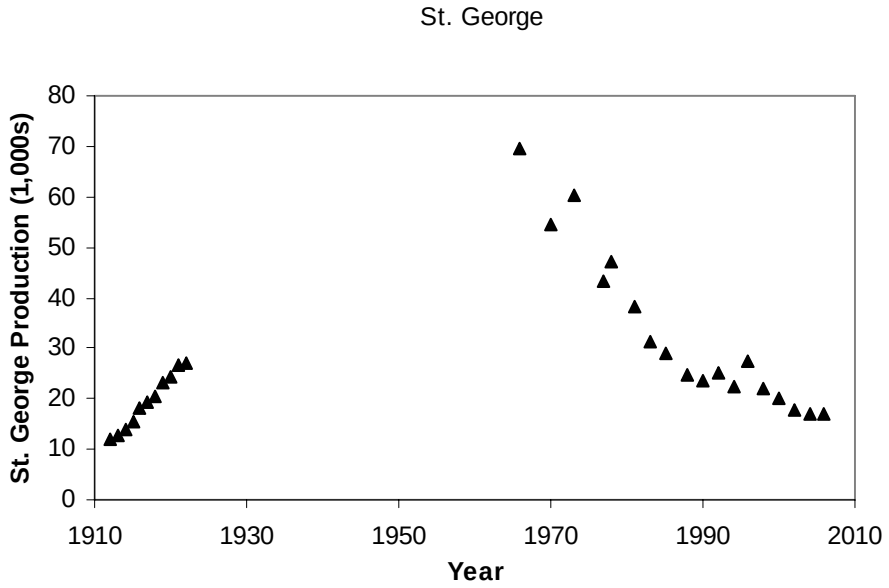


FIGURE 3. ESTIMATES OF NORTHERN FUR SEAL PUP PRODUCTION ON (A.) ST. PAUL, (B.) ST. GEORGE, AND (C.) {*NEXT PAGE*} BOGOSLOF ISLAND FROM 1912-2006.

C.

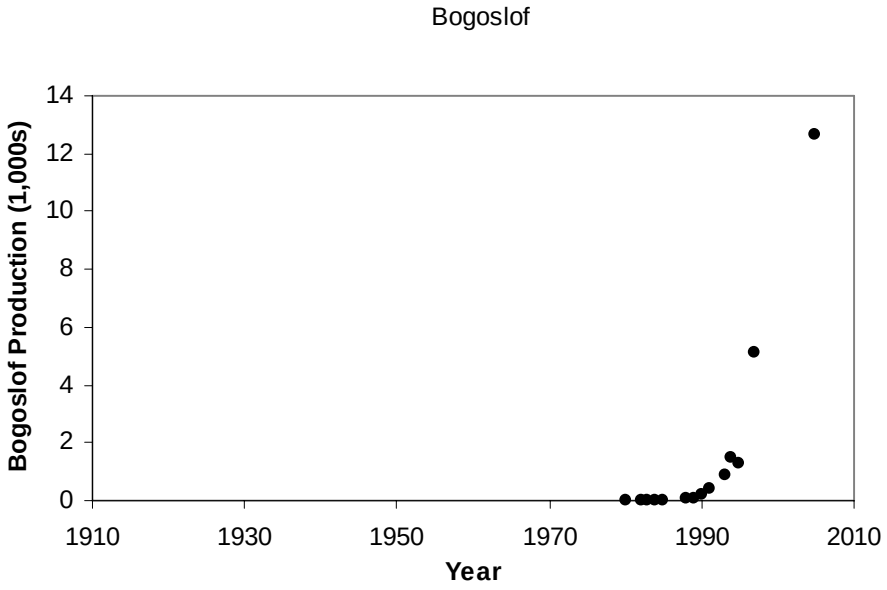


FIGURE 3 {*CONT'D*}. ESTIMATES OF NORTHERN FUR SEAL PUP PRODUCTION ON (A.) ST. PAUL, (B.) ST. GEORGE, AND (C.) BOGOSLOF ISLAND FROM 1912-2006.

While this Conservation Plan concerns the Eastern Pacific stock, it is important from an ecological perspective to consider the population status of other stocks. The San Miguel Island population was colonized by individuals from the Pribilof Islands population during the 1950s or early 1960s (Peterson et al., 1968; DeLong, 1982). Since the discovery of the San Miguel Island rookery, the fur seal population there has grown steadily but has had major short-term declines associated with strong El Niño events. The San Miguel Island stock reached a high in 1997 when pup production was estimated at just over 3,000 (DeLong and Melin, 1999; Melin and DeLong, 2000), with a total population estimated between 12,272 and 12,408 (Carretta et al., 2002). In 1999, the San Miguel population again began to recover with a total pup count of 1,084, and a stock estimate of 4,336 seals (Carretta et al., 2002), although the number of territorial bulls (106) was lower than the 1997 count (Melin and DeLong, 2001). This recovery continued through 2001 but remained below the 1997 level by 24 percent. Other signs of population recovery in 2000 and 2001 included good condition of 4-month-old pups and reduced late-season pup mortality, but the reduced number of adult females in the population after 1998 and the loss of most of the 1997 cohort suggest that fur seal pup production at San Miguel Island may remain depressed for several more years.

Fur seal numbers in the Commander and Kuril Islands and on Robben Island were greatly reduced in the early 1900s as a result of commercial sealing (Lander and Kajimura, 1982). Fur seal populations have generally decreased or remained stable from the 1960s to the late 1980s on the Commander and Kuril Islands (Gentry, 1998). The Commander Island population was estimated at 225,000 to 230,000 in 1988-1990, which is slightly less than the maximum of 255,000 in the late 1970s. The Kuril Island population was estimated to be 45,000 to 50,000 in 1988, a reduction from the peak of 60,000 in 1977-1978 (Vladimirov and Nikulin, 1991). The Robben Island stock declined from about 60,000 pups born in the 1960s to annual pup production of about 20,000 in 1990 (Yoshida and Baba 1982 in NRC, 1996; Gentry, 1998), but appears to be recovering; in 2002 the rookery was estimated to number 88,000 individuals and 26,400 pups (Kuzin 2002, pers. comm. to members at U.S./Russia meetings, Santa Cruz, CA). In recent years a small population that apparently originated from the San Miguel Island stock has also been reported on South Farallon Island off the central California coast (Pyle et al., 2001). Twenty-four pups were born on the Farallon Islands in 2005 (NMML unpublished).

C.2. Abundance

Loughlin et al. (1994) estimated approximately 1.3 million northern fur seals worldwide, and the Pribilof Islands represented about 982,000 (74 percent) in 1992. The population estimate for the Eastern Pacific stock of northern fur seals is calculated as the estimated number of pups at rookeries multiplied by a series of different expansion factors determined from a life table analysis to estimate the number of yearlings, two-year olds, three-year olds, and animals at least four years old (Lander 1981). The resulting population estimate is equal to the pup count multiplied by 4.5. The expansion factor is based on a sex and age distribution estimated after the harvest of juvenile males was terminated. Currently, coefficients of variation are unavailable for the expansion factor. As the great majority of pups are born on the Pribilof Islands, pup estimates are concentrated on these islands, though additional counts have been made on Bogoslof Island. Since 1990, pup counts have occurred biennially on St. Paul and St. George Islands, although less frequently on Sea Lion Rock and Bogoslof Island. The most recent estimate for the number of fur seals in the Eastern Pacific stock, based on pup counts from 2002 on Sea Lion Rock, from 2004 on the Pribilof Islands, and from 2005 on Bogoslof Island, is 721,935 (4.5 x 160,430). NMML calculated preliminary estimates of the 2004-5 worldwide population at 1.1 million, and the Pribilof Islands accounted for about 55 percent of the annual production, down from 74 percent in 1992.

C.3. Carrying Capacity

Both carrying capacity (K) and optimum sustainable population (OSP) are difficult to measure; K is especially hard if the ecosystem has changed significantly since historic high population levels. Pribilof Islands northern fur seal carrying capacity was estimated at 1.8 million (Kenyon et al., 1954) during the depleted listing (51 FR 47156). Subsequent analyses of the population data suggested that the population might have been closer to 2.1 million during the late 1940 to early 1950 period (Briggs and Fowler, 1984). Gerrodette and DeMaster (1990) suggest natural changes in carrying capacity are a more accurate reflection of environmental complexity than assuming a constant environment. Fowler and Siniff (1992) further discuss the importance of differentiating and defining "natural K," from "current K" and "altered K." One of the major challenges to assessing the current carrying capacity of a population is determining what influence human activities may have on the "natural K" (i.e., historical carrying capacity) and whether an "altered K" exists and can be restored to the "natural K" through management and restoration actions.

The MMPA defines optimum sustainable population as "...the number of animals which will result in the maximum productivity of the population or the species, keeping in mind the optimum carrying capacity of the habitat and the health of the ecosystem of which they form a constituent element (16 U.S.C. §1362(9))." NMFS regulations at 50 Code of Federal Regulations (CFR) 216.3 define OSP as

> ...a population size which falls within a range from the population level of a given species or stock which is the largest supportable within the ecosystem, to the population level that results in maximum net productivity. Maximum net productivity is the greatest net annual increment in population numbers or biomass resulting from additions to the population due to reproduction and/or growth less losses due to natural mortality.

Section 1361(2) of the MMPA states that marine mammal species, populations, and stocks should not be permitted to fall below their OSP level. The maximum net productivity level (MNPL) is the lower end of OSP. Historically, MNPL has been expressed as a range of values (generally 50-70 percent of K) determined theoretically by estimating what stock size in relation to the original stock size will produce the maximum net increase in population (42 Federal Register (FR) 12010, March 1, 1977). MNPL for marine mammals is at least 50 percent of carrying capacity (Eberhardt and Siniff, 1977), and may be as high as 80 percent (Fowler 1981, 1988). In 1977, the mid-range value of 60 percent was used to determine if a stock of dolphins was depleted (42 FR 64548, Dec. 27, 1977). The 60 percent value was supported by NMFS in the final rule governing the taking of marine mammals incidental to commercial fishing operations (45 FR 72178, Oct. 31, 1980). The lower bound of OSP for northern fur seals is also considered to be at 60 percent of K (Fowler, 1981). The lower bound of OSP would be 1,080,000 if K was 1.8 million northern fur seals and 1,260,000 if K was 2.1 million.

Fowler (1986) stated that

> given the available data and analyses, it is not possible to clearly determine whether the Pribilof fur seal population is currently at, above, or below carrying capacity levels; whether carrying capacity has changed significantly in the last two or three decades; or whether the observed population decline is due to declining carrying capacity, increased mortality, or some combination of both.

Gerrodette and DeMaster (1990) used Goodman's (1988) dynamic response analysis and a condition index to evaluate northern fur seal population status. They determined that the population was below OSP, and evidence suggested that carrying capacity was unchanged. Fowler and Siniff (1992) used a variant of the approach used by Gerrodette and DeMaster (1990); they suggested that carrying capacity might be reduced on the order of 13 percent based on a proportional reduction of mortality estimates from 1911 to 1990 (Fowler and Siniff, 1992).

Carrying capacity estimates for other seasonal occupants of the Bering Sea may provide insight towards the uncertainty in estimating carrying capacity of the Eastern North Pacific northern fur seal stock. Schell (2000) suggested that the overall carrying capacity in the Bering Sea declined during the past two decades based on primary and secondary production estimates. Swartzman and Haar (1983; 1985) reviewed pollock fisheries data for the Bering Sea and concluded that an increase of juvenile walleye pollock may have resulted in an increase of total pollock (i.e., increased K), potentially benefiting foraging northern fur seals. Some researchers have suggested that gray whales are approaching or have reached their carrying capacity for the

Bering Sea (e.g. Moore et al., 2001). Hobson et al. (2004) disagreed with Schell's hypothesis of a reduction of Bering Sea productivity.

In today's world, humans have impacts on all ecosystems (Millennium Ecosystem Assessment, 2005), and it is difficult to conceive of the Eastern Bering Sea and North Pacific as ecosystems immune to these changes. Alterations and impacts stemming from global warming (Houghton et al., 2001), pollution, and fishing are factors that influence carrying capacity and force us to think in terms of ecosystem-based management. The carrying capacity for any species is an ecosystem feature determined, in part, by the combined effects of such factors. Commercial fishing harvests result in competition for fish also consumed by northern fur seals. Competition among the predators in ecosystems is a natural dynamic, which Fowler (2003) uses as basis for establishing what is normal and what is abnormal or pathological in the consumption of individual resource species, species groups, and ecosystems. Commercial fishing in the Bering Sea results in harvests of fish that average on the order of 10 to 50 times greater than the consumption of fish by the other predators in that system (Fowler and Hobbs, 2002; Fowler, 2003). The production of carbon dioxide, manufacture of toxic substances, and consumption of resources would have to be counted among the many factors to be regulated in order to "*Maintain ecosystem health and sustainability….*" (NPFMC, 2006) in dealing with the complex set of factors that influence ecosystems and their carrying capacities for species such as the northern fur seal.

D. Life History

D.1. Reproduction

Some males and most females probably return to their natal sites to breed (Baker et al., 1995; Gentry, 1998). Male fur seals become sexually mature at 5-7 years of age and begin competing for a territory after about 7-9 years of age (Johnson, 1968). Adult males arrive on rookeries in mid-May, and territorial males fast while defending territories until early August. Territories are small, averaging a maximum area of approximately 110 m^2 (Gentry, 1998). Male displays and calls appear to be directed at other males and are probably not used to attract females. Immature male fur seals also fast while resting on the haulout sites and may lose an estimated 20-30 percent of their body weight during the breeding season, which is somewhat less than that lost by territorial males during the same period (Baker et al., 1994).

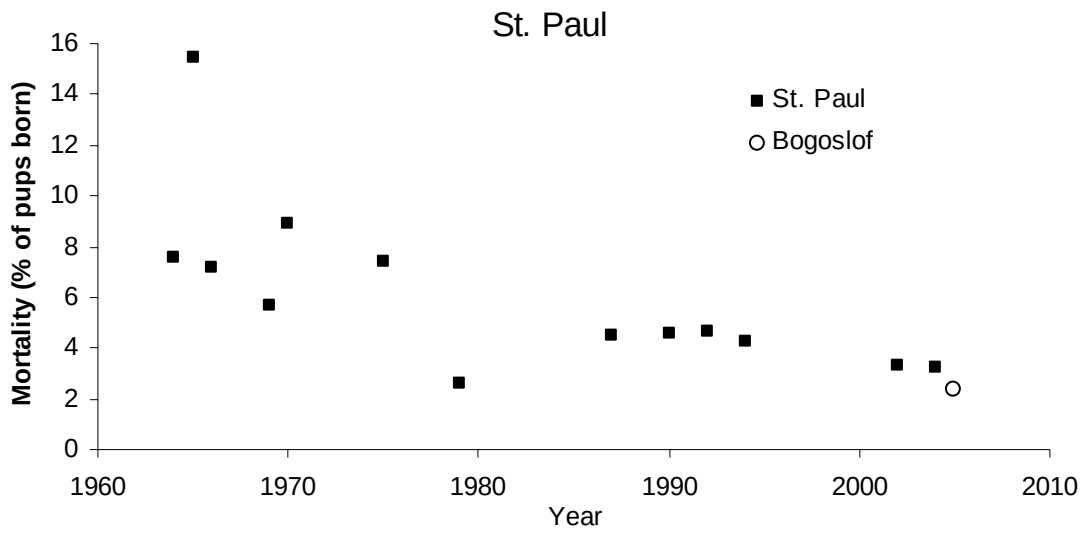
Most females become sexually mature between four and seven years of age (average about 5) (York, 1983) and are known to give birth up to at least 23 years of age (Lander, 1981). Pregnant females begin to arrive in mid-June; non-pregnant adult females arrive later (Bartholomew and Hoel, 1953; Gentry and Holt, 1986; Gentry, 1998). Arrival of pregnant females peaks in early July, followed by a progressive decline in numbers of new arrivals through August (Gentry and Holt, 1986; Gentry, 1998). Females give birth to a single pup within two days of arriving on shore, and mate 3-8 days after parturition (Petersen, 1968; Gentry and Holt, 1986; Gentry, 1998). Female fur seals exhibit a delayed implantation of the blastocyst with implantation occurring between mid November to early December (York and Scheffer, 1997). Lactating females make three- to ten-day foraging trips from the island, punctuated by one- to two-day visits to the rookery to feed pups. Upon the female's return from foraging, pups and females recognize each

other initially by vocalization. Mother-offspring pairs recognize each other's vocalization during the course of the breeding season and are able to retain these memories for at least 4 years (Insley, 2000). Pups are weaned at approximately four months of age. After pupping, mating, and weaning of pups, adult females from the Pribilof Islands migrate south through passes in the Aleutian Islands into the North Pacific Ocean (Ream et al., 2005).

D.1.1. Pup Mortality

Neonatal mortality is an important indicator of influences on the reproductive capacity of a population. York (1985) reported neonatal mortality on St. George Island is lower than on St. Paul Island, where the population is higher. Between 1990 and 1999, pup mortality ranged from 4.69 percent to 2.82 percent on St. Paul, and 3.97 percent to 2.05 percent on St. George (Antonelis et al., 1994; York et al., 2000). Several factors, including emaciation, trauma, various infections, and increased incidence of disease and parasites, contribute to neonatal mortality rates (York, 1985, Fowler, 1985). Figure 4 shows pup mortality for St. Paul and St. George from 1964 through 2004. Gentry (1998) suggested that neonatal mortality due to female induced trauma (~17 percent of the total mortality) is not density dependent because of female spacing tendencies. Females form dense groups at all population levels (Gentry, 1998). In the 1940s and 1950s on-land pup mortality ranged from 10 to 22 percent. Trends in pup mortality are influenced by density dependent factors and the on-land harvest of adult females in the late 1960s (York and Hartley 1981) is strongly related to higher neonatal mortality through 1968.

A.



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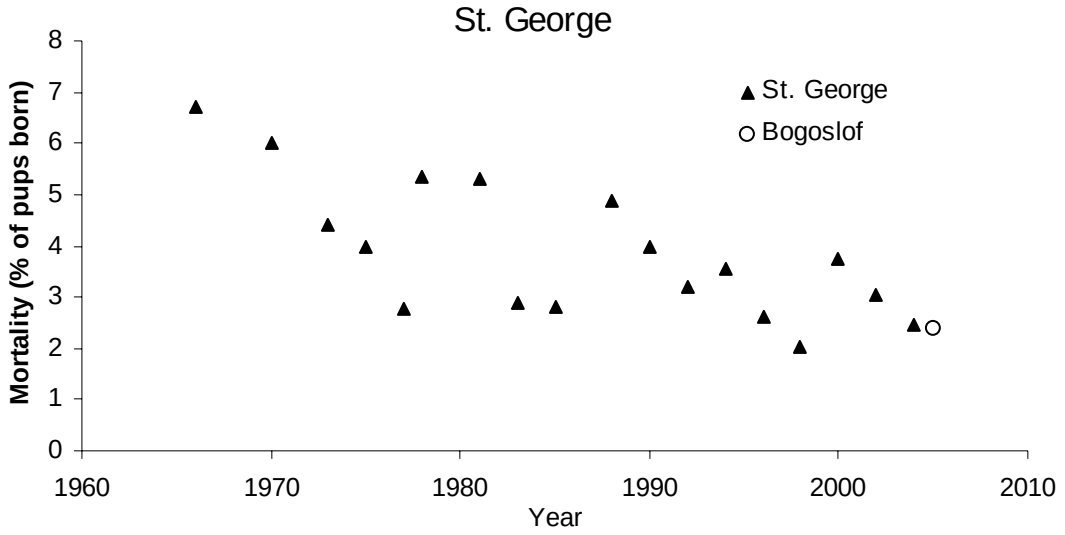


FIGURE 4. NORTHERN FUR SEAL PUP MORTALITY ON (A.) ST. PAUL AND (B.) ST. GEORGE FROM 1964-2004. BOGOSLOF ISLAND MORTALITY DURING 2005 IS INCLUDED IN EACH FOR REFERENCE.

Historically, hookworm disease was responsible for 45 percent of the fur seal pup mortality in a study conducted between 1974 and 1977 (Gentry, 1981a). Lyons et al. (2001) indicated a dramatic decline in the incidence of hookworm disease in fur seal pups on St. Paul Island in recent years. Infectious diseases were found in 4 percent of the pups on St. Paul. Spraker et al. (in review) found no evidence over the past 27 years to implicate diseases or neonatal pup mortality as an important factor in the current population decline on St. Paul.

Trites and Antonelis (1994) indicate the "pivotal event" to influence the survival of pups is the timing of birth. Trites (1990) describes the importance of high birth weight pups being able to tolerate cold Pribilof Islands weather from 1956 to 1981, whereas those with low birth weight had a higher probability of succumbing to storms shortly after birth. Changes in the timing of birth would have critical implications for assessing trends in mortality and mass (next section).

D.1.2. Pup Health

The NMML measures the mass and length of pups on St. Paul and St. George Islands concurrent with estimates of pup production. Baker et al. (1994) reported that larger than average male pups were more likely to survive to age five from 1987-1990, suggesting that pup mass and length are useful indicators of health. Figure 5 shows mass for St. Paul and St. George pups from 1957-2004. St. George pups are typically heavier and longer than those born on St. Paul. Male pups are heavier than female pups (Figure 5a, b).

A. **B.**

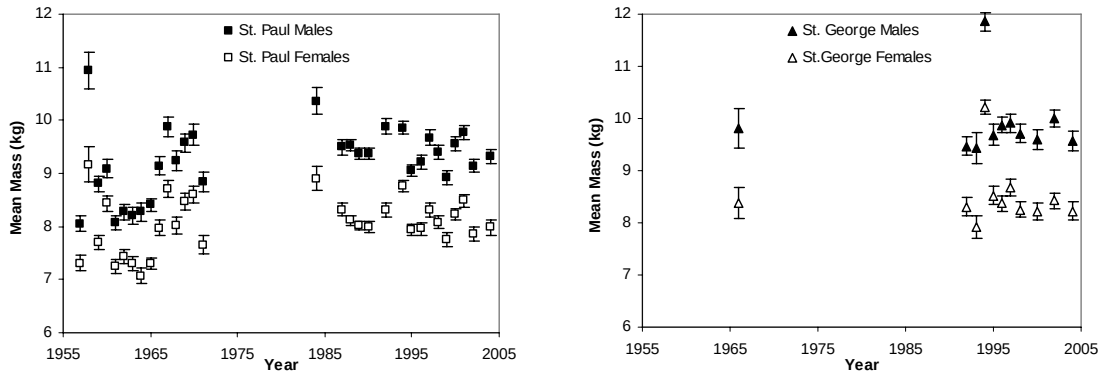


FIGURE 5. NORTHERN FUR SEAL MALE AND FEMALE PUP MASS ON (A.) ST. PAUL AND (B.) ST. GEORGE FROM 1957-2004, INCLUDING STANDARD ERROR BARS. MASS MEASUREMENTS ARE CORRECTED FOR GROWTH RATES (BOLTNEV ET AL., 1998) TO A STANDARD DATE WITHIN THE RANGE OF SAMPLING DATES.

Trites (1991) suggests that early measurements (1957-66) of pup mass may have been collected from a biased sample of lighter than average pups. Revised pup sampling protocols (Antonelis, 1992) have reduced the potential sampling bias described by Trites (1991). Robson et al., (1994) reported measurement error associated with mass and length methods in 1992 were insignificant relative to natural variation in mass and length. Trites (1991) reports no reduction in growth for pups tagged and handled from 1957-1966.

D.2 Migration

The typical migratory pattern of northern fur seals has been described by numerous authors (e.g., Bigg 1990; Fiscus, 1978; Fowler, 1998). Northern fur seals begin to return to the breeding islands from their pelagic winter foraging in the spring of each year. Adult males arrive first and establish territories on the breeding rookeries. On the Pribilof Islands they arrive in descending order by age, beginning in early May. The youngest males may not return to the breeding areas until mid-August or later. Some yearlings arrive as late as September or October; however, most remain at sea. The older pregnant females arrive about mid-June; the peak of pupping occurs in early July. Pups leave the islands in early November after the older animals.

Fur seals migrate during early winter through the Eastern Aleutian Islands into the North Pacific Ocean then into the waters off the coasts of British Columbia, Washington, Oregon, and California (Figure 6). Older males appear to remain in the northern part of the range, while young males and females of all ages spend the winter feeding in the southern part. While seals feed at sea, the daily feeding rate for pregnant females is 1.6 times that of nonpregnant females (Perez and Mooney, 1986). The northward migration begins in March. This migration brings the animals back to the breeding colonies where the cycle is repeated.

Adult males are believed to migrate only as far south as the Gulf of Alaska (Kajimura, 1984). Loughlin et al., (1999) used satellite telemetry to monitor the movements of 8 adult male fur seals from the Pribilof Islands and reported that seven of eight males eventually left the Bering

Sea and fed either in the Eastern Pacific Ocean and Gulf of Alaska or to the west off the Kuril Islands and Japan.

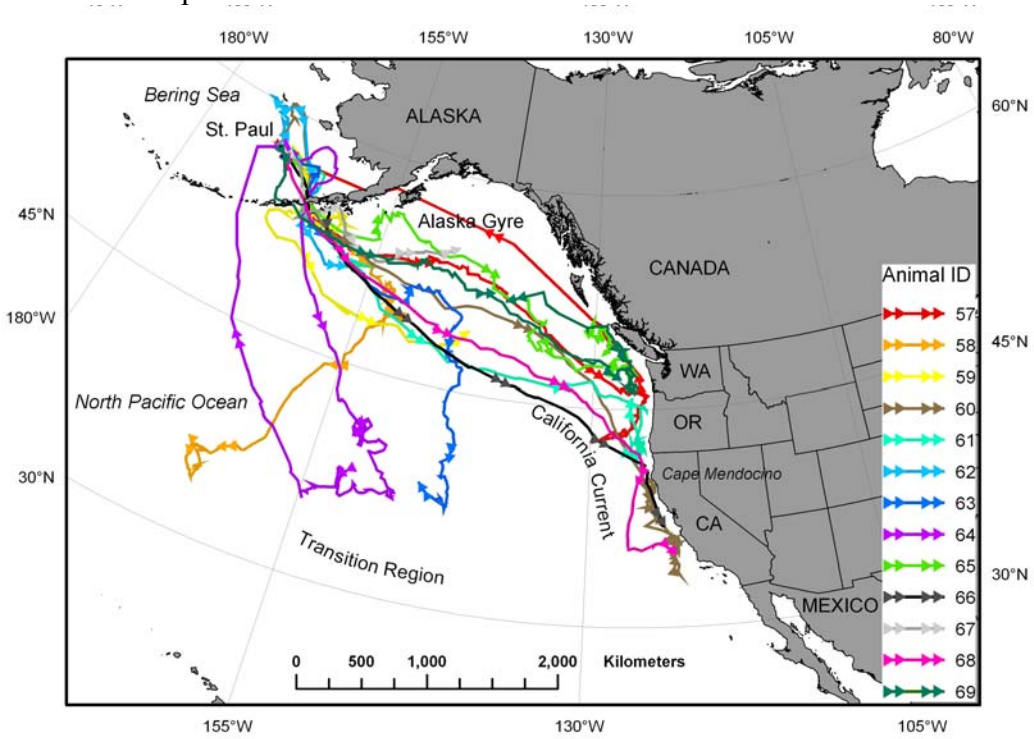


FIGURE 6. WINTER MIGRATION ROUTES OF 13 ADULT FEMALE NORTHERN FUR SEALS TO FEEDING AREAS IN THE NORTH PACIFIC OCEAN (*FROM REAM ET AL., 2005*).

Pups begin swimming at about 26 days of age, spend a substantial amount of time in the water by 40-50 days of age, and by 100 days old are making shallow dives for short durations (Baker and Donohue, 2000). They begin leaving the Pribilof Islands in October and are widely dispersed by the time they reach the Aleutian Islands (Ragen et al., 1995). It is thought that pups from the Pribilof Islands travel through Aleutian Island passes after leaving their birth islands and remain at sea in the North Pacific Ocean for about 22 months before returning to their islands of origin as 2-year-olds. Baker et al. (1994) and Baker and Fowler (1992) showed that larger-than-average male pups were more likely to survive to at least two years of age.

Ream et al. (2005) monitored 13 adult female fur seals from St. Paul Island during their migration in 2003 and found that seals departed from the Pribilof Islands in November and moved in a southeasterly direction over the continental shelf as they left the Bering Sea (Fig. 4). Their travel routes did not follow coastal or bathymetric features as they crossed the North Pacific Ocean, and instead corresponded to complementary water movement of the Alaska Gyre and the North Pacific Current. Feeding locations during winter are generally unknown, but Ream et al. (2005) demonstrate that the fur seals cue on significant oceanographic features to navigate in the open ocean and to locate prey. It is believed that fur seals from all Eastern Bering Sea rookeries intermix with fur seals from other rookeries in the Bering Sea and North Pacific. San Miguel Island fur seals are present in the Eastern Pacific Ocean predominantly offshore California during the winter.

E. Diet and Foraging Behavior

Northern fur seals consume schooling fish and gonatid squid, although the species eaten vary with location and season (Kajimura, 1984; Sinclair et al., 1994; Ream et al., 2005) (Table 3; Figs. 5 & 6). The subsequent sections describe details of diet information based on fur seals sampled from the main geographic regions occupied by fur seals, trophic levels of fur seals, and foraging behavior. The greatest volume of information describing the feeding ecology of northern fur seals is based on stomach contents taken in pelagic collections of adult female and juvenile seals from the 1950s to the 1970s (Kajimura, 1984). The stomach content data is at least 30 years old and it's applicability to present day fur seal diet estimates is unknown. More recent diet information has been obtained from fecal analyses, stable isotope analysis, and fatty acid signature analysis (Antonelis et al., 1997; Sinclair et al., 1996; Kurle and Worthy, 2001; Goebel, 2002; Gudmundson et al., 2006; Zeppelin and Ream, 2006). All methods of analysis to estimate species and size composition of pinniped diets are limited by some form of bias (Pierce et al., 1991; Sinclair et al., 2000; Tollit et al., 2004; Yonezaki et al., 2003; Yonezaki et al., 2005).

E.1. Diet: Bering Sea

Walleye pollock, squid, and bathylagid fish (northern smoothtongue, *Leuroglossus schmidti*, a.k.a. seal-fish) were the predominant prey of fur seals in the Bering Sea during the first half of the 20th century (Scheffer, 1950). The stomach contents of female northern fur seals in the Eastern Bering Sea between 1958 and 1974 consisted of juvenile walleye pollock (35 percent), capelin (*Mallotus villosus*;16 percent), Pacific herring (11 percent), and squid (30 percent) (Perez and Bigg, 1986). Considerable variation in the importance of each of these species and groups existed among areas, and by season and year sampled. Kajimura (1984) found that deep-sea smelts of the family Bathylagidae ranked fourth in importance by volume in the Bering Sea during the years 1963, 1964, 1968, 1973 and 1974. Deep-sea smelts may be under represented in volumetric summaries that combine all years because oceanic habitat was sampled less frequently during the pelagic collection period. However the relative use of oceanic habitat by fur seals is also poorly understood and may be greater than previously thought (see Ream et al., 2005). Pollock was particularly important around the Pribilof Islands and other inshore areas from July to September. Capelin was the main prey consumed near Unimak Pass during June to October. A large number of other prey species occurred in small quantities. Sinclair et al. (1994) reported that fur seal stomachs and GI tracts collected during pelagic studies conducted during the 1980's in the Eastern Bering Sea contained mostly juvenile walleye pollock from the age-0 group (65 percent) or from the age-1 group (31 percent), while only four percent were from the age-2 group and older. The percentage of the various age groups of walleye pollock consumed by fur seals varied among years and was apparently a reflection of differences in the strengths of year classes before and during the course of the study. Adult walleye pollock were most frequently found in the stomachs of fur seals collected over the outer domain of the continental shelf, while juvenile pollock were found in fur seals collected both over the midshelf and outer domain. Atka mackerel (*Pleurogrannus monopterygius*) was found only in fur seals collected over the outer shelf domain north of Unimak Island. Northern smoothtongue and gonatid squid were the dominant species found in stomach samples collected

TABLE 2. FREQUENCY OF OCCURRENCE (FO) OF PRIMARY PREY (>5% ON ANY ROOKERY) BY ROOKERY FOR 1988-2000. FO VALUES >10% ARE BOLD. GB/BM SQUID ARE *GONATOPSIS borealis* OR *BERRYTEUTHIS magister* AND GM/GM SQUID ARE *GONATUS madokai* OR *GONATUS middendorffi*.

Rookery (n)	Walleye pollock	Pacific sand lance	Gm/Gm squid	Gb/Bm squid	Gonatus tinro	Pacific salmon	Northern smoothtongue	Pacific herring	Atka mackerel
Morjovi (219)	**66.21**	**11.42**	8.68	<1	0.00	3.20	0.00	7.76	1.37
Vostochni (539)	**69.39**	**11.69**	6.49	1.30	<1	5.38	<1	6.12	1.86
Pol & PolCfs (262)	**70.23**	**12.98**	5.73	1.91	0.00	**10.31**	<1	6.49	3.05
Kitovi (228)	**68.42**	**10.96**	6.58	7.02	1.75	7.89	3.07	2.63	0.00
Lukanin (84)	**65.48**	**15.48**	8.33	8.33	0.00	8.33	3.57	5.95	0.00
Little Zapadni (236)	**83.90**	4.24	**20.76**	4.66	<1	7.63	<1	3.81	2.54
St. Paul, Zapadni (334)	**75.15**	6.29	**21.56**	5.99	<1	4.79	2.99	2.99	3.59
Tolstoi (395)	**68.86**	3.04	**17.22**	7.59	<1	7.59	1.52	2.78	5.32
Zapadni Reef (92)	**76.09**	8.70	**15.22**	1.09	0.00	**11.96**	1.09	5.43	5.43
ArdGorbatch (260)	**70.38**	8.46	**16.15**	**13.08**	3.46	5.00	3.85	3.08	5.38
Reef (319)	**64.26**	7.52	**10.97**	**11.91**	2.19	6.27	2.82	4.70	5.64
North (309)	**66.02**	3.56	6.15	**17.80**	1.94	**14.56**	1.29	1.29	1.29
East Cliffs (196)	**65.31**	2.55	7.65	**19.39**	5.61	**18.88**	5.61	3.06	3.06
East Reef (139)	**70.50**	2.16	4.32	8.63	1.44	**10.07**	<1	2.16	2.16
Staraya Artil (169)	**61.54**	1.18	5.33	**16.57**	1.18	**10.06**	5.33	4.73	1.18
South (226)	**47.79**	3.10	**10.18**	**34.96**	4.42	**15.93**	**14.16**	2.21	3.98
St. George, Zapadni (164)	**42.68**	3.66	**12.80**	**38.41**	7.93	**14.63**	**15.85**	1.22	<1

over continental slope and oceanic waters (Sinclair et al., 1994). Herring, eulachon, and capelin were largely absent from fur seal diet in the Bering Sea during the 1980's (Sinclair et al., 1994). Gudmundson et al., (2006) reported significant differences in prey consumption estimates when comparing frequency of occurrence from northern fur seal scats and regurgitations. Difference in prey consumption estimates from stomach contents and other methods have not been examined. Sinclair et al. (1996) reported that juvenile pollock was the predominant prey found in scat of Pribilof Island fur seals from 1987 to 1990. In a recent survey of mesopelagic nekton in the slope and oceanic waters of the Southeastern Bering Sea, Sinclair and Stabeno (2002) reported that as a family, the bathylagids were the dominant group throughout the water column and that nearly half of the total catch weight values were comprised of northern smoothtongue.

Antonelis et al. (1997) examined scats collected at rookeries during the breeding season to compare prey species taken by female northern fur seals on St. Paul and St. George islands with those taken at Medny Island (Russia). Juvenile walleye pollock was the most common prey of fur seals on St. Paul Island; a combination of walleye pollock and squid was consumed by seals on St. George Island; and gonatid squid, was the primary prey consumed on Medny Island. The reasons for these differences were apparently related to the physical and biological environment surrounding each island. St. Paul Island is surrounded by a broad neritic environment and is farther from the continental slope than either St. George or Medny Island. Medny Island is surrounded by a compressed neritic environment and is adjacent to the continental shelf edge. The environment surrounding St. George Island is intermediate to that of the other two islands. Zeppelin and Ream (2006) have examined scats from St. Paul and St. George breeding areas from 1988-2000 (Table 3). As with earlier Pribilof fur seal diet estimates, pollock was the most frequent item found in scat from either island. Squid were found second most frequently for many rookeries, and when combined comprise a majority of the diet for St. George fur seals from southern rookeries. Zeppelin and Ream (2006) used cluster analysis on the frequency of

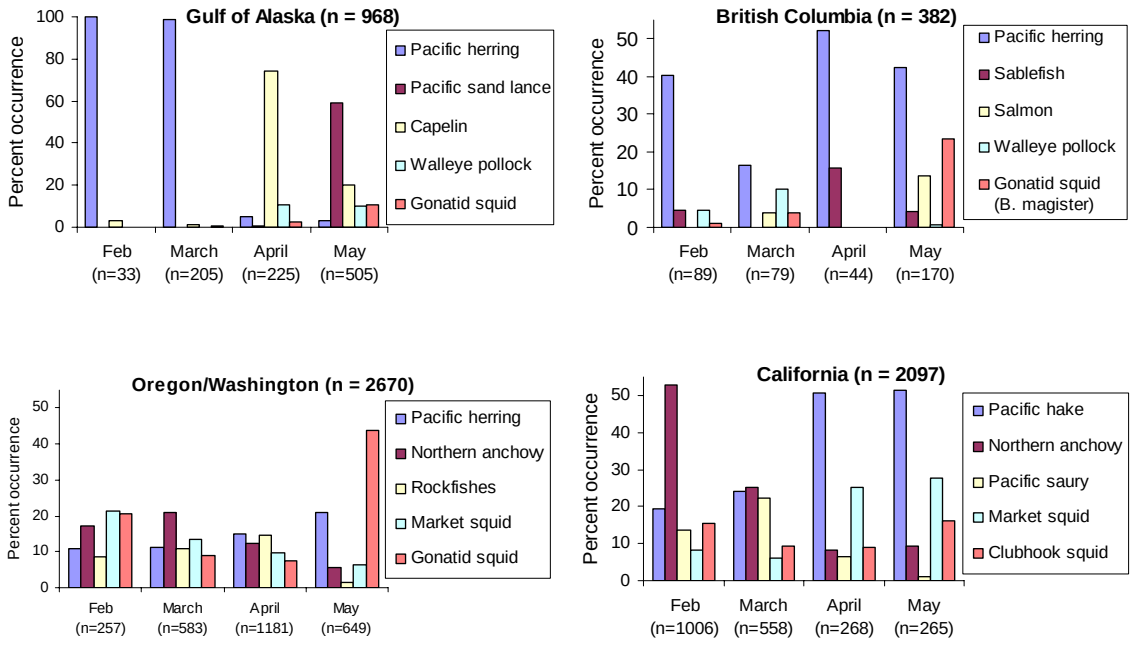
occurrence of primary prey by rookery. Their results support the hypothesis of foraging habitat partitioning by central breeding area (Robson et al., 2004; Sterling and Ream, 2004), but also provide evidence for further partitioning of foraging resources by groups of rookeries.

Robson (2001) compared fecal samples of seals from St. Paul and St. George islands and reported results similar to those of Antonelis et al. (1997): pollock occurred more frequently than any other prey species in fecal samples for seals from both islands, however, squid occurred more frequently in the diet of fur seals from St. George than from St. Paul. Walleye pollock was the principal prey identified by Goebel (2002) using fatty acid signature analysis on milk from lactating females to examine dietary shifts related to changes in physical oceanography, dive pattern, and foraging location in female northern fur seals during 1995-1996.

E.2. Diet: Gulf of Alaska

Although the species of prey consumed by northern fur seals varies throughout their range, the characteristic habit of selecting small schooling forage fishes and squids with similar habits does not change (Kajimura, 1984; Sinclair et al., 1994). The dominant prey for fur seals in the Gulf of Alaska from February to April was Pacific herring and from April to July it was Pacific sandlance (*Ammodytes hexapterus*) and capelin (Perez and Bigg, 1986). Kajimura (1984) reported that the principal prey in the Gulf of Alaska from 1958 to 1968 included Pacific herring, capelin, salmon (*Oncorhynchus* spp.), walleye pollock, Pacific sandlance, rockfish (*Sebastes* spp.), Atka mackerel, and squid. Scheffer (1950) identified squid and rockfishes as fur seal prey in the Gulf of Alaska during the first half of the 20th century although sample sizes were small.

Ream et al. (2005) summarized data from stomach contents of fur seals collected in the North Pacific Ocean and found that in the Gulf of Alaska (February - May) Pacific herring, capelin and Pacific sand lance were the most frequently observed items from 1958 to 1974 (Figure 7, top left panel). Differences in diet between juvenile males and females in the Gulf of Alaska (Figure 8) may have been present and possibly related to differences in diving capacity (Ream et al., 2005).



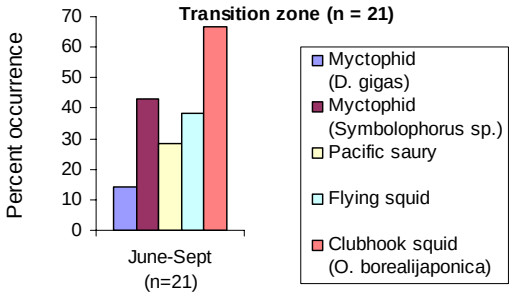


FIGURE 7. PERCENT OCCURRENCE OF PRIMARY PREY SPECIES (TOP 5 SPECIES) IN STOMACHS OF NORTHERN FUR SEALS COLLECTED AT SEA. PREY IS LISTED BY MONTH AND REGION OF COLLECTIONS (*FROM REAM ET AL., 2005*).

E.3. Diet: Pacific Ocean

A wide variety of prey species occurred in stomach contents of female fur seals in the North Pacific, and prey composition varied by location and time of year (Kajimura, 1984; Perez and Bigg, 1986). Fur seals in the waters off California fed primarily on northern anchovy (*Engraulis mordax*) during January to March, and Pacific whiting (*Merluccius productus*) during April and May. Pacific herring was consumed in neritic areas off the Washington coast during December to January and May to June. Rockfishes, northern anchovy, and squid were more prominent in

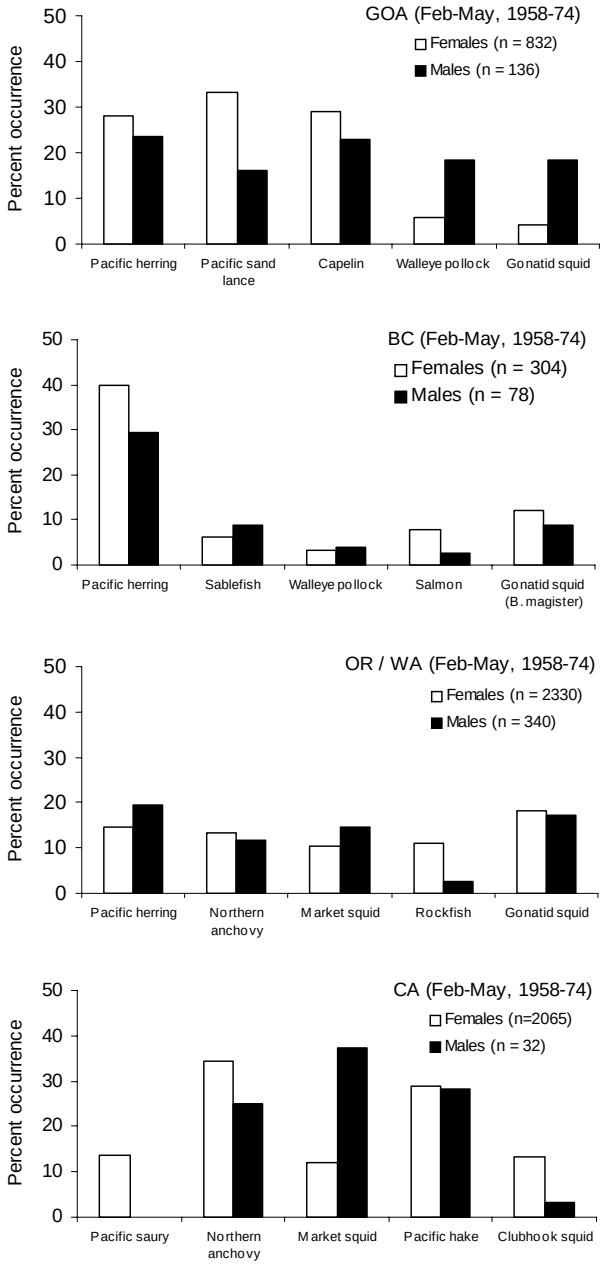


FIGURE 8. PERCENT OCCURRENCE OF PRIMARY PREY IN STOMACHS OF MALE AND FEMALE NORTHERN FUR SEALS, BY REGION (GOA=GULF OF ALASKA; BC=BRITISH COLUMBIA; OR/WA=OREGON AND WASHINGTON; CA=CALIFORNIA, *FROM REAM ET AL., 2005*).

fur seal stomachs off Washington during February and March. Off British Columbia, Pacific herring was the primary prey from February to June, although market squid (*Loligo opalescens*) was important in coastal inlets and onychoteuthid squids and salmonids were important in oceanic waters during May and June. Important prey species in the northern portion of the North Pacific included Pacific sand lance, capelin, Atka mackerel, salmonids, walleye pollock, and squid.

Northern fur seals collected in continental shelf waters off the California and Washington coast between 1958 and 1972 fed primarily on fishes, while those collected beyond the shelf fed primarily on squids (Kajimura, 1984). Prey species were similar to those reported by Perez and Bigg (1986). Adult female northern fur seals breeding on San Miguel Island fed on Pacific whiting, northern anchovy, juvenile rockfish, and several squid species in the oceanic zone northwest of the island (DeLong and Antonelis, 1991). Ream et al. (2005) suggested differences between female and male diets in across their winter range during 1958 to 1974 (Figure 6). Kajimura (1984) suggested that northern fur seals in the Eastern Pacific are opportunistic feeders, preying on the most abundant species throughout their range. However, Sinclair et al. (1994) concluded that fur seals in the Eastern Bering Sea were size-selective, mid-water feeders.

Stomachs collected from fur seals taken in the Japanese high seas fishery in the late 1990s contained 15 squid species in the near-shore waters of the western North Pacific compared to only 4 species in the central North Pacific (Mori et al., 2001). *Watasenia scintillans* was the dominant squid species in the western North Pacific from January to May, while *Onychoteuthis borealijaponica* and *Ommastrephes bartramii* were important in the central North Pacific from May to August. Mori et al. (2001) did not quantify fish consumption.

Walker and Jones (1993) analyzed stomach contents of 21 northern fur seals taken from the North Pacific Transition Zone in the Japanese high seas squid driftnet fishery in 1990. They found a higher frequency of occurrence of squid and bathylagids versus groundfish and forage fish in the fur seal diet from the transition zone than from other regions.

E.4. Trophic Analysis of Diet

Hirons et al. (2001) found no significant change in stable nitrogen isotope ratios from fur seal, harbor seal, or Steller sea lion bone collagen for samples from animals that died between 1951 and 1997. These results did not support the hypothesis that a change in pinniped trophic level may have occurred during this time that contributed to population declines. Hirons et al. (2001) suggested that a change in the stable carbon isotope ratio, with no accompanying change in the stable nitrogen isotope ratio, may indicate an environmental change that affected the base of the food web, rather than a change in the trophic level (i.e., prey switching) where sea lions were foraging.

Based on the concentration of stable nitrogen isotopes in the skin of Pribilof Island fur seals, Kurle and Worthy (2001, 2002) suggested that pregnant females fed coastally during the spring migration, while juvenile males and nulliparous females fed offshore. Similar values for stable carbon isotopes indicated that pregnant and nulliparous females fed at similar trophic levels despite feeding in different areas during migration. The analysis of enriched carbon and nitrogen isotopes in fur seal tissues further suggest that the diet of lactating females includes prey at trophic levels equivalent to two to four-year-old walleye pollock and small Pacific herring during the fall (Kurle and Worthy, 2001; 2002). Hobson et al. (1997) suggested that female fur seals fed at a higher trophic level than juvenile males.

E.5. Foraging Behavior

Fourteen adult male fur seals captured on St. Paul and St. George in 1991-92 were fitted with satellite linked time-depth recorders (Loughlin et al., 1999). The seals remained in the Bering

Sea for an average of approximately 30 days after tag attachment. While in the Bering Sea the male fur seals foraged in areas associated with the outer domain of the continental slope and northwest of the Pribilof Islands on the continental shelf in water ranging from 100 to 250 m in depth. Relatively little time was spent foraging in deep water (greater than 1000m) or shallow water (less than 100m). Eventually the male fur seals left the Bering Sea and entered the North Pacific through Aleutian Island passes and fed either in the Eastern Pacific Ocean and Gulf of Alaska or to the west off the Kuril Islands and the coast of Japan. Most dives were shallow: 68% were between 4 and 50m, 14% were between 51 and 100m, and 17% were between 101 and 350m (Loughlin et al., 1999). Only 2.5% of all dives were greater than 250m and no dives were deeper than 350m. Duration of dives was usually less than 6 minutes (90%), 43% were one minute or less and fewer than 1% of the dives were over 11 minutes.

Thirty-one juvenile male fur seals tagged on the Pribilof Islands had trip durations ranging from 8.7 to 28.8 days with trip distances from 171 to 681 km (Sterling and Ream, 2004). Diving tended to reflect patterns associated with different bathymetric domains: shallow nighttime diving was common in water about 3000 meters deep, whereas deeper diving was generally observed in less than 200 m deep waters. Juvenile male fur seals and non-lactating females forage at greater maximum distances from the island of departure than lactating females.

Two diving patterns were described for female northern fur seals from St. Paul during the breeding season: (1) deep-diving that occurred at all hours of the day over the continental shelf in water less than 200m depth, and (2) shallow-diving that occurred primarily at night over deep water (Goebel et al., 1991). Gentry (1998) described thirteen diving patterns based on the timing and number of depth reversals within a given dive, but questioned whether this number was an artifact of scoring dive reversals. Shallow divers foraged more frequently at night and made more dives per foraging trip than deep divers. The primary prey of fur seals in deep water beyond the continental shelf (gonatid squid, deep-sea smelt) exhibit diel vertical migration and are at relatively shallow depths at night, which would allow fur seals to efficiently capture prey with shallow, night-time dives. Costa and Gentry (1986) reported that shallow-diving female fur seals had higher food and energy consumption than deep-diving seals. Deep-diving seals obtained a smaller mass of food but gained similar body mass during a feeding trip, suggesting that their prey is of higher energy content than that of shallow divers. Goebel et al. (1991) further reported that deep divers expended less energy than shallow divers and apparently obtain greater energy per dive. The female fur seals tracked by Goebel et al. (1991) fed as far as 160 km to the northwest, southwest, and south of St. Paul Island. At San Miguel Island, postpartum fur seals foraged approximately 70 km northwest of the island in oceanic waters with a mean depth of 933 m (Antonelis et al., 1990).

Loughlin et al. (1987) followed adult female fur seals equipped with radio transmitters and found that some had round-trip foraging trips of over 400 km and one had a round trip of 740 km. Robson (2001) used satellite telemetry to compare feeding locations of 97 lactating female fur seals on St. Paul and St. George islands and reported a strong tendency for separation of foraging areas by breeding location on the islands. Females from St. Paul Island dispersed in all directions except southeast where St. George Island females foraged. Foraging locations were also separated for female fur seals departing from different groups of rookeries on St. Paul Island. Females from Tolstoi and Reef rookeries on the southwest side of the island foraged in areas on the southwest to northwest sides of the island, whereas those seals from Vostochni and Polovina Cliffs rookeries on the northeast side of the island foraged from the northwest to the east of the island. Robson et al. (2004) measured the mean maximum vector distances of foraging trips and reported they were significantly farther (260 km) in 1995 than in 1996 (229 km).

Winter foraging areas are suspected to vary geographically. Ream et al. (2005) showed female fur seal are closely associated with eddies, the subarctic-subtropical transition region, and areas that undergo coastal mixing due to the California Current during the winter and spring. Ream et al. (2005) indicated that fur seals may cue on a variety of oceanographic features thereby reducing energetic expenditures and optimizing foraging.

F. Distribution and Habitat Use

Northern fur seals are endemic to the North Pacific Ocean. Northern fur seals migrate seasonally from summer breeding grounds where they regularly haul out on their breeding islands. Northern fur seals are primarily pelagic in the winter months, but occasionally haul out onto land for brief periods at sites in Alaska, British Columbia, Canada, and on islets along the west coast of the continental United States (Fiscus, 1983).

F.1. Seasonal Distribution

During the winter the southern limit of their range extends across the Pacific Ocean from southern California to the Okhotsk Sea and Honshu Island, Japan (Kajimura and Loughlin, 1988; Figure 1). In the spring most northern fur seals migrate north to breeding colonies. The largest breeding colonies are located in the Pribilof Islands and comprise approximately 74 percent of the worldwide fur seal population (Fowler, 1998; Gentry, 1998). The rookeries at the Commander Islands and Robben Island comprise approximately 15 percent and 9 percent of the world population, respectively (Gentry, 2002). Pribilof fur seal populations account for approximately 55 percent of the worldwide abundance based on preliminary estimates from all breeding colonies in 2005 (NMML unpublished data). Historically, northern fur seal breeding colonies may have been more widely distributed based on seal remains at ancient human occupation sites found coastally on Vancouver Island, in Washington, Oregon, and California (Burton and Koch, 1999; Lyman 1988; Clark, 1986).

F.2. Emigration and Immigration

Less than 1 percent of northern fur seals harvested on the Pribilof Islands came from other islands in the North Pacific Ocean (Lander and Kajimura, 1982). However, movement from the Pribilof Islands population to other areas has been documented range-wide. An estimated 12-21 percent of the tagged, young males harvested on the Commander Islands were tagged as pups on the Pribilof Islands in 1958-63, and only 0.1-1.0 percent were tagged on Robben Island. Northern fur seals re-colonized San Miguel Island, California Channel Islands, in the 1950s or early 1960s and increased 46 percent annually from 1969 to 1978 (DeLong, 1982). Some of this high production was attributed to immigration of females from the Pribilof Islands, Robben Island, and the Commander Islands (DeLong, 1982; Antonelis and Delong, 1985).

From 1976 to 1981, small numbers of fur seals were observed on Bogoslof Island (Loughlin and Miller, 1989). Pups were first seen on Bogoslof in 1980 (Lloyd et al., 1981). Ream et al. (1999) reported pup production increased at 58 percent per year between 1988 and 1997. In 2005 the Bogoslof Island population continued significant growth (NMML unpublished data). The growth rate at Bogoslof Island is greatly influenced by immigration, probably from the Pribilof Islands (Ream et al., 1999). Experimental manipulation of post-parturient females and their pups

between rookery sites on St. Paul and St. George and between extinct and current rookery sites on St. George indicate that females are able to and do voluntarily move to other sites (Gentry, 1998). Sixty-seven percent (12 of 18 females) of translocated females remained with their young at the new site and made multiple feeding trips until at least late August when observations ceased (Gentry, 1998). The remaining females and their pups were returned to their original rookery and reunited (Gentry, 1998). The rate of females moving among rookery sites for pup rearing is thought to be small, but females also use other sites to intermittently rest during the breeding season further confounding estimates of emigration (Gentry, 1998). Thus, emigration does occur between all fur seal populations in the North Pacific, but not at a rate that could have influenced the decline observed on the Pribilof Islands during the 1960s and 1970s (York, 1987b; Loughlin et. al., 1994).

F.3. Habitat Use

The Pribilof Islands are essential for pupping, mating and rearing of pups and represent terrestrial habitat for the majority of the population to reproduce and rest during the summer and fall. Northern fur seals are pelagic occupying the Bering Sea and North Pacific Ocean during the winter and spring. Northern fur seals use the marine environment for foraging and migrating/transiting, and rarely use terrestrial sites during the winter or spring.

F.3.1. Terrestrial Habitat

Northern fur seals occupy terrestrial habitat for about 6 months, exhibit natal site fidelity (Baker et al., 1995; Gentry 1998), and segregate into distinct central breeding and resting areas. Individual seals, however, may be found on land for only a fraction of the time during this entire period (mid-May through early November). Adult males defend a discreet breeding area (~110 m^2) for an average of about 42 days (Gentry, 1998), and remain at sea for the remainder of the year. Pregnant adult females arrive on land beginning in mid-June and intermittently depart to forage for multiple days. Lactating females occupy terrestrial sites on the Pribilof Islands for on average 38 days per year, non-lactating females occupy terrestrial sites for fewer days per year (Gentry, 1998). Females tend to use a small (less than 20 m diameter) subarea of their central breeding area that minimizes interactions with males and maximizes proximity to other females (Gentry, 1998). Non-breeding males typically occupy inland resting areas that are significantly larger than nearby breeding areas (Gentry, 1981b).

F.3.2. Marine Habitat

The surrounding summer and fall feeding grounds out to at least 200-300 km from the islands are important for lactating females (Loughlin et al., 1987; Goebel et al., 1991; Robson, 2001; Robson et al., 2004; Ciannelli et al., 2004). Juvenile male fur seals forage out to mean maximum straight-line distances about 367 km (range 171-680 km) from the islands during the summer (Sterling and Ream, 2004). Aleutian Island passes are also important due to their use by a majority of the Eastern Pacific stock for their annual migration between the Bering Sea and North Pacific Ocean (Bigg, 1990; Ragen et al., 1995). It is unknown to what extent some passes may be used more than others, though Unimak Pass continues to be a primary migration corridor. These passes are used at least twice each year as seals move into and out of the Bering Sea.

Many fur seals are seen far out to sea, as indicated by sighting data collected from 1958 to 1997

(Fig. 9); bycatch data on fur seals collected from June through September (Zeusler, 1936; Loughlin et al., 1983); and telemetry data (Loughlin et al., 1987; Goebel et al., 1991; Loughlin et al., 1999; Robson, 2001; Sterling and Ream, 2004; Ream et al., 2005). A clear understanding

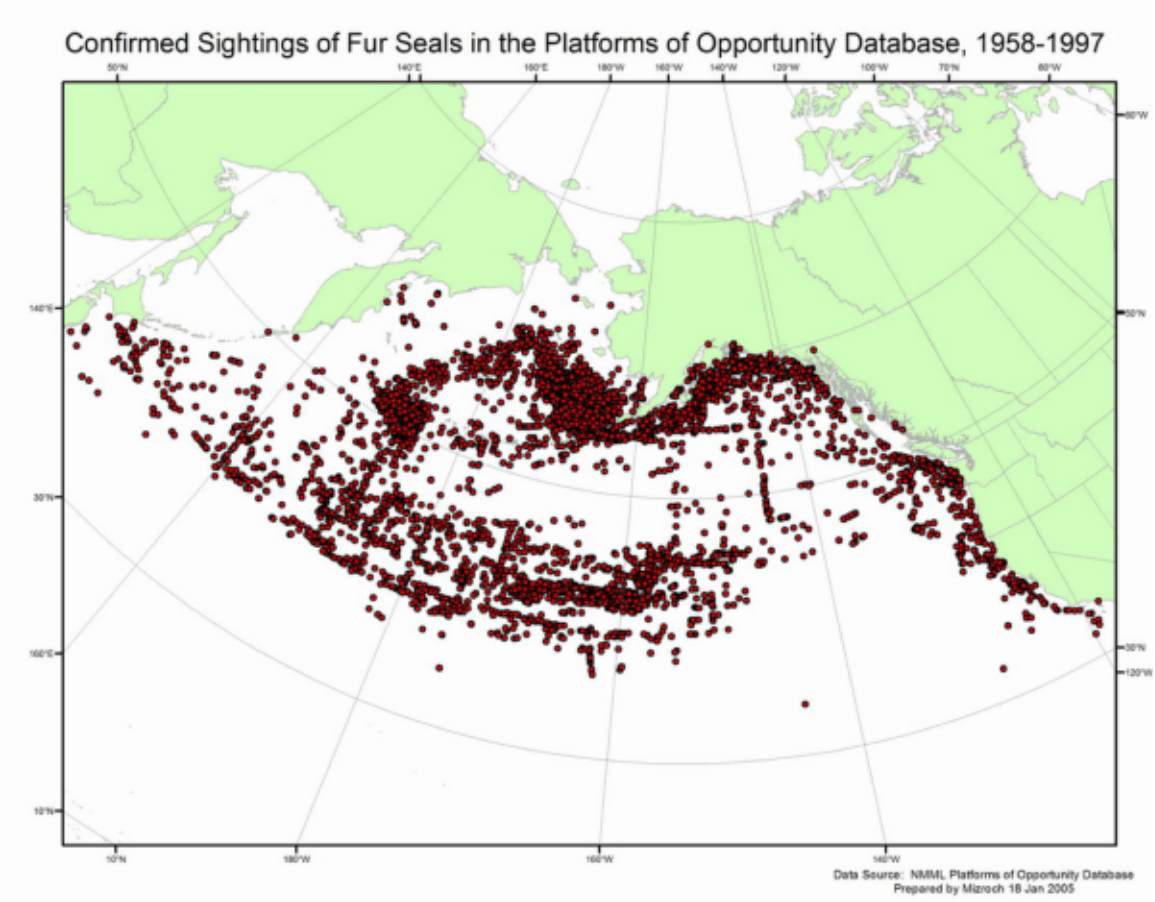


FIGURE 9. DISTRIBUTION OF ALL NORTHERN FUR SEAL SIGHTINGS IN THE NORTH PACIFIC OCEAN AND BERING SEA BASED ON OBSERVATIONS IN THE NMFS PLATFORMS OF OPPORTUNITY SIGHTING DATABASE 1958-1997.

of fur seal use of pelagic habitat across years or seasons is unknown, but is beginning to be investigated. The subpolar continental shelf and shelf break from the Bering Sea to California are known feeding grounds for fur seals while at sea. It has been suggested that highest fur seal densities in the open ocean occur in association with major oceanographic frontal features such as sea mounts, valleys, canyons and along the continental shelf break (Lander and Kajimura, 1982; Kajimura, 1984; Loughlin et al. 1999). It should be noted that principal prey of fur seals may be concentrated or most accessible in such areas, and the association may be due to a combination of biological and physical factors (Sinclair, 1988; Sinclair et al., 1994). The transition zone may bound the southern pelagic distribution of fur seals in the North Pacific Ocean, possibly because the fronts between subarctic and subtropic water masses serve as physical barriers to fur seal prey (Sinclair, 1990; Beamish et al., 1999; Ream et al., 2005).

G. Threats

The Eastern Pacific northern fur seal stock is threatened by both natural and human-related factors. NMFS cannot manage to any practical degree natural threats to fur seals such as predation, disease, or El Niño Southern Oscillation events. NMFS can manage human-related threats and that is the basis for three of the four objectives of this conservation plan. Table 3 presents several likely human-related threats influencing the Eastern Pacific stock of fur seals. These threats are thought to contribute to the recent decline on the Pribilof Islands. It should be emphasized that we may never know the cause(s) of previous declines in fur seal production and it is likely that human and natural threats interact in unknown but potentially significant ways. These interactions may never be separated distinctly and thus complicate determining causation. The Eastern Pacific northern fur seal stock has been declining for at least the past 10 years, thus cumulatively all of the factors influencing the stock are having a significant adverse effect (NMFS 2001; NMFS 2005). The contribution of natural versus human influences on the stock remains uncertain.

Understanding the causes of historic declines, however, may have long-term predictive value allowing researchers to anticipate similar events in the future. York and Kozloff (1987) showed that unless a population decline is sudden and dramatic, the estimates of population size are sufficiently variable that a statistically significant decline cannot be observed until several years following its initiation. While more recent population abundance estimates may be more precise, only by comparing the changes of population structure, diet, foraging behavior, habitat use, incidence of diseases, and entanglement rates of fur seals with other pinniped species which share their habitat (e.g., Steller sea lions), or fur seals from the polar regions of the southern hemisphere will we better understand the importance of these factors. Natural threats will be discussed first followed by human-related threats in the subsequent sections.

G.1. Natural Mortality Excluding Disease

York (1985) reported neonatal mortality on St. George Island is lower than on St. Paul Island, where the population is higher. Gentry (1998) suggested that traumatic neonatal mortality is not density dependent because of female spacing tendencies. Females form dense groups at all population levels and female induced pup trauma causes 17 percent of the on-land mortality. The majority of neonatal mortality is density dependent and caused by several factors, including emaciation, trauma, various infections, and increased incidence of disease and parasites (York, 1985, Fowler, 1985, Fowler, 1987). In the 1940s and 1950s on-land pup mortality ranged from 10 to 22 percent. Between 1990 and 1999, pup mortality ranged from 4.69 percent to 2.82 percent on St. Paul, and 3.97 percent to 2.05 percent on St. George (Antonelis et al., 1994; York et al., 2000; Figure 4). Spraker et al. (in review) necropsied 2,608 northern fur seal pups during the breeding season on St. Paul from 1986 - 2003. Five general categories of mortality were found: emaciation, trauma, perinatal mortality, infections, and a rare anomalous condition. Emaciation was found in 52 percent of the pups. Trauma was the primary cause of death in 19 percent of the pups (blunt trauma-12 percent and sharp trauma-7 percent) and is consistent with the findings of Gentry (1998). Perinatal mortality accounted for the death of 18 percent of the pups.

Mortality at sea is highest during the first two years, when mortality may reach 60-80 percent (Keyes, 1965; Lander 1981; Fowler, 1985; York, 1987). Most of this mortality is assumed to occur during the first winter (Lander, 1979). Lander (1980) estimated that at-sea mortality of 0-2 year olds from 1950 to 1970 was 60-65 percent. York (1994) estimated mortality for the 1987 and 1988 cohorts from age 0-2 was 71 and 75 percent, respectively. York (1994) estimated

mortality from 2-4 years for the same cohorts averaged 25 (1987) and 23 (1988) percent. Some

TABLE 3: MATRIX OF THREATS TO THE EASTERN PACIFIC NORTHERN FUR SEAL STOCK

ORIGIN OF THREAT	SOURCE[A]	SCALE OF EFFECT[B]	SEVERITY[C]	PROBABILITY OF OCCURRENCE	GEOGRAPHIC SCOPE[D]
NATURAL	Trauma (3.1.3)	STOCK	DEATH	LOW	RANGEWIDE
	Starvation (3.1.3)	POP	DEATH	LOW	RANGEWIDE
	Disease (3.2)	POP	INJURY	LOW	RANGEWIDE
	Predation (3.1.8)	POP	DEATH	HIGH	RANGEWIDE
	Environ. Change (3.4)	STOCK	HARASS	MED	RANGEWIDE
HARVEST	Commercial	POP	UNK	LOW	BERING SEA
	Subsistence (1.3)	POP	DEATH	HIGH	BERING SEA
POACHING	Terrestrial (1.3)	INDIV	DEATH	HIGH	BERING SEA
	At-Sea (1.2)	INDIV	DEATH	MED	RANGEWIDE
COMM. FISHING	Bycatch (1.2)	POP	DEATH	LOW	RANGEWIDE
	Entanglement (1.1)	STOCK	INJURY	MED	RANGEWIDE
	Indirect Effect (2.7)	STOCK	HARASS	HIGH	RANGEWIDE
HUMAN PRESENCE	Trespass (2.4)	POP	HARASS	HIGH	BERING SEA
	Research (2.4)	POP	HARASS	HIGH	RANGEWIDE
NOISE AND LOCAL DEVELOP	Construction (2.4)	POP	HARASS	MED	BERING SEA
	Vehicles (2.4)	POP	HARASS	HIGH	BERING SEA
	Aircraft (2.4)	STOCK	HARASS	LOW	RANGEWIDE
	Vessels (2.4)	STOCK	UNK	HIGH	RANGEWIDE
ENVIRONMENTAL CONTAM.	Various (2.6)	STOCK	UNK	HIGH	RANGEWIDE
OIL & GAS	Spills (2.6)	STOCK	DEATH	LOW	RANGEWIDE

[A] Number in parentheses corresponds to the Conservation Action described in Section II.
[B] Scale of Effect indicates what portion of the population is affected by the threat: STOCK=entire E. Pac. stock; POP=at least an entire breeding area; INDIV=individuals within a breeding or resting area.
[C] Severity describes the most likely outcome of the threat: DEATH=mortality; INJURY=physical harm; HARASS=unknown reduction in survival or reproduction.
[D] Geographic Scope describes the extent of where this threat exists: RANGEWIDE=the entire range of the stock; BERING SEA=only the Bering Sea.

evidence suggests that mortality rates of 0-2 year olds (York, 1985), 2-5 year olds (Fowler, 1985a), and adult females (Trites and Larkin, 1989) may have increased through the 1960s and 1970s. Cohort survival has not been studied in recent years.

Survival of adult females remains high (greater than 80 percent) until age 14, after which it decreases to about 30 percent by age 19 (Smith and Polachek, 1981). Males have a higher mortality rate than females after two years of age, and particularly after seven years when males begin to defend territories (Lander and Kajimura, 1982). Factors involved in juvenile and adult mortality are numerous and are discussed in other sections of this document. No comprehensive studies of male or female survival have been completed since the cessation of the commercial harvest on St. Paul.

Spraker et al. (in review) determined the cause of death for 104 adult female fur seals on St. Paul Island between 1986 and 2003. The subsistence harvest accidentally killed 17 of the 104 adult females necropsied from 1986 to 2003; therefore 87 female fur seals at the two breeding sites surveyed died from natural causes over this period. Seventy-two percent (63 of 87) of female deaths were the result of bite wounds. The remaining deaths were caused by a variety of factors. Spraker et al. (in review) also examined 40 dead adult males to determine the cause of death. Eighty-seven percent of male mortality on land was the result of bite wounds and secondary infections (Spraker et al., in review).

G.2. Disease and Parasites

The effect of diseases and parasites between the late 1970s and the present is unknown. Necropsies of juvenile seals taken in the St. Paul subsistence harvest during the 1980s suggest that the population is relatively disease free compared to the period from the 1950s to early 1970s (NMML, unpublished data). For example, fur seal mortality from ascarid (nematode worm) infection may have been important during the 1950s and 1960s (Neiland 1961; Keyes 1965), and Leptospirosis was not identified until the 1970s (Smith et al. 1977). Thus, fur seals do succumb to disease, as do all mammals. The prevalence of disease and parasites has not been a significant threat to fur seals in recent years. High mortality from disease should be considered a constant threat given the high densities of fur seals during the breeding season that would facilitate transmission. In addition, Baker et al. (1995) and Gentry (1998) reported that about 20 percent of individuals from a particular island visit other islands intermittently during the year, thus facilitating disease transmission between islands.

Hookworm disease was responsible for 45 percent of the fur seal pup mortality in a study conducted between 1974 and 1977 (Gentry, 1981a). Lyons et al. (2001) indicated a dramatic decline in the incidence of hookworm disease in fur seal pups on St. Paul Island in recent years. Infectious diseases were found in 4 percent of the pups on St. Paul. Spraker et al. (in review) found no evidence over the past 27 years to implicate diseases or mortality of pups prior to weaning as an important factor in the current population decline on St. Paul. In 2003, hookworm mortality at San Miguel Island exceeded 50 percent and was a significant cause of mortality of pups in the first three months of life (Melin et al., 2005).

G.3. Predation

Killer whales, Steller sea lions, and foxes prey on fur seals, but fur seal population impacts from these sources have not been detected. Killer whales (*Orcinus orca*) are probably the most important predator of northern fur seals, however, predation observations in the marine environment are difficult to confirm. The only authenticated stomach examination of a killer whale from the Pribilof area occurred in 1868 when a killer whale was seen "swimming with such force that he ran aground and was unable to get off. When the tides went out the whale was cut open and three seals were found in its stomach" (original record reported in Scheffer et al.,

1984). Killer whales have also been observed to attack fur seals near Robben Island, Russia (Bychkov, 1967), but no published information is available for the Pribilof Islands in recent years. Anecdotal reports by local fishermen to the Tribal Government of St. Paul's Ecosystem Conservation Office (Tribal ECO) and others indicate that killer whales continue to be seen around the islands. Since 1996, the Tribal ECO reports that 1-5 sightings of killer whales feeding on fur seals are made each year (Island Sentinel database, St. Paul). Killer whales are seen around St. Paul in early and late summer, but fishermen see killer whales offshore from June-August. Springer et al. (2003) hypothesized that sequential declines in North Pacific populations of seals (including fur seals), Steller sea lions, and sea otters were due to increased predation by killer whales, following the removal by commercial whaling of baleen whales as the killer whales primary food source. Wade et al. (2003) disagreed with the hypothesis of Springer et al. (2003) and proposed that killer whales may have caused or contributed to the decline of species like sea otters, but suggested that little evidence of a lack of available cetacean prey resulted in elevated killer whale predation on pinnipeds. DeMaster et al. (2006) evaluated the Springer et al. (2004) hypothesis and reported both top-down and bottom-up factors provided a more consistent explanation of the observed pinniped declines rather than top-down alone. Melnikov and Zagrebin (2005) reported killer whale predation collected systematically by Chukotkan subsistence hunters. Annually, killer whales attacked gray whales (66 percent of incidents) and walrus (26 percent) during the 10-year observation period on the Chukotkan Peninsula (Melnikov and Zagrebin, 2005). Melnikov and Zagrebin (2005) reported low pinniped predation rates by killer whales, although ringed and spotted seals were quite numerous (i.e., available) in the region.

Foxes on the Pribilof Islands are primarily scavengers, and attacks on live pups are rare (Roppel, 1984). Steller sea lions kill weaned fur seal pups close to shore on St. George Island (Gentry and Johnson, 1981), and were seen killing fur seal pups in 1992 (reported in NMFS 1993). Attacks on northern fur seals by Steller sea lions may be lower in recent years due to concurrent and sustained declines of both species, however, no recent data and investigations have been undertaken.

G.4. Environmental Change

Changes in environmental and oceanographic features may influence mortality rates of fur seals and the distribution and abundance of prey. In 1950, severe storms and low temperatures may have contributed to the deaths of 700 fur seals in Oregon and Washington (Scheffer, 1950). York (1991) reported a significant positive correlation between sea surface temperatures (SST) off British Columbia and early survival of male fur seals 4 months to 2 years old, and suggested that SST may influence Pacific herring (*Clupea pallasi*, a common fur seal prey in winter and spring), abundance and availability, thus affecting early survival of fur seals. From 1977 to 1986, there was a very large North Pacific basin temperature anomaly, with temperatures in Alaska warming more than 1.5°C (Trenberth 1990), that might have resulted in a regime shift or a community level reorganization of the marine biota (Anderson and Piatt 1999). Pribilof female feeding trip duration during 1979-1985 decreased relative to the period from 1974-1978 suggesting that prey may have been more abundant or located closer to the colony during the post-1977 regime (Gentry, 1998).

Fauquier et al. (1998) report that the peak years of fur seal strandings off the central California coast from 1975 to 1997 were during the El Niño events of 1992 and 1997. Most stranded fur seals were recently weaned pups that were emaciated and malnourished. El Niño events of 1972, 1983, 1992, and 1997 had dramatic impacts on birth rates, and pup growth and survival for fur seals on San Miguel Island (NMML, unpublished data). The El Niño events of 1983 and 1997-

98 were particularly powerful. It was estimated that no pups born in 1983 survived, and that fur seal pup production on San Miguel Island declined by 60 percent after 1983. In 1997, pup mortality on San Miguel Island was estimated at 87 percent, and pup production declined 80 percent in 1998. California sea lion pup production also declined on all rookery islands in the Channel Islands in 1983. Fur seal pup survival on San Miguel is lower during El Niño events, but survival of Pribilof juvenile males over longer time periods is positively correlated with El Niño (York, 1991) and higher air and sea surface temperature trends (York, 1995). However, the individual El Niño events of 1983 and 1997-98 appeared to have little detectable effect on fur seals in the Pribilof Islands (Gentry, 1991; York et al., 2000).

Trites and Antonelis (1994) investigated the timing of births of fur seal pups in the Pribilof Islands in relation to climatic factors and determined that although sufficient food was available in June for lactating females to successfully begin nursing, births occurred during the first three weeks of July coincident with lower rain and wind conditions and elevated temperatures. Their model predicted that pups born earlier in the year (June) would succumb to hypothermia during periods of generally colder, wetter, and windier weather than conditions in July (Trites and Antonelis, 1994).

Major shifts have occurred in the abundance of fish and shellfish in the Bering Sea over the past several decades (Anderson and Piatt 1999). The possibility that these shifts in prey may be related to climatic regime shifts is well documented (e.g., Beamish and Bouillon 1993; Benson and Trites 2002). The fish community in the Bering Sea appears to have shifted from one dominated by pelagic and semi-demersal species to one with fewer pelagic species and a larger biomass of semi-demersal (walleye pollock and Atka mackerel) and demersal (all flatfishes) species (Anderson 2002). Important fur seal prey species continue to include pollock (Gudmundson et al., 2006; Zeppelin and Ream, 2006) and the number of pollock consumed by fur seals in the Bering Sea is directly related to pollock year-class strength (Sinclair et al. 1994; 1996).

If environmental conditions strongly influence pollock year-class success, fur seals could be directly impacted. Such factors could also influence the foraging success of fur seals as they prey on other species (e.g., Pacific herring, Pacific whiting or hake, and anchovy) during their migration south into the North Pacific. Recent studies reported long-term fluctuations in fish populations in the North Pacific and Bering Sea regions that may have affected the availability of fur seal prey. Naumenko (1996) identified four periods with differing ichthyofaunal community structures from 1958 to 1993 in the western Bering Sea. The causes of this structuring were apparently related to commercial fishing pressure and to environmental conditions. The first period (1958-1964) was dominated by herring, the second was a transitional period (1965-1974), the third period (1975-1987) was dominated by pollock, and the fourth period (1988-1993) was dominated by groundfish (pollock and large flatfish) or may have been another transitional period.

Merrick (1997) suggested that the adult groundfish biomass has been at high levels since the decline of the whale and fur seal populations, and that adult groundfish may be out-competing other predators, such as seals and seabirds. Factors that may have precipitated increases in adult groundfish abundance include changes in environmental conditions, commercial fishing practices, and predator release resulting from the over-harvest of marine mammals and some fish species during 1955-1975. As the numbers of marine mammals declined more prey became available for groundfish, thereby increasing groundfish abundance. The current high population of groundfish (e.g. adult walleye pollock) might have resulted in a reduction in the availability of marine mammal and seabird prey (e.g. capelin and juvenile pollock). Declines in the abundance

of some key prey species that are the primary food sources for marine mammals and seabirds could have caused declines in the numbers of these apex predators (Hunt et al., 2002, Sinclair, 1988, Sinclair et al., 1994). Fritz and Hinckley (2005) indicate limited, if any, evidence supporting the nutritional stress hypothesis and the variation in fur seal foraging data is more consistent with variation in regional prey abundance consumed by fur seals sampled at different locations, than an indication of nutritional stress.

Evidence suggests that some key prey species were more available to marine mammals and seabirds before the decline of these apex predators. Peaks in adult pollock biomass that occurred in 1972 and 1985 coincided with two periods of decline in Steller sea lion numbers, while low points in pollock abundance in the late 1970s and early 1990s coincided with periods of relative stability in sea lion numbers (Merrick, 1997). Adult pollock consume many of the same forage fish species as marine mammals and seabirds, including juvenile pollock. A five-fold increase in the adult pollock biomass from 1962 to 1972 undoubtedly increased the amount of prey consumed by adult pollock and might have reduced the availability of prey for marine mammals and seabirds. Fur seal diets estimated from pelagic Bering Sea collections indicate that pollock, capelin, and squid are the most frequent items found in stomachs in 1960, 1962, 1963, and 1964, respectively (NMML unpublished data). In 1968, 1973, and 1974, squid was the most common item found in fur seal stomachs collected in the Bering Sea, followed by pollock (NMML unpublished data).

Kuzin and Shatilina (1990) reported a significant correlation between the survival of fur seals less than two years of age and the temperature of the sea water near Hokkaido where fur seals winter. Sea surface temperature strongly influences the distribution and abundance of fish and squid thereby altering their availability for consumption by juvenile fur seals. It was suspected that fur seal food sources may have decreased near Hokkaido during warmer years.

G.5. Commercial Harvest

Russian explorers first visited the Pribilof Islands in June 1786, and the exploitation of fur seals began almost immediately thereafter. From 1786 to 1828, the Russians, with enslaved Aleut labor, harvested an average of 100,000 fur seals annually, primarily pups (Roppel, 1984). It was not until 1822 that bulls were protected and restrictions were placed on the number of pups killed (Scheffer et al., 1984). From 1835 to 1839 an average of 70,000 seals were harvested annually. Beginning in 1847, the number of males taken was controlled and the harvest of females was stopped. About 30,000 to 35,000 fur seals were killed annually during the last 10 years of Russian occupation. The population was reportedly thriving and was sustaining an annual harvest of several thousand males when the United States purchased Alaska in 1867 (York and Hartley, 1981). During the first 2 years following the purchase of Alaska by the United States, the fur seal harvest ensued without regulations. Approximately 240,000 fur seals were taken on land in 1868. Meanwhile, pelagic sealing resulted in additional harvests and seals killed and lost at sea.

Roppel and Davey (1965) report the history of pelagic sealing from 1875 to 1909, its impact on the fur seal population, and a discussion of a treaty banning pelagic sealing. At the peak of pelagic sealing (1891-1900), more than 42,000 fur seals (mostly lactating females) were taken annually in the Bering Sea (Scheffer et al., 1984). In addition, pelagic sealing removed a large but unknown number of fur seals from waters off British Columbia (Scheffer et al., 1984). Because the takes greatly reduced the fur seal stock, Great Britain (for Canada), Japan, Russia, and the United States ratified the Treaty for the Preservation and Protection of Fur Seals and Sea Otters in 1911, which was the first international wildlife management agreement of its type in

modern history. The treaty prohibited pelagic sealing and required a reduction in the harvest of seals on land. There was no commercial harvest from 1912 to 1917 due to the severe population reduction. From 1918 to about 1941, the Pribilof Island fur seal stock grew at eight percent per year under a harvest that ranged from 15,862 in 1923 to 95,016 in 1941 (NMML, unpublished data). In 1941, Japan abrogated the 1911 Convention on the grounds that fur seals were too numerous and were damaging their fisheries; after World War II, a similar concern on the part of Japan was important in negotiating the 1957 Fur Seal Convention (Scheffer, 1980). No commercial harvest took place in 1942. The take from 1943 to 1955 averaged about 70,000 per year.

In 1957, the signatories of the 1911 Treaty ratified a new agreement, the Interim Convention on the Conservation of North Pacific Fur Seals, for the conservation, research, and harvesting of fur seals. During those negotiations, calculations presented by the United States suggested that maximum sustained productivity would occur at lower female population levels than those of the early 1950s. These projections postulated higher pregnancy and survival rates from a smaller herd (Anonymous, 1955). Consistent with that analysis, from 1956 to 1968, a total of about 300,000 female fur seals were killed on the Pribilof Islands and a pelagic collection of about 16,000 females was taken for research purposes by the United States and Canada during 1958 to 1974 (York and Hartley, 1981). Concurrently, 30,000 to 96,000 juvenile males were harvested each year (Lander and Kajimura, 1982).

The Pribilof Islands fur seal population did not react as expected to the herd reduction program initiated in the 1950s. Kajimura (1980) reported that neither a substantial decrease in age at first pregnancy nor an increase in pregnancy rates occurred as the population was reduced. Additionally, survival rates did not overcome population losses resulting from intentional herd reduction. The inability of the herd to recover generated speculation that some natural or anthropogenic factor, or combination of factors, may have adversely affected the recovery of the herd and caused extreme fluctuations in year class survival and a reduced production of young males (Roppel, 1984). The United States established a research sanctuary and commercial harvest moratorium on St. George while continuing the commercial harvest on St. Paul to study the effects of harvest regimes on fur seal population dynamics. Thus, NMFS began the first long-term study of behavior in the history of fur seals on the Pribilof Islands in 1973 (Roppel, 1984; Gentry, 1998). St. Paul Island harvest management regulations changed very little from 1973 to 1979, and harvests ranged from 24,000 to 27,000 animals per year (Harry and Hartley, 1981).

The level of commercial juvenile male harvests on the Pribilof Islands in the 1970s and 1980s was not believed to have deleteriously affected the population. It is therefore unlikely that the present fur seal population is now influenced by any residual effects from the past commercial (or subsistence) harvest. A thorough summary of the harvest and its effects on the fur seal population can be found in the 1993 Conservation Plan for the Northern Fur Seal and in numerous publications (e.g., Roppel, 1984, Roppel and Davey, 1965; York and Hartley, 1981).

The authority of the 1957 North Pacific Fur Seal Convention was extended in 1963, 1969, 1976, and 1980. Under the terms of the 1980 extension, the Convention expired on 14 October 1984. In consultation with the U.S. Departments of State and Justice, and the Marine Mammal Commission, the United States declined to sign an extension after 1984. It was determined that no commercial harvest could be conducted under existing domestic law, and, therefore, the commercial harvest on St. Paul Island was terminated. Accordingly, on July 8, 1985, NMFS issued an emergency interim rule to govern the subsistence harvest of fur seals for the 1985 season under the authority of section 105(a) of the Fur Seal Act. A final rule was published on

July 9, 1985, and the regulations provide the basis for the subsistence use of fur seals on the Pribilof Islands.

G.6. Subsistence Harvest

NMFS promulgated an emergency rule to authorize the Pribilovians to conduct a subsistence harvest of northern fur seals in 1985 after the protocol to extend the Convention on the Conservation of Fur Seals was not ratified by the United States. The 1985 emergency regulations were revised in 1986 to authorize continued subsistence harvests on the Pribilof Islands under regulations setting an annual upper and lower harvest range based on the subsistence need of the communities. In 1991 NMFS amended the harvest regulations to open the harvest season one week earlier (June 23 vs. June 30) to allow residents to obtain fresh meat earlier (NMFS, 2005). In 1994 NMFS amended the harvest regulations to set three-year harvest ranges for both St. George and St. Paul (NMFS, 2005). Current northern fur seal subsistence harvests on the Pribilof Islands are managed under the 50 CFR 216 subpart F. The regulations describe the harvest period (24 June – 8 August), allowable harvest locations, and prohibitions on harvesting adults, pups, or females.

Recent subsistence harvest information for the Pribilof Islands is summarized in NMFS (2005). In summary, St. Paul juvenile male subsistence harvests have ranged from a high of 1704 in 1987 declining to 396 in 2006 (Kajimura et al., 1990, Lestenkof and Zavadil, 2006). On St. George subsistence harvests have remained relatively stable during the past 20 years (range 329-92; NMML unpublished data). Harvests are coordinated and implemented locally based on the harvest methods developed commercially to humanely take only two - four year-old male fur seals. The current level of Pribilof northern fur seal subsistence harvest as implemented under 50 CFR 216, subpart F has an insignificant effect on the human or natural environment (NMFS, 2005).

Historically Native Alaskans harvested fur seals for consumption throughout the year as they were available. Harvests prior to the discovery of the Pribilof Islands were likely pelagic throughout coastal Alaska. On the Pribilof Islands, subsistence harvests from 1870 to 1917 were first recorded during leases to the Alaska Commercial Company and North American Commercial Company. These early reports provide the number of "seals killed for Native food" from all months of the year. Seals harvested for food in the Pribilofs were primarily juveniles and pups. The practice of killing pups for food was banned under the new lease arrangement in 1881. Pups were not harvested for food in 1882, but harvests were initiated again in 1883 and subsequent years until the prohibition in 1891 (Jordan, 1898). For the period from 1912 to 1916 all commercial harvests on the Pribilof Islands were banned except to meet the subsistence needs of the Native population. Harvest estimates for this five-year period represent annual subsistence use (Zimmerman and Letcher, 1986). An estimate of the subsistence harvest on the Pribilof Islands for the period after the sealing moratorium is estimated by counting those seals killed before June 1st and after August 31st as well as those specifically noted as food killings during the commercial harvest period. Killing of seals outside the general summer harvest season was halted in 1930 after the expansion and modernization of the by-products plant in 1930.

Many of the records for food harvests are incomplete or inconsistently reported. Records of seals killed for food after 1895 were those harvested in the spring and fall months or illegal harvests during the commercial season. Numbers of seals reported as killed for food are significantly lower after 1895 than in earlier years, possibly reflecting seals used for food during the harvest season that are not recorded as in other years. Average consumption of seal meat on the Pribilofs in 1881 was calculated as 600 pounds of seal-meat annually per person by Elliott

(1881) and in 1914 as 17.5 carcasses or 612.5 pounds annually per person (Osgood, 1914).

During the 1950s and afterwards, harvests for food became less the duty of the lessee or the government and more a responsibility of local residents. Seal carcasses were available on the killing ground following the commercial harvest for anyone who needed food (Veltre and Veltre, 1981). Residents took meat for immediate needs and for the winter season. Residents of St. George, where commercial sealing was banned in 1972, conducted a small subsistence harvest of their own and obtained meat from the St. Paul commercial harvest. Zimmerman and Letcher (1986) and Zimmerman and Melividov (1987) reported the subsistence harvests of 3,384 and 1,299 on St. Paul Island in 1985 and 1986, respectively. The higher harvest in 1985 is likely related to the distribution of about 10,000 lbs of seal meat to St. George and other Aleut communities (Zimmerman and Letcher, 1986). There was no indication of fur seal meat being distributed to other communities in 1986 (Zimmerman and Melividov, 1987).

Northern fur seals were harvested pelagically in other areas of coastal Alaska, British Columbia, Washington and Oregon during the first half of the 1900s. After 1912, Native hunters were specifically given the right to hunt seals at sea as needed for food and clothing using aboriginal methods. The native harvest exemption was maintained in the Marine Mammal Protection Act, and further specified in the regulations promulgated after the cessation of the commercial harvest (50 CFR 216.71-216.74). It is likely that harvest levels in Sitka were primarily driven by sales of skins to fur buyers in the region. The harvests from the Sitka area were estimated based on the numbers of skins authenticated and sold. Skins from these hunts were prized and the harvest increased through the 1920s to a maximum of about 1000 skins and declined due to the lack of market for skins in 1940 (USFWS, 1940). The majority of fur seals harvested in Southeastern Alaska were taken during their migration north in April or May by hunters and fishermen from Sitka and the skins were sold in Sitka. Composition of the harvest in the Sitka region included pregnant females, juvenile males and yearlings (Marsh and Cobb, 1909).

G.7. Commercial Fishing

Commercial fisheries have the potential to affect northern fur seals in several ways: (1) from incidental take during fishing operations, (2) from entanglement in marine debris lost or discarded from fishing activities, (3) from disturbance related to boat traffic, fishing activities, and the presence of fishing gear, (4) from changes in prey availability (abundance, density and distribution), and (5) competition that may result from commercial fisheries. The policies and management strategies that govern the Alaska groundfish fisheries are regularly reviewed by the North Pacific Fisheries Management Council and NMFS, and changes to the policies or strategies could influence the northern fur seal population (NMFS, 2001). Few data exist to indicate the level or probability of commercial fishery impacts through the proposed mechanisms described above.

Currently, all marine areas used by fur seals are commercially fished by domestic or international fleets. Fur seal presence in the Bering Sea coincides with numerous commercial fisheries on species also found in the fur seal diet from May through November. These fisheries include a variety of gear types directed at pollock, Pacific cod, Pacific herring, Atka mackerel, squid, and salmon. In addition there are Bering Sea commercial fisheries directed at species (yellowfin sole, flathead sole, rock sole, Alaska plaice, Greenland turbot, halibut, and pollock) considered competitors with fur seals. In the Pacific Ocean there are also commercial fisheries directed at fur seal prey and fish that compete with fur seals for the same prey. Therefore commercial fisheries in the Pacific Ocean could reduce, alter or redistribute the prey field of northern fur seals similarly to that postulated in the Bering Sea. Alternatively, removal of

competitor species due to fishing may increase the availability of fur seal prey; however, the relationship between fur seals, fisheries, and fur seal prey varies by region and to the extent one species is able to out-compete another for common prey is unclear.

G.7.1. Incidental catch (Bycatch)

Fur seals taken as bycatch may die, be injured, or released unharmed. In the late 1970s, incidental take of fur seals in commercial fisheries in the North Pacific Ocean was not considered large enough to have been a significant factor in the decline of the Pribilof Islands fur seal stock. Loughlin et al. (1983) reported that 8 fur seals were caught in foreign trawl fisheries in the Eastern North Pacific between 1978 and 1981. Perez and Loughlin (1991) reported that 48 fur seals were incidentally killed in foreign and joint-venture trawl fishing operations in U.S. waters from 1973 to 1987. They estimated a total incidental take mortality of 246 fur seals in both the foreign and joint U.S.-foreign commercial groundfish trawl fisheries from 1978 to 1988. Similar numbers of fur seals probably suffered incidental mortality from 1966 to 1977 (Perez and Loughlin, 1991). Illegal fishing in international waters may have declined significantly in recent years, and bycatch by these illegal activities is unknown. The following descriptions of past fisheries are provided as context for the historic levels of northern fur seal bycatch. Data from more recent fisheries are presented in a subsequent section.

High-seas Squid Gill-Net Fishery--Drift gill-net fishing for squid in the North Pacific began in 1978 and the rapid expansion of this high-seas gill-net fishery in the 1980s raised concerns that large numbers of marine mammals were being incidentally killed (Hobbs and Jones, 1993). By the early 1980s, more than 700 commercial drift gill-net vessels fished about 10 months of the year and set approximately 40-60 km of gill-net per boat per night (representing 35,000 linear km of gill-net per night). In 1988, 134 fur seals (43 dead/91 alive) were incidentally taken (INPFC, 1989) and in 1989, 80 fur seals (dead or unknown status) were incidentally taken (Hobbs and Jones 1993). Nine hundred fur seals were incidentally taken during the 1990 and 1991 seasons of the high-seas squid fishery (INPFC, 1991, 1992; Hobbs and Jones, 1993). Based on the observed number of fur seals taken in 1989 and 1990, Hobbs and Jones (1993) estimated the total incidental take to be 1,579-1,927 and 4,960 fur seals in these years, respectively. Although these fisheries operated from late May to December, most incidental take occurred during July and August. Hobbs and Jones (1993) indicated that the estimated mortality of fur seals in the drift-net fisheries was low in comparison to their abundance and concluded that impacts to the population were not sufficient to cause significant declines. The foreign high seas driftnet fisheries incidentally killed large numbers of northern fur seals, with an estimated 5,200 (95 percent CI: 4,500-6,000) animals taken during 1991 (Larntz and Garrott, 1993). In 1992 commercial drift-net fishing in the North Pacific was halted, as a result of a 1991 United Nations resolution that called for a global moratorium on large-scale high-seas drift-net fishing.

Japanese Salmon Gill-Net Fishery--The Japanese high-seas salmon gill-net fishery reported taking from 7 to 11 fur seals per year between 1981 and 1989 (e.g., INPFC, 1989). In 1988, Japanese high-seas salmon gill-net fisheries were terminated in the U.S. Exclusive Economic Zone (EEZ) and part of the Bering Sea.

Domestic and Joint-venture Groundfish Fishery--Fur seal mortality related to trawl fisheries in the U.S. EEZ has been relatively low; 31 fur seals were taken by the domestic trawl fishery in Alaska and the North Pacific Ocean between 1989 and 2001 (Perez, 2003). A total of 3 fur seals

were killed in the joint-venture trawl fisheries in Alaska during 1989 and 1990 (Perez, 2003). NMFS manages the current groundfish fisheries in Alaska with input from the North Pacific Fisheries Management Council (NPFMC) under a series of fishery management plans (FMP). The Bering Sea Aleutian Islands groundfish FMP and the Gulf of Alaska groundfish FMP regulate fisheries in waters used by northern fur seals during the spring, summer, and fall. During the winter various fisheries in the Pacific Ocean coincide with fur seal presence in both coastal and pelagic waters. The pelagic fisheries include international high seas driftnet, longline, and trawl fisheries that are poorly understood in time or location. Coastal fisheries within U.S. and Canadian waters are better understood.

Marine Mammal/Fishery Observer Program--More recent estimates of interactions between fur seals and commercial fisheries are summarized in Angliss and Lodge (2003) and Perez (2003). Federally-managed target fisheries in Alaska include both pelagic and bottom trawls, fixed gear, and scallop dredging. From 1990 to 2001, six commercial fisheries were monitored by the observer program (Angliss and Lodge, 2003). The average annual bycatch for the Bering Sea Aleutian Islands (BSAI) trawl fishery is 1.4 fur seals from 1994 to 1998 (Angliss and Lodge 2003). Self-reporting from other commercial fisheries plus the BSAI rounded average indicates a minimum total annual mortality of about 15 fur seals (Angliss and Lodge, 2002). Perez (2003) accounted for recent genetic and tooth identification to evaluate the incidental take of marine mammals in the domestic and joint venture groundfish fisheries in the U.S. EEZ from 1989-2001. Perez (2003) estimated about 0-2 northern fur seals were taken annually in the North Pacific U.S. EEZ. To what extent this value underestimates the actual annual mortality is unknown, but Perez (2003) accounted for observer coverage and fishery effort. Fisheries in the North Pacific U.S. EEZ appear to be causing very few direct fur seal mortalities in recent years. Numerous northern fur seal sightings are made outside the North Pacific U.S. EEZ (Figure 9); thus for fisheries outside the U.S., EEZ bycatch rates are unknown due to low observer coverage.

G.7.2. Entanglement in Debris

Fur seals become entangled at sea in debris from the commercial fishing industry (Figure 10). Fur seals were first seen entangled in marine debris just after World War II (Fowler et al., 1990), and records of entanglement of northern fur seals in marine debris have been kept since the late 1960s. Most data come from studies of juvenile males collected during the commercial harvest between 1967 and 1985 (e.g., Scordino and Fisher, 1983), and scientific roundups conducted after the cessation of the commercial harvest (e. g., Fowler, 1987; Fowler et al., 1992). The most common types of debris include trawl net webbing, plastic packing materials, and monofilament line.

The juvenile male fur seal entanglement rate has fluctuated over time but was generally lower in the 1990s (about 0.2 percent) than in the 1970s and 1980s (~0.4 percent). Robson et al. (1999) reported no difference between entanglement rates on St. Paul and St. George Islands over a three year period. Williams et al. (2004) reported that entanglement rates remained generally consistent from 1995 to 2003, and determined that approximately 20,000 seals would need to be sampled to detect a 50 percent change in the proportion of juvenile males entangled. Williams et al. (2004) suggested consistent counting procedures and adequate sample size are important considerations when reporting trends in juvenile male entanglement. The entanglement rate is less than one percent annually (Figure 10) for juvenile (two to four-year-old) male seals that are observed on the Pribilof Islands. However, this rate does not account for seals that become entangled at sea and are unable to return to the breeding grounds, nor does it account for the

percentage of adult fur seals that are entangled.

The rates of entanglement for adult females may be higher than that of adult males because of their smaller size and slower rate of growth. In 1985, DeLong et al. (1988) estimated between 0.06 and 0.23 percent of adult females on select St. Paul rookeries were observed entangled in marine debris. Mass and survival of pups with entangled mothers were significantly lower than other pups. Entangled lactating females spent more time at sea feeding than non-entangled females or did not return to the rookeries at all (DeLong et al., 1988). A sample of adult females has been counted since 1991 during the counting of adult males on St. Paul to determine the percentage of adult females entangled (Figure 10). The percentage of adult females entangled in recent years is lower than for juvenile males, suggesting that either adult female fur seals are less likely to become entangled or their survival once entangled is lower than juvenile males.

Observations of fur seal entanglement at sea are limited, and the actual extent and significance of entanglement at sea are unknown (Fowler, 2002). Captive studies on three juvenile male fur seals

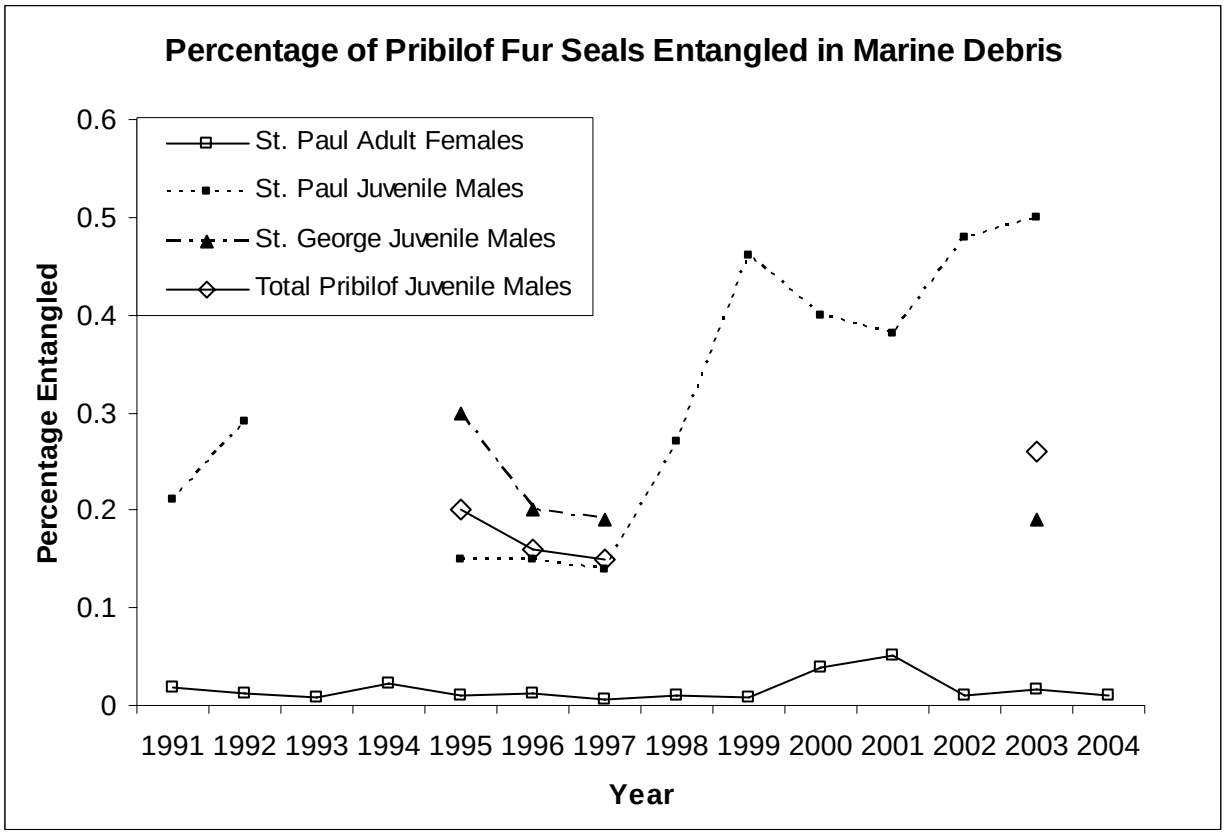


FIGURE 10. SUMMARY OF NORTHERN FUR SEAL ENTANGLEMENT ON THE PRIBILOF ISLANDS FROM 1991-2004, *FROM FOWLER ET AL., (1994); WILLIAMS ET AL., (2004); AND NMML, UNPUBLISHED DATA*.

showed that a free-swimming animal entangled in a net fragment of 200 g or larger will experience considerable difficulty swimming (Feldcamp et al., 1988). The relative size of females and juvenile males (2-4 year old) correlates well with the common mesh sizes of trawl net material. Females, due to their smaller size at age, may have a longer opportunity to become

entangled in the prevalent net material than subadult (5+ years old) and older males. Juveniles of both sexes may be more likely to become entangled than adults.

Laist (1997) suggested that while the entanglement rates seen on land are too low to account for the fur seal population decline, the unrecorded number of animals entangled and killed at sea may be a potentially significant factor. Trites and Larkin (1989) modeled fur seal population trends and speculated that entanglement related mortality was likely contributing significantly to the decline observed through 1987. Trites and Larkin (1989) indicated a 2-5% reduction in adult female survival provided the best fit of model choices to the available trend data. Entanglement in marine debris is a plausible mechanism for the reduction in adult female survival in the late 1980s. Fowler (1985; 1987; 2002) estimated that entanglement mortality could be as high as 15% for seals from birth to age three.

G.7.3. Indirect Fishing Effects

NMFS (2001) evaluated the indirect effects of commercial fishing on northern fur seals and determined that the Steller sea lion protection measures altering the commercial groundfish in the Bering Sea pollock fishery resulted in conditionally significant negative adverse effects. This analysis is still the best available science, however further investigations are underway, based on more recent diet, telemetry, and oceanography data. Indirect commercial fishing effects could include a reduction, redistribution, alteration, or increase in the availability of prey. Fisheries could affect fur seal prey on either local (e.g. "localized depletion") or ecosystem-wide scales (NMFS, 2000; 2001) by removing fish. Fisheries may reduce the density of individual patches (through dispersion) or change the distribution, size, or number of patches in space (e.g., deeper, greater patch separation, smaller, fewer). In addition, fisheries may affect fur seals through interactive competition (Baraff and Loughlin, 2000). Interactive competition may include disruption of normal fur seal foraging patterns by the presence and movements of vessels and gear in the water; abandonment of prime foraging areas by fur seals because of fishing activities; and disruption of prey schools in a manner that reduces the effectiveness of fur seal foraging. Fishery removals influence fur seals in numerous ways as do the effects of other predators in ecosystems, but effects of fisheries are orders of magnitude larger than the consumption by other predatory species (Fowler and Hobbs, 2002; Fowler, 2003). Ecosystem complexity, data and model limitations, and indirect linkages confound the quantification of most interactions between northern fur seal seals, their prey, and commercial fisheries.

Commercial fisheries removals have been studied to a greater degree with respect to the impact on Steller sea lions than northern fur seals. Commercial fisheries may affect northern fur seals in ways similar to or different than those for Steller sea lions. Numerous conservation actions described in Section II of the conservation plan would increase our understanding of the relationships between fur seals, fish, and commercial fisheries. Results of future fur seal and fisheries research may inform future management actions.

G.8. Human Presence and Coastal Development

Proposed development of on-land infrastructure to create more diverse economic opportunities for Pribilof Island residents has the potential to impact northern fur seals. Development and human presence have the potential to harass fur seals either directly or indirectly. Harassment must be quantified at the individual and population level. Harassment duration, timing, repetition and intensity are important to differentiate during the examination of low-level and chronic (e.g., noise, vehicle, and vessel traffic), intensive and intermittent (e.g., round-ups, bull

counts, pup counts, other human intrusions), and invasive (e.g., poaching, capturing, handling, tagging) human activities. Interpreting the biological significance of harassment from these activities is more challenging than simply detecting short-term behavioral changes.

The projects proposed for the Pribilof Islands include small boat harbor and airport upgrades; enhanced dock facilities for vessel repair, maintenance, and storage; and multi-species seafood processing plants. NMFS oversees economic development projects in the Pribilof Islands for consistency with the goals of this plan and the MMPA. NMFS authorizes a Western Alaska Community Development Quota (CDQ) fisheries program in the Pribilof Islands. CDQ groups represent St. Paul (exclusively) and St. George (with other Aleutian Island communities) in applying for allocations, managing the harvest or lease of the allocations, and investing money earned in projects to develop or support economic opportunities related to commercial fisheries. NMFS allocates a percentage of the groundfish fisheries total allowable catch to the CDQ program. Crab and halibut processing waste is authorized to be discharged into the nearshore environment on both St. Paul and St. George islands under National Pollutant Discharge and Elimination System permits. Wastes discharged from processing other fish species may contain greater amounts of oils and grease that may compromise the fur seal's pelage if discharged during their presence on the Pribilofs. High-volume processing of bottomfish/surimi may discharge waste particularly detrimental to fur seal pelage. A complete description of processing options and the timing of discharges will need to be considered prior to determining effects on fur seals.

G.8.1. Aircraft Noise and Overflights

Insley (1993) concluded that aircraft activity could adversely affect fur seals because the sound spectra of aircraft noise and fur seal vocalizations on land overlap, and some fur seals oriented towards aircraft noise overhead. Johnson et al. (1989) reported that in 1981 a large twin-engine aircraft passed approximately 300-500 ft. over the Gorbatch haul-out on St. Paul Island and caused a large stampede of bachelor bulls into the water, while a large twin-engine cargo plane passing at low altitude over a group of sleeping subadult male fur seals at a haul-out adjacent to East Rookery on St. George Island caused little disturbance other than some seals lifting their heads. Similar to fixed-wing overflights, observed helicopter overflights result in variable responses by fur seals.

Despite the variability in fur seal response to aircraft overflights, some biologists in the late 1980s speculated that the Little Polovina rookery/haul-out (5 km from the St. Paul airport) could be negatively impacted by aircraft disturbance (Johnson et al. 1989). Although fur seal use of the Little Polovina breeding and resting area has remained low, the rookery has not been abandoned, and whether these low numbers are related to aircraft disturbance or to some other factor is unclear.

Activity levels of juvenile males near the old and new airports on St. George Island were higher for approximately 5 minutes following aircraft overflights (Williams 1997). Williams did not find evidence of population-level effects (e.g., reduction in pup production, pup health indices, or shifts in the distribution of the breeding population) on fur seals during the peak of aircraft overflights on the southern breeding areas on St. George in 1993 and 1994. The potential for fur seals to habituate to aircraft disturbance has not been studied in detail, and researchers may have found that subtle habituation may have occurred on St. George in 1994 (Williams 1997).

Attempts to manage and mitigate aircraft harassment to fur seals have included the establishment

of Aircraft Advisory Zones and Requested Aircraft Flight Paths, which have reduced overflights of fur seal rookeries on St. George and St. Paul Islands, including the Polovina Complex.

G.8.2. Vessel Traffic and Noise

Few studies have described fur seal responses to vessel traffic. Johnson et al. (1989) reported observations of fur seals approaching vessels at sea, but also reported that seals avoided ships at distances of up to a mile if they were engaged in seal hunting. The potential for fur seal disturbance from fishing vessels and underwater and airborne noise appears to be low (Johnson et al. 1989 and references therein). Some evidence suggests that fur seals in the water are curious and may be attracted to vessel traffic or to engine and propeller noise. On some occasions, fur seals have been observed to approach fishing vessels and, on other occasions swim away from vessels. Fur seal interactions with fishing vessels have not been documented systematically, and fur seal response to vessel traffic may be related to past experiences of individual animals. Whether fishing vessels may temporarily displace some fur seals from preferred feeding areas is unknown, but the limited number of recent interactions reported by fisheries observers during the trawl fishery would suggest that fur seals avoid large actively-fishing vessels, but not general vessel traffic.

Vessel presence and shipwrecks on the Pribilof Islands pose both the threat of oil spills and resultant effects, but also rat-infested ships pose a threat from the potential for disease transmission and alteration of the terrestrial ecosystem of the Pribilof Islands. The potential effects of the introduction of invasive species such as rats have not been evaluated. The presence of rats on other breeding islands and their interactions with fur seals are unknown.

G.8.3. Construction Activities and Noise

Gentry et al. (1990) concluded that, over the duration of quarrying activities on St. George Island, non-breeding fur seals did not avoid prolonged, airborne construction sounds of about 85 dB re 20 μPa peak source level. Additionally, fur seals did not avoid ground vibrations from heavy equipment working within 100 m, and showed no response to subterranean blasts 0.6 to 2 km away (75 dB re 20 μPa at 50 m from the source) or to heavy construction 500 m away (Gentry et al., 1990). No fur seals were observed in the harbor during excavation and expansion activities on St. George, and no seals were observed to respond (either by changing behavior or orienting towards the source or water) to upland blasting approximately 1 km from a resting area at Zapadni Rookery. Due to wind conditions, however, the blast was not distinctly audible to the observer at the haul-out near the seals (M.T. Williams pers. obs. Aug. 1996).

G.8.4. Human Presence and Research

Human presence at breeding and resting areas harasses fur seals. Such presence includes research activities, ecotourism, and activities of residents of St. Paul and St. George. The presence and activities of humans near or in fur seal rookeries/haul-outs can cause major disturbances. As a result, regulatory closures (50 CFR 216, subpart G) preclude human access to fur seal breeding and resting areas from 1 June until 15 October without prior authorization. NMFS must receive and review an application prior to issuance of a permit authorizing northern fur seal research and any associated incidental and intentional fur seal harassment. Steller sea lion hunters are allowed a special exemption to access a primary fall hunting location at Sea Lion Neck after 15 September for subsistence needs. Some researchers have suggested that the

abandonment of the Lagoon rookery on St. Paul in the late 1940s may have been caused by increased activities (including the operation of a fur seal by-products processing plant) and by hunting pressure from residents of the village of St. Paul (Johnson et al. 1989). Little Eastern rookery was abandoned by about 1914 and was close to the village on St. George; however, the eastern portion of North rookery is closer and still active (Gentry 1998). Ream et al., (1994) suggested that rookeries with road access had higher rates of decline than those without road access. Similar analyses may provide insight into the effects of different levels of human presence at fur seal breeding and resting areas.

A detailed analysis of the influence of human-caused disturbances has not been undertaken. NMFS (2007) evaluated the effects of scientific research and under the preferred alternative estimated mortality to be negligible (i.e., less than 10% of PBR), and sub-lethal effects unknown. Experiments conducted by Gentry (1998) indicate that fur seals are resilient to extreme disturbances during the breeding season. Prior to the arrival of adult females, Gentry (1998) drove all territorial males from the breeding area they occupied on two different rookeries. About 80 percent of all males reoccupied their former sites within 7 hours and with fewer aggressive interactions than during the initial formation of their territory. Gentry (1998) translocated lactating females to other breeding areas with their pups and about 70 percent remained with their pups, making multiple feeding trips similar in duration to unmoved lactating females.

The biological effects of disturbance are strongly related to the season, type of disturbance, and frequency. During the peak of the breeding season, fur seals are reluctant to leave the breeding areas. Fur seals seem to tolerate disturbances in the breeding areas during the peak of the breeding season. Fur seals often detect human scent and become vigilant prior to detecting a visual stimulus, like the silhouette of a person. Outside of the peak breeding season, mothers will separate from their young once human presence is detected in the breeding area, but often return within a few hours depending on the season. Displacement of females and pups from breeding areas during the later portions of the lactation period might result in longer periods of separation between mothers and pups. Repeated displacement of adult females might result in permanent abandonment of sites. Juvenile males are less tolerant of human presence in the resting areas and are displaced from land easily. Juvenile males may return to the original or nearby resting areas within a few hours. Juvenile males were displaced repeatedly for the commercial pelt harvest, and no evidence of a redistribution of juvenile male seals from St. Paul to St. George was detected (Gentry, 1998). The energetic cost of such displacement from resting and breeding areas is unknown.

The dates for closing and opening the breeding and resting areas to human presence are not based on the absolute absence of fur seals but represent a compromise between community access and the suspected biological consequences of late season human-related harassment. In the fall, Steller sea lion hunters, tourists, and beachcombers can unknowingly displace breeding females and their dependent young. The September 15th exemption for Sea Lion Neck was implemented to avoid undue hardship on hunters with limited transportation options, when few personal vehicles were owned in the community. The prevalence of motorized vehicles may have resulted in more individual hunting and incidental harassment of nearby fur seals multiple times during a week or even a day in recent years. Reassessing the number of incidental disturbances and the consequences of repeated events late in the lactation period is important to managing human interactions with fur seals.

Early studies suggested that some research had detectable effects on the animals involved. Gentry and Kooyman (1986) found that lactating females who were outfitted with straps to secure dive recording instruments had significantly longer foraging trips than those that were

flipper tagged but not instrumented. These findings resulted in significant alteration of the procedure for attaching instruments and efforts to reduce the mass and drag of instruments. Similarly, Walker and Boveng (1995) reported that lactating female Antarctic fur seals (*Arctocephalus gazelle*) had significantly longer foraging trips and nursing bouts when instrumented with a time depth recorder and radio transmitter versus a radio transmitter alone. An inspection of the current data may provide insight into the effects of various tag attachments and broader scale changes in distribution related to repeated harassment due to research.

G.8.5. Motorized Vehicle Traffic

The impact of motorized vehicle traffic may result from visual stimulus, noise or pollution. Vehicle exhaust fumes and leaking fluids add pollutants into the habitat used by fur seals on the Pribilofs. Fur seals may respond to passing vehicles or audible noise by becoming vigilant, departing, or vocalizing. Ream et al. (1994) suggested St. George rookeries with road access declined faster from 1914 to 1992 and contributed a smaller proportion to pup production than those rookeries with no road access. Whether the results were related to vehicle traffic, human presence, or both is unknown. Increased vehicle traffic near rookeries is often related to opening some rookeries on September 15th to hunting or opening all rookeries on October 15th. Automobile and all-terrain vehicle traffic on roads and trails adjacent to fur seal breeding and resting areas may affect the continued use of these areas.

G.9. Environmental Contaminants

Environmental pollutants are a possible factor influencing the decline in the populations of some marine mammals. Some studies have suggested organochlorine pollutants may have been associated with reproductive failures of California sea lions and harbor seals (DeLong et al., 1973; Gilmartin et al., 1976; Reijnders, 1986). Loughlin et al. (2002) reported that organochlorine concentrations in the blubber of fur seals on St. George Island were higher than in seals on St. Paul Island. The toxic equivalency levels of raw blubber from St. George juvenile male fur seals exceeded the levels recommended for consumption by humans. However, milk samples from seals on St. Paul Island had higher PCB levels than samples from St. George Island seals (Loughlin et al., 2002).

Tanabe et al. (1994) measured the levels of persistent organochlorine residues in the blubber of female northern fur seals off the coast of Japan. PCBs and DDTs were found to be high in all samples. These residues showed a drastic reduction after maturity and then increased again after the menopause. Beckmen et al. (1999) reported that fur seal pups from young (less than 5 years) females had significantly higher organochlorine concentrations in their blood than pups born to older (greater than 7 years) females, and organochlorine contaminants were significantly more concentrated in early lactation milk of young females than older females. Mean concentrations of PCB congeners were higher in pup blood than in that of reproductively active females. Beckmen et al. (1999) suggested that northern fur seal pups, especially pups born to first-time mothers, have a substantial exposure to organochlorine contaminants at a critical developmental stage and suggested that this exposure could impact neurological and immune system development.

Krahn et al. (1997) reported concentrations of certain organochlorine contaminants in blubber from Pribilof Island fur seals that were about an order of magnitude higher than those found in other seal species. Age and sex did not account for differences in contaminant concentrations,

and it was suspected that the differences may be due to differences in feeding habits and migratory patterns among species.

Kim et al. (1974) found mercury in adult female fur seal blood and hair, and Anas (1974) reported high mercury concentration in fur seal liver, followed by kidney and muscle. Concentrations of cadmium and lead were highest in kidneys. Noda et al. (1995) measured the concentrations of various heavy metals in muscle, liver, and kidney tissues of northern fur seals caught off the coast of Japan and from the Pribilof Islands. Concentrations of heavy metals varied depending on the particular metal in question, the tissue involved, and the age and location of the seal, but no consistent trends among areas were detected. Beckmen et al. (2002) reported higher total mercury concentrations in the fur of northern fur seals from the depleted Pribilof Island population when compared to both declining and thriving populations of Steller sea lions from Prince William Sound and Southeast Alaska. Saeki et al. (2001) reported relatively high concentrations of silver and vanadium in northern fur seals.

Major information and data gaps regarding the effect of toxic substances on northern fur seals include information to assess the effect at the individual, population, and species levels. Of primary concern is chronic exposure to toxic substances and the potential for reactive metabolites to cause damage to DNA, RNA, and cellular proteins. But more importantly, there are no studies on the effects of toxic substances at the population level to determine their impact on vital rates, population trends, or the human consumers.

Contaminant studies on fur seals have shown exposure to various toxic substances and evidence of accumulation in various tissues. Whether lingering effects on vital rates from exposure to these substances are occurring at the individual or population is unknown. Of lesser importance, but a recognized data gap, is the determination of the level of contaminant load (organochlorine pesticide residues, polychlorinated biphenals, and heavy metals) for discriminating between populations.

G.10. Oil and Gas

An oil spill coincident with northern fur seal presence would be the most severe direct impact in the Pribilof Islands region and winter fur seal range. The oil and gas industry is interested in exploration and development in the North Aleutian Basin. The North Aleutian Basin overlaps with the summer and winter range of northern fur seals, and the potential for oil spills and seismic noise to affect fur seals there is high. Unlike many other marine mammals, fur seals rely on the water-repellent quality of their fur rather than a thick layer of blubber to provide insulation from the cold temperatures of Bering Sea and North Pacific Ocean waters. Oil that comes in contact with fur seals will diminish the insulating capacity of the fur resulting in death from hypothermia (Kooyman et al., 1976).

From June to December, northern fur seals concentrate on the breeding grounds of the Pribilofs. Sub-adult animals, adult females, and non-breeding males all frequently return to the sea to feed during this period, and could be exposed to floating oil. By early September, all animals including pups regularly enter the water and would be potentially vulnerable to a marine spill. Fur seal pups often congregate in tidal pools and shallow nearshore waters where oil may become trapped or concentrated. The risk of oiling may therefore be greater to pups than adults.

Inhalation of petroleum product vapors may result in increased levels of hydrocarbons in blood and tissues of northern fur seals. The toxic effect of inhalation may be serious, particularly

during the first few hours of a spill when volatile fractions are given off, or for spills of refined products (i.e., gasoline or diesel fuel), which contain higher percentages of these compounds. Possible effects include lethargy, sickness, and destruction of the central nervous system. Exposure to high concentrations of volatiles may result in the mortality of some northern fur seals.

Direct exposure to hydrocarbons has been observed to cause irritation to eyes and mucous membranes in pinnipeds. Ingestion of oil may also have deleterious effects, although it is not anticipated that this would be as significant a concern for northern fur seals as heat loss due to oiling of their fur.

In the event that oil approaches or contacts a rookery, clean-up efforts may be directed to both nearshore and offshore regions. Disturbance to northern fur seals may result from the presence of oil-spill response workers and associated aircraft, vessel, and ground support vehicles. Northern fur seals may respond to human presence by immediate departure from the area. Prolonged or intense disturbance could result in abandonment of the site. Harassment from oil response activities on breeding fur seals on the rookeries could result in increased mortality of fur seal pups due to disrupted nursing, early weaning, or crushing due to stampedes of frightened animals. This harassment, however, is small relative to the direct mortality as a result of contact with oil.

Approximately 5,000 South American fur seal (*Arctocephalus australis*) pups were known to have died as a result of a crude oil spill off the coast of Uruguay in February 1997 (Mearns et al., 1999). The spill occurred during the peak of the pupping season, and pups became oiled as the oil reached the beaches of the breeding colony. Fur seals were not affected by the Exxon Valdez oil spill (EVOS) (Loughlin, 1994), although an estimated 2,800 sea otters may have perished as a result of the spill and many more probably died and were not recovered (Garrott et al., 1993; Loughlin et al., 1996).

Several mathematical models have been developed to predict fur seal mortality from a hypothetical spill (French et al., 1989; Neff, 1990). A modeled spill of 10,000 barrels of Prudhoe Bay crude oil in Unimak Pass during spring fur seal migration fouled 0.05 percent of the males and 3.7 percent of the females in the population (Reed et al., 1986 in Neff, 1990). The model assumed a population of 1.16 million animals, and the number of oiled seals averaged 29,364 in eight simulations. Another spill scenario south of St. Paul Island in mid-July, also involving 10,000 barrels of crude oil, fouled 4.0 to 6.2 percent of the females and 5.3 to 6.4 percent of the males depending on the assumptions of the model. The model projected that 10,603 to 73,948 seals would be oiled, depending on the initial size of the population and whether or not the island was oiled. French et al. (1989) used a similar scenario to that of Reed et al. (1986) to predict mortality of 4,772 to 14,235 seals for the Unimak Pass spill depending on the mortality rate once the animal was oiled. The St. Paul spill model predicted seal mortality ranging from 3,562 to 30,724 animals depending on the mortality rate once the animal was oiled and also whether rookeries on the island were oiled.

Whitney and Yender (1997) reported on 14 oil spills, primarily of diesel fuel, near the Pribilof Islands from 1979 to 1996. The largest spills were approximately 40,000 gallons in November 1979, 25,000 gallons in March 1990, and 15,000 gallons in March 1987. Most of the spills occurred in February and March, one spill occurred in May, one in October, and no spills occurred during June through September when the greatest numbers of fur seals are on the Pribilof Islands. Few impacts to marine birds and mammals were reported in association with these spills, although approximately 1,500 birds (mostly king eiders) were oiled during a spill off

St. Paul Island in February 1996 (Whitney and Yender, 1997). Approximately 50 percent of the micro organisms and invertebrates in Salt Lagoon, St. Paul Island, were killed as a result of the large spill in November 1979 (Whitney and Yender, 1997).

A spill that occurred in the Aleutian Islands as a result of the grounding of a large cargo ship in December 2004 had the potential to affect fur seal breeding sites at Bogoslof Island. Had it occurred during spring or fall during fur seal migration, it could have had detrimental impacts on females and pups migrating south through Aleutian Islands passes. The number of seals affected by an oil spill in an Aleutian Island pass would depend on the amount and type of spill, the location, and the time of year (French et al., 1989; Neff, 1990). The Minerals Management Service has begun initial evaluation of oil and gas lease and exploration potential in the North Aleutian Basin (MMS 2006). NMFS has expressed considerable concern about the sensitivity of numerous species using the waters in the North Aleutian Basin, including northern fur seals.

Contingency plans to deal with unexpected oil spills from tankers en-route to West Coast refineries or from spills in the Aleutian Island passes may be difficult to implement because of the large area involved. General oil spill response activities similar to those that have been implemented for previous oil spills would be conducted. Due to the concentration of a significant proportion of the fur seal population in the Pribilof Islands, an oil spill here could have a catastrophic effect. Mearns et al. (1999) suggest that the remoteness of the Pribilof Islands and other fur seal rookery sites demands on-site preparedness. Low-technology strategies, such as those employed for the spill in Uruguay, may be the most effective way of responding to a spill in the Pribilof Islands. NMFS has purchased a natural fiber-based absorbent material, used in the Uruguay spill, for such response. This material is warehoused on St. Paul Island. NMFS will continue to pursue effective response and preparedness strategies on the Pribilofs as necessary to conserve the northern fur seal. NMFS has also worked with the U.S. Coast Guard, U.S. Fish and Wildlife Service, and the Alaska Department of Fish and Game to prepare the Wildlife Protection Guidelines for the Pribilof Islands. Those guidelines provide recommendations to responders and provide a hierarchy of response actions.

II. CONSERVATION STRATEGY

NMFS provides the history of northern fur seal life history, ecology, management, and research in the first section of the Conservation Plan. In addition the first section of the plan provided an assessment of the likely natural and anthropogenic threats to the Eastern Pacific northern fur seal stock. NMFS describes the conservation strategy here as the framework for future northern fur seal recovery and conservation. This recent and historical context will differentiate the traditional maximum sustained yield management approach during the commercial harvest (through 1984) from the single species management approach through early 2000s. NMFS is initiating the transition towards ecosystem approaches to management as identified in the NOAA Strategic Plan (http://www.ppi.noaa.gov). NOAA must take steps to integrate the diverse research projects within the range of the Eastern Pacific northern fur seal stock. NOAA research integration will better inform commercial fisheries, harvest, and island development management. As part of the conservation strategy, NMFS identifies recent management and research progress, biological constraints on research and management, and conservation measures, goals and criteria in the remainder of this section of the plan.

A. Summary of Progress since 1993

The original Conservation Plan for northern fur seals was completed in 1993 (NMFS 1993). NMFS has managed numerous projects and worked with a diverse group of constituents, partners, and agencies on the Pribilof Islands. The following summary describes the accomplishments of northern fur seal management and research primarily in the Pribilof Islands since 1993.

A.1. Comanagement Agreements

Comanagement agreements were signed between NMFS and the tribal governments of St. Paul Island in 2000 (Appendix 1) and St. George Island in 2001 (Appendix 2). These agreements are comprehensive, outlining the government to government relationship for cooperative management of northern fur seals (and Steller sea lions) subsistence use. Northern fur seal (and Steller sea lion) subsistence harvest monitoring is a cornerstone of the agreements and includes specific items such as supporting and continuing the harvest monitoring and reporting. The tribal governments of both islands have implemented programs that promote full utilization of edible and inedible seal parts for traditional arts, crafts, and other legal uses. The result has been an expanded use of these materials by the Aleut residents and increased fulfillment of the non-wasteful provisions of the MMPA.

Fur seal viewing blind permits and marine mammal parts registration forms are distributed and processed by the Tribal Governments. The Island Sentinel and Conservation officer intensively monitors rookeries and haulouts while fur seals are present and assists with compliance of federal regulations at 50 CFR 216, subparts F & G.

The Island Sentinel Program monitors fur seal rookeries and shorelines year round to document habitat degradation or alteration such as oil or fuel spills, trash or garbage accumulation, human disturbances, abnormal sheens on the surface of the water, or fish waste accumulation. They also observe and record natural changes and processes, such as presence of all marine mammals, redistribution of fur seals on rookeries and haulouts, and the timing of various life history events for fur seals.

Tribal staff implement community outreach and education programs through newsletters, curriculum development, radio and television public service announcements, and bulletin board postings. Educational and interpretive sessions with teachers, students, and visitors are done multiple times per year. Under contract to the NMFS the Tribal Governments maintain and repair fur seal research infrastructure on Federal lands designated as fur seal rookeries.

A.2. Marine Debris

NMFS, NMML, and Tribal governments have conducted disentanglement studies on the Pribilof Islands for the past decade. These studies provide entanglement estimates and remove debris from captured animals. Because of logistical constraints, the primary focus has been disentanglement of immature male fur seals seen at the resting sites, but adult females, adult males, and pups may be captured and the debris removed when practical and authorized.

For the past 10 years the Tribal Government of St. Paul has coordinated beach clean-up and derelict fishing debris removal on an annual basis at select locations. Early clean-up programs

were conducted by volunteers collecting derelict fishing gear and marine debris from northern fur seal habitat. Subsequent clean-up programs and funding have been implemented with support from various organizations resulting in many tons of debris removed from nearshore habitat. In addition funding has provided for the disposal of debris stockpiled on St. Paul. The Tribal Government of St. George is working to develop and fund similar clean-up projects on St. George.

A.3. Rat Prevention Program

The U.S. Fish and Wildlife Service, NMFS, and a variety of local community organizations and other federal agencies work collectively to prevent the introduction of rats onto the Pribilof Islands. The occurrence of rats would rapidly devastate the abundant seabird populations and has the potential to introduce disease to marine mammals. Rat prevention training occurs on a periodic basis. Activities include the setup and regular maintenance of trapping stations, visitor education programs, identification of rat introduction risks, and emergency response protocols.

A.4. Oil Spill Contingency Plans

NMFS in cooperation with numerous agencies developed an area oil spill contingency plan which has been extant for nearly ten years (Whitney and Yender 1997). The Alaska Regional Response Team plan can be found at: http://www.akrrt.org/index.shtml. This plan is reviewed and updated as needed to insure its applicability to ever-changing oil spill risks and to integrate experience gained from response in other regions. State, federal and local agencies identified sensitive habitats in the Pribilof wildlife protection guidelines and created a sensitive habitat map. USFWS and NMFS distributed the map to the public with descriptive text in Russian, Japanese, and English.

A.5. Observer Program and Incidental Take

NMFS monitors domestic fisheries to identify sources of marine mammal mortality including fur seals. Marine mammal program observers placed on fishing vessels record fishing effort (e.g., number of sets, size of nets, time and location of sets), bycatch of non-target species, and document the number, sex, and age of all marine mammals observed and caught. Incidental take of marine mammals is summarized in the annual Stock Assessment Reports.

A.6. Development Review, Environmental Analyses, and Mitigation Identification

NMFS regularly reviews proposed state and federal permits and actions that may affect northern fur seals. NMFS works with agencies and applicants to determine whether such actions could harm fur seals or damage habitats essential to their survival and to identify measures to avoid or minimize possible adverse effects. Activities are analyzed under the National Environmental Policy Act. Marine mammal research permits are also reviewed.

A.7. Marine Mammal Stock Assessments

On April 30, 1994, Public Law 103-238 was enacted amending the Marine Mammal Protection Act. The amendments mandate that NMFS regularly evaluate interactions between marine mammals and commercial fisheries. The amendments also established three regional scientific review groups to advise and report on the status of marine mammal stocks offshore of Alaska, along the Pacific Coast and Hawaii, and off the Atlantic Coast (including the Gulf of Mexico). NMML prepares a stock assessment for northern fur seals.

A.8. Research

The NMML reports the results of their fur seal studies in the NOAA Technical Memorandum series, Fur Seal Investigations. Fur Seal Investigations is currently published biennially and thus provides an expeditious dissemination of fur seal research results. Comprehensive findings, as well as individual studies, are published by NMML staff in peer-reviewed literature. Interim results may be published on the NOAA Fisheries website.

NMFS's long-term conservation planning with internal and external funding is the most likely way to provide a stable time-series of biological and ecological data to implement an ecosystem approach to management. The North Pacific Fur Seal Commission proposed, reviewed, and approved early long-term fur seal studies and related management through 1984. The lapse of the Fur Seal Convention in 1985 significantly reduced research funding into the causes of the fur seal decline and limited the subsequent scope of that broad fur seal research program (Gentry, 1998). The following brief fur seal research summaries are provided as the fundamental core of continuing research needed to document population changes. Only through continued integration and collaboration with other research programs (e.g., North Pacific Marine Science Organization, Pacific Marine Environmental Lab, Bering Ecosystem Study, and North Pacific Research Board) will we gain an adequate understanding of the processes and interactions between northern fur seals and their ecosystem to effectively manage human activities.

A.8.1. Abundance Estimation

NMML conducts annual field investigations of the population status of northern fur seals on the Pribilof Islands. Since 1909 researchers have counted adult male seals annually on the Pribilof Islands.

Pup production is considered the most accurate estimator for monitoring population trends. All rookeries on St. Paul and St. George Islands were shear-sampled in 1990, 1992, and 1994. In 1996, sub-sampling of rookeries on St. Paul Island was instituted, but has been discontinued in recent years due to high variance. Towell et al. (2006) reports the decline in northern fur seal pup production on the Pribilof Islands from 1973 to the present. NMML continues biennial estimates of Pribilof pup production and intermittent estimates of pup production on Bogoslof Island.

A.8.2. Basic Life History and Health

NMML measures the mass and length of pups on St. Paul and St. George Islands and records their sex concurrent with estimates of pup production. These data serve as indices of health and condition over time. Sex ratios of pups born on both islands are either equal or skewed towards

fewer females (Antonelis et al., 1994). St. George pups are typically heavier and longer than those born on St. Paul. However, comparisons of pup mass and length by specific breeding areas on both islands have not indicated consistent trends (latest information in Towell et al., 2005). Baker et al. (1994) reported that from 1987-1990 larger than average male pups were more likely to survive to age five, suggesting that pup mass and length are useful indicators of health. Spraker et al. (in review) evaluated northern fur seal pup mortality at select St. Paul rookeries.

Biologists collect tissues from dead fur seals found on rookeries and haulouts when practical. These tissues are archived for later analysis and can assist with estimates of age-specific mortality. Fur seals harvested for subsistence purposes are also sampled. Biologists collect teeth and tissues in cooperation with subsistence hunters.

A.8.3. Feeding Ecology

NMML studied the foraging ecology of 97 adult females on St. Paul and St. George Islands over the 1995 & 1996 breeding seasons (Robson et al., 2004). Robson et al. (2004) defined foraging areas and estimated home ranges of lactating females among breeding sites. Sterling and Ream (2005) described at-sea locations, dive behavior and changes in body mass in juvenile male fur seals from various haul-outs. Goebel (2002) examined adult female reproductive behavior during two years of contrasting oceanography. Analysis of additional lactating female tracking and diving data collected during these studies is being investigated.

A method was derived to improve size estimates of walleye pollock and Atka mackerel (*Pleurogrammus monopterygius*) consumed by pinnipeds from captive feeding experiments (Tollit et al., 2004). Ream et al. (2005) examined female foraging in the North Pacific Ocean. Gudmundson et al. (2006) analyzed the variability of fish and squid remains in scat and in regurgitations. Antonelis et al. (1997) found differences in female fur seal diet among breeding islands, and suggested that the differences were related to the hydrographic structure surrounding each island. Zeppelin et al. (in review) analyzed scats and examined variation in the composition of prey remains among the individual rookeries on the Pribilof Islands.

Kurle and Worthy (2002) used stable nitrogen (δ15N) and carbon (δ13C) isotope analyses of juvenile male fur seal's fur, muscle, blubber, brain, liver, and kidney tissues to examine trophic level changes over time in the Pribilof Island stocks. Kurle and Worthy (2002) suggest that changing isotopic ratios has implications for fur seal foraging ecology and migratory patterns.

A.8.4. Disturbance, Harassment, and Displacement

Insley (1993) reported aircraft sound pressure levels strong enough to be detected above background levels by northern fur seals, and hypothesized the potential for effects of repeated flights over fur seal breeding and resting areas on St. George Island. Insley (1993) reported that the adherence to previously described flight corridors will minimize the likelihood for negative effects on the behavior, productivity, and survival. Williams (1997) estimated behavioral responses of non-breeding seals lasted for fewer than 10 minutes after the visual or acoustic stimulus from aircraft subsided. Williams (1997) did not detect effects from aircraft overflights on the behavior, productivity, or abundance of breeding northern fur seals on St. George. Ream et al. (1994) suggested the declining trend for fur seal breeding areas on St. George was related to the proximity of roads leading to those breeding areas and the resultant human intrusions.

Gentry (1998) speculated that greater numbers of human intrusions into breeding areas could reduce survival. Gentry (1998) reported that most lactating females tolerate being physically moved to an alternate breeding area or island with their young and still maintain the maternal bond within a season. It is not known if there is a seasonal influence on fur seal sensitivity to human intrusions into breeding or resting areas.

A.8.5. Contaminants

Since 1992, NMML has collected and archived tissues from northern fur seals on the Pribilof Islands. These tissues are available for analyses to answer various questions about the fate and impacts of organochlorine pollution on local fur seal populations and the implications of consuming subsistence harvested animals. Loughlin et al. (2002) examined organochlorine contamination in blubber and milk from pups, subadult males, and adult females. Beckmen et al. (1999) examined the exchange of contaminants from mothers to their pups via milk. Beckmen et al. (2002) examined heavy metal concentrations in fur seal tissues.

A.8.6. Migration and Site Fidelity

Baker et al. (1995) found that natal site fidelity in northern fur seals increased with age. Female northern fur seals exhibited stronger natal site fidelity than males of the same age, which suggests that site fidelity was related to age at sexual maturity (Baker et al., 1995). The strong site fidelity reported by Baker et al. (1995) does not preclude females from using alternative breeding areas in subsequent seasons or when conditions warrant (Gentry, 1998). The high rate of growth of breeding fur seals on Bogoslof Islands supports the results of Gentry's translocation experiments (1998). Ragen et al. (1996) studied the early migration of northern fur seal pups from St. Paul. Ream et al. (2005) described the winter migration of adult female northern fur seals into the North Pacific Ocean. The mechanisms and thresholds for changes in breeding site fidelity, emigration, and immigration are not understood, but may be linked to any number of factors described in previous parts of this plan.

B. Biological Constraints on Management and Research

Research and management on northern fur seals is constrained by species-specific life history and ecology. Effective management depends on a reasonable understanding of northern fur seals' interaction with human activities within its environment. Our incomplete understanding of northern fur seals increases our uncertainty and confounds efforts to implement appropriate management measures to positively affect fur seal recovery. A marine predator with a long life span, delayed reproductive maturity, no individual markings, segregation and philopatry, high density aggregations, and complicated site-specific foraging are the major biological constraints on management and research on the Eastern Pacific northern fur seal stock. Clarifying these constraints will be the focus of the remainder of this section.

B.1. Marine predator

Northern fur seals spend a significant portion of their life underwater and a short but critical portion of their life on land. As a marine predator, northern fur seal foraging cannot be observed directly and must be inferred. The ability to understand northern fur seal ecology is constrained

by our ability to track individual fur seals at sea, determine successful foraging and extrapolate success to other segments of the population. The effectiveness of conservation measures, management actions, and studies are complicated by constraints described here and in subsequent sections.

B.2. Long life span

Northern fur seal's life span is about 25-30 and 9-12 years for females and males, respectively. Survival is highly variable, and the last estimates were computed during the commercial harvest period. Juvenile fur seals do not return to the Pribilof Islands in direct proportion to their abundance until they are three years old. Very few two-year-old fur seals return to the Pribilof Islands and even fewer yearlings. Adults can only be aged into broad categories based on visual characteristics. Recent estimates of northern fur seal survival are lacking. NMFS must estimate fur seal survival to evaluate population trends. Juvenile survival has been identified as a significant factor of recent declines requiring further investigation (Swartzman and Haar, 1983; Roppel, 1984; Trites and Larkin, 1989; Trites, 1992). Thus the long life of northern fur seals necessitates long-term studies to estimate age- and sex- specific survival.

B.3. Delayed reproductive maturity

Northern fur seals do not begin breeding until about three and eight years for females and males, respectively. Multiple years of reproductive data collection are required prior to computing early reproductive estimates. A substantial time lag exists between long-term data collection and computing age- and sex-specific reproductive estimates.

B.4. No individual markings

Northern fur seals do not have any distinguishable markings that can be used to identify individuals from one year to the next. Permanent marking methods of pre-weaned pups and reliable techniques for detection of those marked pups as two- or three-year-olds have not been advanced beyond those used with limited success in the 1980s (Gentry, 1998). Flipper-tagging, hot and freeze-branding, and implanting electronic tags were all considered at a workshop of pinniped biologists and select tag manufacturers convened by NMML in September 2005 (Melin et al., 2006).

B.5. Segregation and philopatry

Northern fur seals are present on land from late May through early November. The duration of land visits varies for all ages and sexes. Visits to land are intermittent during the summer and abbreviated by marine foraging trips. Trips to marine foraging areas extend across great distances during the breeding season. During the non-breeding season fur seals are pelagic foragers across broad marine areas. Northern fur seals rarely visit terrestrial sites during the winter and spring until their return to their summer breeding islands.

Northern fur seals exhibit segregation and fidelity on land (Baker et al., 1995; Gentry, 1998) and at sea (Robson et al., 2004; Sterling and Ream, 2004). For example, juvenile and adult male fur seals are generally thought to winter in the Bering Sea and northern Gulf of Alaska while adult females, weaned pups and yearlings are thought to travel further south into the North Pacific

Ocean. On land two – six year old males are predominantly found in resting areas, while adults and pups are found at breeding areas distinct from the resting areas. Thus important environmental and human-related factors might act on one segment of the stock due to age- and sex-segregation. Gentry (1998) summarized the degree of philopatry (fidelity to the birth site) in northern fur seals and the results of translocation experiments. Philopatry may confound interpretation or extrapolation of results from studies sampling discreet breeding areas. Accounting for these differences may be possible if quantitative measures of these differences can be computed and used in study design and analysis. Alternatively, ecological and impact studies may need to reconsider sampling designs as more is learned.

B.6. High density aggregations

Northern fur seal breeding and resting aggregations contain high densities of individuals. The high density aggregations result in incidental harassment and reduced access to seals for study and monitoring. Breeding area density remains high during the peak of the breeding season, even at low abundance, due to female spacing and maximum male territory size. Density is reduced from summer to fall. Resting area density is highly variable depending on the weather, time of day, and age of the animals.

B.7. Complicated site-specific foraging

Food availability has become an important consideration related to the decline of Pribilof fur seals. Technological advances have resulted in reliable estimates of fur seal locations at sea and dive behavior while at those feeding locations. Northern fur seals select prey depending on numerous factors, few of which are clearly measured or quantified. Comprehensive data on prey (commercially targeted and non-targeted species) availability and environmental and oceanographic conditions will be required to manage and mitigate interactions between fur seals, their prey, and human activities (e.g., commercial fisheries).

NMFS has described the primary biological constraints on managing northern fur seals to help the public understand the challenges faced will not be easily or quickly overcome. When human activities are thought to negatively influence the health, survival, or reproduction of a species, it is the manager's responsibility to examine and evaluate the contribution of human-related and natural effects. Managers subsequently determine how to manage those activities in the appropriate environmental and regulatory context. NMFS intends to reduce the uncertainty by identifying measurable health, survival and reproduction indices that are sensitive to human interactions. NMFS must also identify and measure the extent and duration of human interactions to evaluate and attribute the proportion of detected variability to natural and human induced changes.

C. Conservation Measures

NMFS believes implementing additional conservation measures as needed and continuing to manage subsistence harvests, fisheries, and island development will reduce human-related northern fur seal mortality and ideally lead to a recovery of the population to OSP. Research is needed to resolve the biological significance of human and natural threats and assist in identifying measures most likely to promote the recovery of the Eastern Pacific northern fur seal stock. NMFS will continue to work towards integrating species-based research and project-based monitoring programs into a place-based research and monitoring program as the foundation for

applying ecosystem approaches to management. A place-based research and monitoring program will evaluate both the effectiveness of the measures implemented and the general trends of various population parameters and vital rates, and identify additional measures to promote recovery. The redistribution of fur seal abundance at alternative breeding areas and reduction in population abundance on the Pribilofs suggests some factors are acting on a large scale. Identifying what ecological factors have changed for the Pribilof Islands relative to the other populations will be a key aspect to determining the contribution of human-related and environmental processes to the observed changes in abundance.

Environmental complexity frequently prevents unambiguous interpretation of living marine resource studies. Marine mammal research is no exception, and yet management actions are implemented and subsequently revised using the available data, analyses, and interpretations. Successful management through cessation of commercial whaling has led to recovery of many large whale populations. The cessation of commercial harvesting of Pribilof Island northern fur seals did not achieve similar results and the recent population decline suggests other yet to be quantified factors may be influencing the Eastern Pacific fur seal stock. Developing proactive management actions will optimize funding and promote agency collaborations and partnerships with commercial fishing, oil and gas, and island development interests.

Federal, tribal, state, international and private entities must work together to coordinate research, management, and recovery efforts. Collaborations with commercial fishing organizations will help identify practical research and management opportunities. One of the most productive management actions is to continue to strengthen NMFS relationships with the Tribal Governments of St. Paul and St. George through the co-management process. Availability of local expertise will assist NMFS to implement various measures identified in the conservation plan and, as appropriate, will allow tribal groups to pursue conservation actions independently. Management and monitoring of fur seal harvests for subsistence purposes are a requirement of current regulations. Alternative harvest management and regulatory structure will be evaluated at regular intervals through the co-management process.

NMFS described numerous conservation measures for the Pribilof Islands and defined some measures related to habitat and subsistence harvests in the federal regulations. The federal regulations (50 CFR 216, subparts F and G) identify the following measures to protect northern fur seals:

- Pribilovians may take fur seals if the harvests are for subsistence uses and not wasteful;
- Harvests on St. Paul and St. George are treated separately; allowed at specific locations during a 6-week period; and target juvenile male seals;
- Access to northern fur seal breeding and resting areas is restricted from 1 June through 15 October;
- Dogs are prohibited on the Pribilof Islands; and
- Research must be coordinated with federal representatives prior to conducting studies.

NMFS manages northern fur seal research activities under the provisions of the MMPA.

Identifying and quantifying human-related mortality and injuries to northern fur seals will direct conservation measures towards appropriate short-term management actions. At present, fur seal mortality is caused by entanglement, subsistence harvest, poaching, direct fisheries bycatch, and research. None of these human-related sources of mortality are thought to cause the current population declines on the Pribilof Islands; however, any human-related mortality contributes to

the lack of recovery. NMFS has not adequately characterized biases associated with some of the available mortality estimates, and further studies are needed. Conservation measures implemented in the past have reduced the rate of human-related mortality and serious injury. Reducing high seas drift-net fisheries, implementing MARPOL, implementing fishery observer programs, regulating subsistence harvests, implementing comanagement agreements, and reviewing federally-permitted activities on the Pribilof Islands are some examples of current conservation measures. In addition, a process for reviewing local activities that have the potential for adversely affecting fur seals must be developed and implemented. Continued efforts are needed to quantify and minimize all mortality sources. The biological consequences of modest chronic, intermittent intense, and invasive human harassment of fur seals on and near breeding and resting areas are of growing conservation interest.

NMFS must monitor and quantify the effect of northern fur seal conservation measures. Education and outreach programs need to be continued and improved, and regulations need to be enforced. Identification, monitoring and protection of important fur seal marine and terrestrial habitats beyond those currently identified are also needed. Educational outreach to the sources of marine debris is an immediate and practical conservation measure. The actual removal of beachcast marine debris on the Pribilof Islands will reduce this known source of fur seal mortality.

One of the most significant research needs for the recovery of the Eastern Pacific northern fur seal stock is the development of a method to estimate survival and reproductive rates of the population. The development of demographically-based models accounting for environmental and anthropogenic covariates will be important to direct subsequent research focus towards the segment(s) of the population contributing to the current decline. Analysis of archived data and tissues may assist with study design. Estimating population abundance and trends using established methods must continue, and consideration of alternative methods will be assessed as appropriate. Research into fur seal behavior and ecology has provided insight into important factors influencing population size. In order to properly manage human activities it is critical to resolve the contribution of environmental versus human influences on fur seal abundance, survival, reproduction, and behavior. ***The best way to resolve the contribution of these influences is with hypothesis-driven studies.***

D. Conservation Goals and Criteria

The goal of this Conservation Plan is to promote the recovery of the Eastern Pacific northern fur seal stock to a non-depleted level. The population level at which NMFS would reconsider the depleted classification is at the lower bound of OSP. For northern fur seals, this is at a sustained population level (total abundance estimate) or a sustained level of pup production of 60 percent of the peak historical estimates (i.e., carrying capacity). This could occur by population growth to the historical ranges of carrying capacity or at a lower level if evidence suggests that carrying capacity is lower than earlier estimates and human-related effects do not limit the population.

III. CONSERVATION PROGRAM

NMFS believes that the Conservation Plan should be a dynamic document and thus has focused the plan on many short-term actions needed in the next five years. As new information is obtained, new actions will be identified and incorporated into the program outlined here. As with all conservation plans, this plan will be reviewed and revised periodically, assessing the success of actions taken to recover the stock and prioritizing new actions as needed. The goal of this Conservation Plan is to promote the recovery of the Eastern Pacific northern fur seal stock to a level appropriate to justify removal from MMPA depleted listing. NMFS will focus management using a science-based ecosystem approach to determine how and when to implement and monitor those conservation actions described here.

To the maximum extent possible, future research efforts should collect data that can be compared with historical data. The importance of time-series data is consistent with the local tribal perspective based on long-term observation and interaction with fur seals and the Bering Sea ecosystem, as well as research and policy recommendations made by a broad array of government, academic and non-government organizations (e.g. NRC 1996; Mangel et al. 1996; NMFS 2000; NRC 2003). Studies necessary to calibrate results from newly developed techniques with those obtained by previous techniques should be carefully designed to facilitate future comparison of important ecological parameters for both fur seals (e.g. population trends, fecundity and survival, foraging effort, growth rates, and maternal investment) and the Bering Sea ecosystem. Data analyses should examine trends over time and must evaluate the relationships among observed changes in fur seal parameters with physical, biological and anthropogenic factors known or suspected to influence the parameter of consideration.

Research and monitoring efforts should, as much as possible, be coordinated between multiple locations (St. Paul, St. George, Bogoslof, San Miguel, and the rookeries in Russia when feasible) to investigate regional differences in fur seal population dynamics and the range of responses. Scientists and managers must examine the contribution of oceanography, food resources, and human activities (e.g., harvesting, disturbance, fishing debris, fishing and limits to fishing) in their analyses to understand regional differences in abundance and population parameters.

Enhancing participation by Alaskan Natives and other interested stakeholders is a cost-effective means to facilitate the long-term continuity of some programs. Pribilof Island residents have a long history of interactions with northern fur seals. Pribilovians have and will continue their involvement in many aspects of fur seal conservation, consumption, management, and research.

Four objectives are proposed to restore and maintain the Eastern Pacific northern fur seal stock at its OSP level. These objectives are the basis for the following conservation action outline and narrative.

Objective 1. Identify and eliminate or mitigate the cause or causes of human related mortality of the Eastern Pacific stock of northern fur seals,

Objective 2. Assess and avoid or mitigate adverse effects of human related activities on or near the Pribilof Islands and other habitat essential to the survival and recovery of the Eastern Pacific stock of northern fur seals,

Objective 3. Continue and, as necessary, expand research or management programs to monitor trends and detect natural or human-related causes of change in the northern fur seal stock and habitats essential to its survival and recovery, and

Objective 4. Coordinate and assess the implementation of the conservation plan, based on implementation of conservation actions and completion of high priority studies.

A. Conservation Action Outline

NMFS intends to implement the following conservation actions based on the current understanding of northern fur seal ecology. Many of these actions relate to either interim management of anthropogenic threats or increasing our understanding of northern fur seal ecology and life history to support future management. As new data are collected, analyzed, integrated, and interpreted, conservation measures and subsequent actions will change. NMFS will adapt its conservation measures and management consistent with the understanding of northern fur seal's sensitivity to various threats described previously. Northern fur seal conservation and management drives the actions below rather than general scientific interest.

Items in this outline are not in order of priority. Priorities are identified in the Implementation Schedule that follows.

Objective 1. Identify and eliminate or mitigate the cause or causes of human related mortality of the Eastern Pacific stock of northern fur seals.

1.1 Improve understanding of the sources, fates, and effects of marine debris

1.1.1 Continue disentanglement program to reduce mortality and harm to fur seals entangled in marine debris

1.1.2 Remove marine debris and incorporate surveys of debris in northern fur seal habitat

1.1.3 Examine the fate of entangling debris

1.1.4 Develop and implement additional statutes, regulations, education and enforcement of marine debris reduction programs

1.1.5 Determine the sources of marine debris

1.2 Improve assessments of incidental take of fur seals in commercial fishing operations

1.2.1 Implement and evaluate fishery and marine mammal observation programs in the North Pacific Ocean and Bering Sea

1.2.2 Review observer and incidental take data

1.3 Evaluate harvests and harvest practices

1.3.1 Monitor and manage subsistence harvests

1.3.2 Develop and implement harvest sampling programs

1.3.3 Compile and evaluate existing data

1.3.4 Identify and evaluate illegal harvests

Objective 2. Assess and avoid or mitigate adverse effects of human related activities on or near the Pribilof Islands and other habitat essential to the survival and recovery of the Eastern Pacific stock of northern fur seals.

2.1 Work with the Tribal governments under co-management agreements

2.2 Advise and consult with the relevant action agencies and industries

2.3 Review and make recommendations on proposed activities and actions that have the potential for adversely affecting northern fur seals (e.g. local development, industrial expansion, regulatory actions, research activities, and permitting)

2.4 Conduct studies to quantify effects of human activities (e.g. research, hunting, tourism, vehicles, discharges, facilities) at or near breeding and resting areas

2.5 Undertake conservation or management measures as necessary to eliminate or minimize deleterious impacts to fur seals

2.5.1 Develop oil spill response plans and mitigation strategies specific to fur seal breeding and resting areas on the Pribilof Islands and Bogoslof Island

2.6 Assess and monitor pollutants

2.6.1 Compile and evaluate existing data

2.6.2 Monitor and study environmental pollutant exposure

2.6.3 Evaluate carcass salvage programs

2.7 Quantify relationships between fur seals, fisheries, and fish resources

2.7.1 Study the natural and anthropogenic influences on fur seal feeding ecology

2.7.2 Evaluate pelagic fur seal sampling

2.7.3 Report fishery interactions

2.7.4 Determine impact of fisheries

Objective 3. Continue and, as necessary, expand research or management programs to monitor trends and detect natural or human-related causes of change in the northern fur seal stock and habitats essential to its survival and recovery.

3.1 Monitor and study changes in fur seal populations

3.1.1 Analyze fur seal teeth

3.1.2 Continue regular counts of adult males and estimates of pup production on St. Paul, St. George, and Bogoslof Islands

3.1.3 Estimate pup survival

3.1.4 Evaluate marking programs

3.1.5 Estimate stock vital rates

3.1.6 Evaluate Behavioral/physiological studies

3.1.7 Continue comparative studies on other islands

3.1.8 Conduct appropriate studies to assess the impact of predation (e.g., killer whales, Steller sea lions, sharks) on fur seal populations

3.1.9 Promote joint research and collaborative programs

3.2 Improve assessment of the effects of disease

3.2.1 Compile and evaluate existing data

3.2.2 Determine and mitigate disease effects

3.2.3 Continue management program to prohibit disease transmission to fur seals from introduced species

3.3 Describe and monitor essential fur seal habitats

3.3.1 Compile and evaluate available habitat-use data

3.3.2 Conduct oceanographic and fishery surveys based on pelagic fur seal habitat use

3.4 Identify and evaluate natural ecosystem changes

3.4.1 Reevaluate carrying capacity

3.4.2 Continue and evaluate Pribilof Islands Sentinel Program

3.4.3 Compile and evaluate existing physical environmental data

3.4.4 Select appropriate environmental indices

3.4.5 Quantify environmental effect on behavior and productivity

3.4.6 Ecosystem modeling

Objective 4. Coordinate and assess the implementation of the conservation plan, based on implementation of conservation actions and completion of high priority studies.

4.1 Establish conservation plan coordinator position

4.2 Develop and implement education and outreach programs

4.3 Develop and promote international conservation efforts

4.4 Enforce existing regulations

B. Conservation Action Narrative

The conservation action narrative clarifies the outline and summarizes the key elements or justification for the actions. The conservation actions include management, monitoring and research. Data collected through any research outlined in this plan should be analyzed and reported in a timely manner. Reports should be thoroughly referenced, independently reviewed and be organized to facilitate comparison with existing reports. As much as possible, data should be presented in peer-reviewed periodicals and other open publications to ensure that research programs benefit from regular peer commentary.

To the maximum extent possible, research efforts should collect data that can be compared with historical data. Studies may need to be conducted to calibrate results from newly developed techniques with those obtained by previous methods. Data analysis should examine trends over time and attempt to correlate observed changes with physical, biological, or human-induced changes in the environment.

Analysis should emphasize correlations between regional differences in fur seal population trends with factors such as physical oceanography, food resources, and human activities (e.g., fishing, habitat degradation, harassment). Such correlations can indicate causes of declines

which may lead to more effective management.

Objective 1. Identify and eliminate or mitigate the cause or causes of human related mortality of the Eastern Pacific stock of northern fur seals.

Reducing human related mortality of fur seals will provide the most direct positive benefit to the Eastern Pacific northern fur seal stock. There are numerous known sources of human related mortality including: subsistence harvests, entanglement in marine debris, illegal harvests, direct bycatch in commercial fisheries, illegal shooting, and research. Some of these sources of mortality are understood, while the extent of others is largely unknown. Quantifying the contribution of these mortality sources will identify appropriate conservation and management actions to implement.

1.1 Improve understanding of the sources, fates, and effects of marine debris

The role of entanglement in mortality of fur seals cannot be fully evaluated without information on the amount of debris in the marine environment and the rates and effects of debris entanglement on fur seals at sea. Information is needed to test the null hypotheses that (1) most entanglement of juveniles does not occur near the Pribilof Islands, and (2) rates of entanglement at sea are not sufficient to cause the population to decline. Ideally, the best time to conduct these studies is in late fall and early spring. However, due to the low probability of encountering seals at sea, and because of poor weather conditions during this time, studies to test these hypotheses will be very difficult to carry out and will be very costly. Nevertheless, it is at this time of year when fur seals are probably the most vulnerable to mortality, and thus a study of this problem is warranted. Improved education and enforcement programs are needed to minimize the impact of debris on fur seal entanglement and subsequent survival. It is worthy to note that NMFS and the Tribal government have conducted disentanglement efforts on the Pribilof Islands for the past decade in an effort to remove debris from animals of all ages and sex. Because of logistical constraints, the primary focus has been disentanglement of immature males seen at the haulout sites, but where possible and authorized entangled pups, adult female, and adult male fur seals are captured and the debris removed.

1.1.1 Continue disentanglement program to reduce mortality and harm to fur seals entangled in marine debris

The disentanglement program on St. Paul Island implemented through collaborative research and the co-management structure has proven to be a success in reducing fur seal mortality and pain and suffering to entangled fur seals. This program must be continued and expanded to St. George Island when feasible. Comanagement agreements with both tribal governments identify the importance and value of continued and expanded local involvement in fur seal disentanglement programs. From 1995-1997, surveys were conducted in cooperation with the St. Paul Tribal Government and the Traditional Council of St. George during the Pribilof subsistence harvest (e. g. Robson et al., 1997; 1999). Subsequent entanglement studies were conducted in association with the subsistence harvest, and managed by the Tribal Government of St. Paul's Ecosystem Conservation Office with the assistance of the Pribilof Islands Stewardship Program under terms of the co-management agreement between NOAA and the Tribal Government of St. Paul (Stepetin et al., 2000; Zavadil et al., 2003). Funding through the Prescott Stranding Grant Program was obtained by St. Paul in 2003 to continue entanglement studies and expand them to include St. George (Williams et al., 2004). Funding was again received in 2005 from the same source and these data are being collected and verified as this revision is being prepared. Assessment of alternative sampling designs to those used previously will be important

to quantify biases and determine appropriate long-term methods to determine trends in entanglement.

1.1.2 Remove marine debris and incorporate surveys of debris in northern fur seal habitat

The amount of debris on beaches and at sea is only partially known. The rate of fur seal entanglement at sea and subsequent death is unknown. Presumably, most entanglements occur in the Bering Sea and near the subarctic boundary (about 40°-46°N) where fur seals and oceanic debris tend to concentrate (cf., Shomura and Yoshida 1985; Ribic and Swartzman 1989). A study to examine the distribution and abundance of debris on shore and at sea relative to juvenile and female fur seals could be carried out at the beginning of the reproductive season (May-June), during the peak of lactation (July-September), and when most females depart the islands (October-November). The Tribal government of St. Paul and MCAF have coordinated and participated in the removal of hundreds of tons of marine debris from fur seal rookeries and adjacent areas on St. Paul during the past 10 years. Any efforts to develop programs will build on those methods developed by Pribilof residents.

1.1.3 Examine the fate of entangling debris

Design and conduct field and laboratory experiments to determine the probable fate (longevity, rates of accumulation, exchange between terrestrial and marine debris, deterioration, and fouling, and movements) of lost and discarded fishing gear and other potentially hazardous debris in and near areas inhabited by fur seals, particularly the juvenile age classes. The fate of different types of marine debris is generally unknown. Entrainment of debris around the Pribilof Islands is of particular concern due to circulation and current patterns.

1.1.4 Develop and implement additional statutes, regulations, education and enforcement of marine debris reduction programs

Federal legislation and enforcement programs have substantially changed the attitudes of commercial fishermen and others regarding their responsibilities to reduce and dispose of marine debris. Reduced rates of entanglement on subadult male fur seals on St. Paul Island may be a result of these changed attitudes since the drop in entanglement rates seems to be a result of reduced entanglement in trawl webbing (Fowler and Ragen 1990). Continued efforts in this area are needed in regards to education programs, enforcement, and regulations to further reduce the amount of marine debris and disposition of hazardous materials in the marine environment.

1.1.5 Determine the sources of marine debris

Substantial marine debris removal projects in the northwest Hawaiian Islands have determined that removal rates may only slightly exceed the rate at which new derelict fishing gear enters nearshore areas and is an unsustainable long-term marine debris solution (Boland and Donohue, 2003). Determining the sources of marine debris and reducing or mitigating the source may be the most effective means of reducing marine debris in fur seal habitat and fur seal entanglement in marine debris.

1.2 Improve assessments of incidental take of fur seals in commercial fishing operations

The impact of incidental take of fur seals in international high seas commercial fisheries is unknown, but could be significant. The take in U.S. domestic fisheries is probably not significant, but should be monitored at regular intervals. Based on pelagic sealing data, and recent observations, juvenile animals may be the most likely age-group caught in fishing gear, especially in illegal drift-net fisheries.

1.2.1 Implement and evaluate fishery and marine mammal observation programs in the North Pacific Ocean and Bering Sea

Implement and evaluate fishery and marine mammal observation programs in the North Pacific Ocean and Bering Sea, and elsewhere to better determine and monitor the level of incidental take and to identify changes in fishing gear or practices that might reduce the direct impacts, if any, of fisheries upon the Eastern Pacific northern fur seal stock. Continued monitoring of domestic and foreign fisheries is recommended to identify sources of mortality of fur seals, and seek ways to eliminate the causes. A program with the United States domestic fishing fleet has been ongoing to obtain information on incidental takes within the U.S. Exclusive Economic Zone (EEZ). These programs should be expanded to include biological data gathering to assess the status of marine mammal populations, and especially fur seals, for use in determining the impact of incidental take.

Observers placed on fishing vessels should record fishing effort (e.g., number of sets, size of nets, time and location of sets) and document the number, sex, and age of all fur seals caught. Samples of teeth, stomach contents, blubber thickness, reproductive tracts, blood, and tissues and weight from incidentally caught fur seals would help in assessing the animal's physiological condition, composition of the take compared to the population, and possibly allow for an analysis of stock structure by area. Properly collected samples from fisheries can be of great use in evaluating the role of disease, starvation, and other factors in the at-sea survival of fur seals.

1.2.2 Review observer and incidental take data

Monitoring and reviewing existing and future data collected in the foreign high-seas fisheries and domestic fisheries is essential for assessing the effects, if any, of incidental take. The incidental take of female fur seals is apparently low near the Pribilof Islands, but unknown elsewhere in the North Pacific Ocean and Bering Sea. Needed are data on the number, location, sex, age, and physical and reproductive condition of each seal taken to help estimate the impact on the female component of the stock. The null hypothesis to test is that incidental take does not contribute significantly to the mortality of female fur seals (all ages). Assessing the impacts of incidental take is both feasible and practical assuming observer data and directed research on fur seal distribution is carried out.

1.3 Evaluate harvests and harvest practices

Assess the possible effects of past and ongoing harvest practices and alter those practices, as determined necessary to facilitate population recovery.

1.3.1 Monitor and manage subsistence harvests

Monitor subsistence harvest and modify or suspend harvesting practices, as determined necessary, to facilitate population recovery. St. Paul and St. George residents can harvest 2000 juvenile male fur seals under the current regulations. The subsistence harvest is witnessed by

observers. Observers report on consistency with the humane and non-wasteful provisions of the harvest regulations and consult with NMFS staff and harvest crews during the season. This harvest must be monitored and the level of take analyzed in relation to the expected recovery of the fur seal population.

Heat stress and accidental mortalities of seals must be minimized during harvests and round-ups. Analysis of the humane observer data on St. Paul accumulated since 1986 could provide insight into effective operational criteria and thresholds. NMFS and the harvest crews could develop harvest operation criteria based on correlations between heat stress to air temperature, wind speed, cloud cover, humidity, duration of harvest and other factors recorded by humane observers.

1.3.2 Develop and implement harvest sampling programs

Subsistence harvests provide annual opportunities to collect a wide range of tissues from juvenile male seals. Sampling protocols should be developed and implemented to provide long-term collection of tissues useful for a variety of ecological studies. There are several types of information to be collected from harvested seals, each with an inherent source of variation and bias. Development of a sampling program must determine minimum sample sizes for each data type needed to detect trends. Any harvest sampling programs must first consult with harvesters, consider alternatives, and minimize the intrusive nature of sampling resident's food.

Subsistence harvest sampling and necropsy programs can provide data to determine and monitor the levels of environmental contaminants in various organs and tissues (action 1.5). Properly trained staff should participate under the supervision of a qualified veterinarian pathologist.

Whole body weights, canine teeth, and other measures of condition can be collected from a representative sample of the harvest. Annual indices of animal/cohort health could be developed and monitored from an analysis of the age (from the upper canines), weight, and condition data.

1.3.3 Compile and evaluate existing data

Compile and evaluate existing data on population and genetic theory to determine how and to what extent harvest practices may have altered the biological fitness of the Eastern Pacific northern fur seal stock.

1.3.4 Identify and evaluate illegal harvests

Assess and quantify the nature and extent of illegal harvest to determine whether these harvests may be influencing the population. Harvests of northern fur seals for subsistence purposes have occurred historically throughout the range of northern fur seals. The extent of illegal and unmonitored harvests of fur seals is not known. Identifying locations of illegal harvests will assist NMFS in evaluating the consequences of those harvests on the population, and facilitate enforcement actions as necessary.

Objective 2. Assess and avoid or mitigate adverse effects of human related activities on or near the Pribilof Islands and other habitat essential to the survival and recovery of the Eastern Pacific stock of northern fur seals.

There are a number of activities such as offshore oil and gas development and harbor development which have probably not caused or contributed to the population decline, but which

could further jeopardize or hamper recovery of the Pribilof Islands fur seal population. Plans and proposals for such activities need to be carefully evaluated and revised, as necessary, to avoid or minimize possible adverse effects on fur seals or their habitat. It is also possible that the decreased survival of fur seals is due in part to commercial groundfish fisheries or other fisheries targeting important species in the fur seals' diet; past harvest practices; environmental pollution in one or more parts of the population's range or some combination of these human related factors and natural factors beyond our control. Effort is therefore needed to determine and eliminate or mitigate human related mortality as it contributes to the current population decline.

2.1 Work with the Tribal governments under co-management agreements

The Federal government must continue and strengthen existing cooperative management agreements with tribes and tribally-recognized organizations to further enhance the probability of fur seal recovery and to make optimal use of Alaska Native traditional knowledge and wisdom. Continue work with the Tribal governments to address changes in subsistence use. The existing co-management agreement (Appendices I&II) must be implemented in such a way as to utilize and integrate traditional knowledge, local wisdom and values, and science. NMFS and the tribal governments will establish the best possible management actions for the protection and conservation of fur seals by continued tribal involvement in research, observation, and monitoring efforts. Comanagement agreements have established a process of shared local responsibilities regarding the management and research of fur seals. The co-management process will identify and resolve conflicts that may arise in association with fur seals and provide information to the affected community, as a means of increasing the understanding of the sustainable use, management, and conservation of fur seals.

2.2 Advise and consult with the relevant action agencies and industries

Advise the relevant action agencies and industries to consult with the National Marine Fisheries Service to determine whether proposed, planned, or contemplated actions could harm fur seals or damage habitats essential to their survival and, if so, steps that could be taken to avoid or minimize possible adverse effects. Various action agencies have responsibility for oversight, issuance of permits, etc., regarding activities that may affect fur seals. These agencies include NMFS's Sustainable Fisheries Division which is responsible for oversight of fisheries, and in particular the community development quota (CDQ) Program and related economic development projects in the Pribilofs. The agencies and industries need to consult (but not in the sense of an Endangered Species Act Section 7 consultation) with the National Marine Fisheries Service to determine whether proposed, planned, or contemplated actions could harm fur seals or damage habitats essential to their survival and, if so, steps that could be taken to avoid or minimize possible adverse effects.

The NMFS, Tribal governments, and stakeholders developed a spill response plan (1.5.4) in the event of a petroleum spill on the Pribilof Islands or at Bogoslof Island. Fur seals, like sea otters, are not likely to survive being oiled in an oil spill. Transportation of oil needs to be closely monitored to prevent accidents or to quickly respond to spills. Areas of concern at present are the Aleutians islands, Gulf of Alaska, and along the west coast of Canada and continental U.S. Future areas of concern, related to oil field exploration and development, are Unimak Pass and the St. George Basin.

2.3 Review and make recommendations on proposed activities and actions that have the potential for adversely affecting northern fur seals (e.g.

local development, industrial expansion, regulatory actions, research activities, and permitting)

Solicit and review proposed development plans (e.g., OCS exploration and developmental plans), fishery management plans, or any other plans, as needed, to determine and recommend measures necessary to avoid or minimize possible adverse effects on fur seals or their habitat.

NMFS, other Federal agencies, and the Tribal governments (through co-management plans) must evaluate construction activities, and coastal/ harbor development plans to determine the possible impact of these activities on fur seals and take appropriate management actions to minimize and mitigate the effects of such activities.

There is concern regarding the development of the Pribilof Islands as a fish processing center. Seafood processing presently occurs on both St. Paul and St. George islands, mainly for crab and halibut. Process wastes are discharged into the nearshore environment. Certain process wastes may contain oils and grease which may compromise the insulative properties of fur seal pelage. High-volume process lines such as bottomfish/surimi may be particularly significant in this respect. While NMFS does not oppose fish processing, we will continue to advocate discharge technologies which minimize pollution and are consistent with the goals of this plan. Any proposed discharges near seal haul outs or rookeries should be prohibited unless it can be demonstrated they would result in no increased threat to seals or their habitat. Recovery of fish oils will be strongly advocated during our review of any EPA permits for these discharges.

NMFS participates in oversight of economic development projects in the Pribilof Islands that must be evaluated to ensure that they are consistent with the goals of this plan. Some of the development projects proposed for the Pribilof Islands are small boat harbor construction; vessel repair, maintenance, and storage facilities; and seafood processing plants. The environmental impact of these proposed economic development projects must be assessed by any federal agency taking an action related to funding, permitting, or authorizing these projects. For example, seafood processing plants often involve action by a number of different federal agencies including the Environmental Protection Agency (discharge permits), the Economic Development Administration (funding), and the Corps of Engineers (permitting for any dredging or filling). NMFS coordinates with these and other federal agencies to ensure that the required environmental review and consultations are completed and that any proposed economic development activities are consistent with the goals of this conservation plan.

2.4 Conduct studies to quantify effects of human activities (e.g. research, hunting, tourism, vehicles, discharges, facilities) at or near breeding and resting areas

Determine and undertake such studies as may be necessary to better predict or detect and to avoid or minimize the possible adverse effects of human activities on the Eastern Pacific northern fur seal stock and habitats essential to its survival. NMFS and the Tribal governments must assess the effects of motorized vehicles and other traffic on fur seal behavior, rookery and haulout structure, and seal survival. There is circumstantial evidence that rookeries near observation blinds on St. Paul Island may cause fur seal disruption by vehicle traffic and human presence. These and similar activities should be monitored and modified as appropriate.

The potential vulnerability of fur seals to vessel traffic and oil spills needs to be investigated. A detailed study of the distribution, movements and habitat use of fur seal pups and adult females is recommended by monitoring radio tagged animals after they leave the Pribilof Islands and

migrate into the North Pacific Ocean in autumn and winter (see earlier recommendation). The study on pup migration in 1989/1990 (Ragen et al., 1995) should be expanded into spring and include adult females to identify the importance of areas such as off shore lease areas or important Aleutian Island passes where the seals may concentrate.

The importance of disturbance on the survival of pups needs to be studied at various rookeries on the Pribilof Islands. This can be done by comparing the rate of pup production, territory structure, trauma to pups, and changes in total number of animals on various rookeries monitored for varying rates of disturbance.

If disturbance at fur seal rookeries is found to affect the potential survival of fur seal pups, then it may be necessary to institute more restrictive measures regarding human activities, especially after the breeding season. For example, regulations protecting fur seals from disturbance may have to be more strictly enforced.

2.5 Undertake conservation or management measures as necessary to eliminate or minimize deleterious impacts to fur seals

Once effects have been quantified (action 2.4) conservation and management measures can be determined and implemented. NMFS and all interested stakeholders should undertake appropriate conservation or management measures as necessary to eliminate or minimize biologically significant impacts to fur seals. Management designed to provide the continued protection and recovery of the fur seal population should be based on biological principles and ecological understanding. Despite existing information needs, efforts must be taken to reduce human-induced mortality to the lowest level practicable, to protect important habitats, and to enhance population productivity. Immediate objectives are to be actively involved in the early stages of planning to consider potential effects on fur seals and mitigate those effects prior to implementation.

2.5.1 Develop oil spill response plans and mitigation strategies specific to fur seal breeding and resting areas on the Pribilof Islands and Bogoslof Island

Review oil spill response plans and mitigation strategies specific to the Pribilof Islands and Bogoslof Islands. The Federal government through numerous agencies developed an oil spill contingency plan which has been extant for nearly ten years. This plan must be reviewed and updated as needed to insure its applicability to recent events (tanker grounding and resultant fuel spill in the eastern Aleutian Islands). Additional management efforts must be implemented to insure that all breeding and resting areas on the Pribilof Islands and Bogoslof Island are adequately protected from petroleum-related spills or other toxic substances.

Primary response measures, intended to prevent oil from reaching seals or their habitat, are the most effective and realistic means of protecting and maintaining the Pribilof's northern fur seals. Sorbent materials such as pads and sausage booms are effective when used on refined product spills, such as diesel and gasoline. These devices would be the first line of defense for spills in the St. Paul and St. George boat harbors and in Salt Lagoon on St. Paul Island. Heavier oils such as crude or Bunker C may be picked up with containment booms, oleophilic materials such as pom poms, and natural sorbent materials. A peat moss-based material, Sphag-sorb, was successfully used on a February 1997 oiled fur seal rookery in Uruguay and has now been stockpiled on St. Paul Island.

High-volume, low pressure flushing with ambient temperature water may be the most effective means of oil removal from many Pribilof shorelines. High temperature/high pressure washing is discouraged, as it may change the substrate on a rookery beach and may also alter the ability of a fur seal to locate a rookery using its sense of smell.

The use of chemical shoreline cleaning agents has been shown to be only marginally effective, and introduces additional chemicals and odors onto the rookeries. Therefore, NMFS does not support the use of chemical shoreline cleaning agents on fur seal beaches.

Field activities associated with oil spills have the potential for causing unnecessary and illegal disturbance to fur seals and their habitats. To reduce disturbance and improve the chances for fur seal survival, NMFS will reiterate, through the Federal Aviation Administration (FAA) and Federal On-Scene Coordinator (OSC), the importance of abiding by existing notices to aircraft currently in place for the Pribilofs. Those advisories request pilots to remain at a certain distance from fur seal concentration areas and critical habitats, such as rookeries. Information on aircraft advisories for St. Paul and St. George Islands, respectively, may be found on Environmental Sensitivity Index maps for the islands.

In addition, NMFS will provide, through the Federal OSC, notices to mariners for areas affected by an oil spill. These advisories may request vessel operators to remain at a certain distance from fur seal concentration areas and critical habitats. Copies of any advisories will be sent by the Federal OSC to all federal and state agency and agency-contracted spill-response personnel. A news release will be prepared by NMFS on this subject for distribution by the Federal OSC to appropriate news media representatives. In addition, oiled debris -- particularly contaminated food sources and dead oiled fur seals -- should be removed from the environment as soon as possible to prevent scavenging by other wildlife, which may result in secondary effects due to the ingestion of oil.

Secondary response strategies are intended to prevent an animal from reaching an oiled area. It may be feasible to deter northern fur seals from a particular area in some situations. Spills within the St. Paul Island harbor and Village Cove area may put several hundred northern fur seals at risk, many of which are likely to be pups or juveniles. NMFS personnel or other designated individuals may use acoustic deterrents to prevent these animals from entering oiled areas of the harbors.

Likewise, northern fur seals may be herded by small boats into the outer portions of Village Cove or into Salt Lagoon. It may also be possible to move animals off or to one portion of a beach or rookery to prevent oiling or to clean up oiled shorelines. However, this would not be feasible for territorial animals and would risk separating mother/pup pairs. Because pups in the harbor are not suckling, mother-pup reunions would not be disrupted during any hazing efforts. Only on-site NMFS personnel will be authorized to initiate and direct any deterrent actions in order to avoid driving animals into oiled areas, causing stampedes or displacement into the water, or increasing metabolic stress.

During commercial fishing, it is common for fuel barges to anchor off the coastline of the Pribilof Islands, and for at-sea fuel transfers to occur. The proximity of these barges and fueling activity to fur seal haul outs and rookeries is a significant concern. NMFS will continue to work with the local governments and industry to insure these activities do not predispose fur seals to potential harm.

Finally, tertiary measures were considered; these are actions to capture, clean, and rehabilitate

oiled wildlife. The *guidelines* recognize that capture and cleaning of oiled northern fur seals is generally not feasible. Adult northern fur seals are aggressive by nature, particularly territorial males, and typically could not be safely approached while ashore. It is not presently known to what extent an adult fur seal would be affected by oiling, and most efforts to capture are likely to present greater risk to the animal. Tranquilization, for example, may itself cause the death of an animal even when administered by a veterinarian, and would certainly diminish an animal's resistance to the effects of oiling and exposure. In addition, transportation of animals across rough terrain to treatment centers would also be difficult or impossible, and very dangerous to personnel. Finally, many logistical requirements for the treatment of northern fur seals, such as a large heated building, holding pens for large animals, and high-capacity hot water systems, cannot be met at this time on the Pribilofs.

Although fur seal pups could be captured during certain times of the year, such actions would rarely be justified. Seal pups are wholly dependent upon their mother's milk and cannot digest solid food. Pups removed from a rookery for several days may never reunite with their mothers and would likely die of starvation. If pups were transferred off-island for treatment, the mother-pup bond would be lost. During the 1997 T/V *San Jorge* spill in Uruguay, oiled fur seal pups left on site continued to receive attention and be suckled. If northern fur seal pups are oiled, their condition may improve after they molt in September and October.

Past attempts to rehabilitate oiled pinnipeds have been very expensive and not very successful. When time, labor, and resources are limited, captive cleaning and rehabilitation would not only be of dubious value, but could detract from more humane or effective measures such as hazing, booming, and oil recovery. Humane euthanasia under the supervision of a veterinarian should be followed to alleviate suffering for individual animals with no chance of survival.

Finally, should oil exploration or commercial oil development occur in the eastern Bering Sea, developers should be required to have a specific oil spill contingency plan that includes fur seal response measures for the Aleutian Islands and Alaska Peninsula.

2.6 Assess and monitor pollutants

Assess, monitor and mitigate the levels of potentially harmful pollutants in fur seal tissue and in the marine ecosystems of which fur seals are a part.

2.6.1 Compile and evaluate existing data

Compile, synthesize, and evaluate the adequacy of existing data concerning the presence, levels, and possible effects of heavy metals, petroleum compounds, PCBs, chlorinated hydrocarbons and other environmental pollutants on northern fur seals. In the eastern North Pacific Ocean, pollutants from many sources have been identified in marine mammals since the 1960s. These primarily include heavy metals and organochlorine compounds. A large amount of literature exists on this subject hence a thorough review would provide perspective on potential effects and specific studies needed. A brief summary of pollution studies has already been undertaken as part of this conservation plan and this work should be built upon with further assessment of past data and an analysis of existing tissues in storage.

2.6.2 Monitor and study environmental pollutant exposure

Design and conduct such laboratory or field studies as may be necessary to fill critical data gaps concerning the possible acute and chronic effects of environmental pollutant exposure levels

found in fur seal tissues. The effect of pollutants on the health and status of individual fur seals is equivocal, in most cases. Since high concentrations of some contaminants may be associated with failures in reproductive parameters, periodic biopsies of adult females may be warranted as a long-term tool to assess changes in environmental input. Sources of some pollutants may be identified by sampling and analyzing pollutant burdens in fur seal prey.

After a thorough review of the contaminant literature (action 2.6.1), a study design should be undertaken to determine how frequently, and which tissues to collect for periodic monitoring. Periodic comparisons between samples from harvests (action 1.3.2) and from seals of all ages found dead on the rookeries (action 3.1) may provide insight into effects of environmental pollutant exposure. Also, routine monitoring may be necessary to reduce exposure of Aleuts who subsist on fur seals.

2.6.3 Evaluate carcass salvage programs

Evaluate the usefulness of carcass salvage and necropsy programs to determine and monitor the levels of environmental contaminants in selected tissues. Collection of dead fur seals taken in fisheries and found dead on the shores of the eastern North Pacific Ocean may be of value in determining the cause of death and contaminant burdens. The highest rate of mortality in fur seals occurs during the first year of life. Some studies have shown that organochlorine and PCB levels are highest in juvenile animals, suggesting that a synergistic relationship could exist between pollutant exposure and nutritional stress. Studies of presumably "healthy" seals collected in fisheries and dead animals on the beach may be of some value for comparison of certain tissues, however, careful study design is warranted because of the metabolic changes that take place in moribund animals, and the possible misinterpretation of the levels of contaminants in the animal's system at the time of death.

2.7 Quantify relationships between fur seals, fisheries, and fish resources

Improve knowledge of the numerical and functional relationships between fur seals, fisheries, and fish resources in the North Pacific Ocean and Bering Sea, and elsewhere, and institute such measures as may be necessary to avoid or mitigate possible adverse effects. The direct and indirect relationship between fur seal growth, survival, reproduction and the removal of prey by commercial fisheries and fishery bycatch is not understood. The distribution and abundance of fish resources vary by area, season, and year depending on oceanographic conditions, success of recruitment of different cohorts of fish, and other factors. This variation, in concert with removals by commercial fisheries, needs to be studied to understand the complex relationship between fur seal feeding behavior, growth, and survival. While the complexity of the fishery interaction and ecosystem may obscure findings, we must analyze fisheries removals and fur seal presence at similar times and at the appropriate spatial scales in order to evaluate the commercial fishery influence on fur seal food availability. Continuing and refining analyses of concurrent fur seal foraging data, prey availability, fisheries removals, and environmental data will assist in the development of appropriate fisheries management actions as interactions are better understood.

2.7.1 Study the natural and anthropogenic influences on fur seal feeding ecology

Continue studies of fur seal prey during the breeding and non-breeding seasons and coordinate with oceanographic surveys to identify and characterize fur seal feeding areas in the Bering Sea,

Gulf of Alaska, and other areas of the North Pacific Ocean. Radio or satellite tracking individual seals equipped with dive recorders is recommended to determine the oceanic areas where seals feed, for determining critical feeding habitats. This work is important for understanding the behavior and distribution of seals in relation to data collected over the past 30 years, and to the distribution and potential impacts of commercial fisheries. Scat collection provides a useful independent index of fur seal prey and is less invasive than remote tracking of fur seals. Radio telemetry was used successfully in 1985 and 1986 to determine the rates and distances fur seals traveled to feeding areas off the Pribilof Islands during the breeding season (Loughlin et al. 1987; Goebel et al. 1991). Other instruments have proven effective in studying diving and foraging strategies (cf., Gentry and Kooyman 1986; Robson et al., 2002; Sterling and Ream 2004; Ream et al., 2005). Expand diet studies to include adult male and juvenile fur seals. These studies should continue and be directed toward the high seas fishing areas and in the North Pacific Ocean and Bering Sea where domestic and international fisheries are active.

2.7.2 Evaluate pelagic fur seal sampling

Evaluate the practicality of sampling fur seals at sea by various methods in selected parts of their range. Study designs can focus on detecting changes in diet (prey size and species composition), in condition, growth rates, pregnancy rates, or other biological variables. Evaluate examining stomach contents of seals taken incidentally in fishing operations, stranded and dead on the rookeries. Long-term collections of data regarding food habits can provide information on yearly changes in prey consumption and possibly energetics. Pelagic sampling designs need to incorporate changes in the quantity or quality of available food (prey) resources. Infrequent but dedicated collections of fur seals at sea in areas where they feed may be required to detect changes in diet and provide ecological data related to condition, growth, and reproduction that are important to implementing 2.7.4.

2.7.3 Report fishery interactions

The collection of commercial fishery data occurs through observer programs, log book programs, and participant reporting systems. The data include species, size, location, date, gear type, and other relevant information that is useful in assessing the possible impact of commercial fisheries on fur seals. These reporting systems should be continued and expanded when necessary, to provide information relevant to the status of exploited fish stocks and the recovery of the fur seal population as important to 2.7.4.

2.7.4 Determine impact of fisheries

Determine and take such action as may be necessary to assure that fisheries are not causing or contributing to the continuing decline of northern fur seals in the Pribilof Islands and, as possible, to avoid or mitigate the possible impacts of commercial fisheries on fur seals. This effort should include, measuring effects of fishing on prey (both commercial and non-commercial) composition, distribution, abundance, and schooling behavior, model effects of fishing on prey (both commercial and non-commercial) composition, distribution, abundance, and schooling behavior, evaluating model sensitivity, validity and conformity to known data sets, and evaluate existing fisheries closures and protected areas.

Insufficient or poor quality food resources can make seals vulnerable to diseases, predation, and starvation. Natural changes in the environment or human-related activities that reduce the supply of prey may affect survival. Relevant information regarding the distribution and abundance of

fish resources, exploitation of fisheries, and the energetic requirements of fur seals must be analyzed and reviewed to determine the necessary resources for the recovery of the fur seal population. Fishery management plans need to fully incorporate, as necessary, the requirements of fur seals (and other marine mammals).

Objective 3. Continue and, as necessary, expand research or management programs to monitor trends and detect natural or human-related causes of change in the northern fur seal stock and habitats essential to its survival and recovery.

The activities described in the previous two sections are intended to address the first and second conservation plan objectives (i.e., reduce human-related mortality and adverse effects). Understanding human-related mortality and adverse effects will provide the basis for managers to determine and eliminate or mitigate the cause(s) of the continuing decline of the Pribilof Islands fur seal population. Both the population and habitats essential to its survival and recovery must be monitored to determine the effectiveness of conservation measures which are instituted and to detect natural variation and the possible unforeseen effects of human activities.

3.1 Monitor and study changes in fur seal populations

Develop and implement a program to effectively detect and monitor changes in the size, productivity, and vital rates of the Eastern Pacific northern fur seal stock. A systematic study of the reproductive rates and survival of individually identified adult female fur seals has not been done in sufficient detail to be of use in predicting population recovery. This information is central to understanding some of the mechanisms in population change, and the future reproductive potential of the population. Collection of samples from adult females at sea or those incidentally taken in fisheries operations, and long-term marking and re-sighting study will generate needed information for assessing the important population parameters accounting for population change. The long-term recovery of the Pribilof population is largely dependent on the recruitment of young females into the reproductive population. Information on recruitment is lacking.

Long and short-term research planning and coordination is essential to successful use of limited resources. Many population-level projects can be coordinated and integrated with smaller scale projects to reduce effects of intentional and incidental harassment of northern fur seal. Phasing and integrating research will promote greater insight into northern fur seals' complex interaction within the ecosystem and their recovery.

3.1.1 Analyze fur seal teeth

Section and analyze fur seal teeth collected and archived to identify possible changes and trends in fur seal age structure, growth rates, pregnancy rates, longevity, or other variables indicative of the general health and condition of individuals in the population. A study of the differential deposition in the fine growth layers of the canine teeth of females is recommended to evaluate reproduction and feeding behavior. Teeth from males collected in the subsistence harvest would also be used to evaluate food availability based on nursing lines (Baker 1991). If a better seal marking method (e.g., tag) is not developed, then examining teeth of females with known reproductive histories may be an effective alternative to determine age-specific reproductive rates and possibly survival. Also, the technique might be applied to the teeth collected over the past 50 years providing a means of evaluating long-term density dependent changes in the population (cf., Fowler 1981; Baker and Fowler 1991).

3.1.2 Continue regular counts of adult males and estimates of pup production on St. Paul, St. George, and Bogoslof Islands

Continue annual counts of adult males and biennial estimates of pup production and health on both St. Paul and St. George Islands to detect and monitor trends in pup production and population size. When practical support concurrent studies of pup production and health in addition to adult male counts on Bogoslof Island. Continuation of estimating the number of pups born and adult male counts is required as the best current index of population trends. These data should be collected on a schedule to provide the best possible database for evaluating recovery of the stock. NMFS should regularly evaluate of the sensitivity of these methods to detect changes and the potential use of alternative methods for population abundance estimation.

3.1.3 Estimate pup survival

Continue regular post breeding season beach surveys to determine the number of pups that die before leaving the pupping islands and the causes of on-land pup mortality on St. Paul, St. George, and Bogoslof (when practical). Continuation of the regular post breeding season beach surveys to determine the number of pups that die before leaving the islands is required to both determine the number of pups born and to monitor the level of pup mortality through time.

Comparison of currently collected condition indices, in addition to weaning weight and blubber thickness of live pups with subsequent survival to age 2 may provide further insight into pup survival. These data should be compared to other rookery islands (action 3.1.7) for study of differential survival.

3.1.4 Evaluate marking programs

Evaluate implementation of fur seal marking programs to detect annual variation and monitor long-term trends in age-specific survival and reproductive success. Approximately 10,000 to 15,000 female pups were tagged on St. Paul Island from 1987-89 for long-term analysis of survival and recruitment. Those females are at the end of their reproductive life and have not been adequately monitored through a re-sighting program. Estimating female survival and reproductive rates (see action 3.1.5) can only be accomplished through a new tagging and resighting program. The tags presently used, however, are not easily read from greater than 5 m. A new tag needs to be tested for durability and readability. Melin et al., (2006) reviews the historical northern fur seal tagging data and information.

3.1.5 Estimate stock vital rates

A study of the long-term survival and reproduction of individually-identified females is recommended. Once a better tag is tested (action 3.1.4), an expanded tagging and re-sighting program is recommended to obtain an improved estimate of age-specific survival and reproductive rates. Melin et al., (2006) describes the results of a tagging and census workshop aimed to direct research planning for estimating vital rates. Melin et al., (2006) concludes previous attempts have failed due to a lack funding for resighting and unreliable marks. A combination of longitudinal and cross-sectional studies are most likely to provide data to inform questions about stock survival and reproduction (Melin et al. 2006). The number of juvenile male fur seals surviving since the cessation of the commercial harvest in 1985 may have altered population composition.

3.1.6 Evaluate Behavioral/physiological studies

Design and conduct behavioral studies and sampling programs to detect and monitor changes and trends in pup attendance cycles, weaning weight of pups, parasite loads, and other variables that may reflect the general condition and health of the Eastern Pacific northern fur seal stock. Long-term behavioral and physiological studies are recommended to assess the current foraging effort of post-parturient females and their ability to transfer energy to their offspring. Harassment effects must be studied to properly incorporate the expected variability in effects of harassment that is low-level and chronic (e.g., noise, vehicle, and vessel traffic), intensive and intermittent (e.g., round-ups, bull counts, pup counts), and invasive (e.g., capturing, handling, tagging). Telemetry instrumentation, remote behavioral sensing devices, and radio isotopic techniques would be employed to provide information needed to estimate the food requirements of the fur seal population. This work would be done in conjunction with growth and survival studies of pups (action 3.1.3) to assess those factors having the greatest influence on year class survival. Also, foraging locations of parturient females and juvenile males need to be defined and compared to earlier studies and coordinated with fishery evaluations (1.3). This study would include an estimate of the food requirements and foraging locations of the male fur seal population.

3.1.7 Continue comparative studies on other islands

Predicting, detecting, understanding and mitigating the factors influencing a particular population may not be practical due to limits on the control of those factors. Experimental manipulation can often lend great insight into understanding the most influential factors for a particular population. Experiments on free-ranging animals are limited by logistical and funding constraints, therefore comparative studies with adequate knowledge of the factors under consideration may provide data necessary to determine those most influential (i.e., biologically important) factors. Continue and expand comparative genetic, diet, and behavioral studies of fur seals on the Commander Islands, Robben Island, Bogoslof Island and San Miguel Island to evaluate population differences with the Pribilof Islands fur seal populations. Also support collection of concurrent data on environmental conditions to apportion the variation seen in these ecological traits. Comparisons of population growth rates of fur seals on different islands provide a valuable resource for identifying locations where different factors influence population change. Prior to the expiration of Interim Convention on the Conservation of North Pacific Fur Seals in 1984, population assessments of the fur seal colonies in U.S. and Russian waters were compared annually. In the absence of this international agreement, it has been difficult for scientists from the two countries to assess the current status of the world fur seal population and examine the factors which influence regional population changes. A workshop of U.S. and Russian specialists was held to redefine and standardize the techniques used to assess population change (Antonelis 1990). This workshop set priorities on the monitoring programs used to evaluate and compare those factors thought to have the greatest influence on population growth. Such monitoring programs included pup production estimates, bull counts, dietary studies based on scat analysis, estimates of age specific natality rates, and evaluations of early pup growth and survival. The evaluation of stock identification and intermixture from genetic studies was also recommended as a research project worthy of investigation.

The physiological condition of foraging adult female fur seals may be affected by changes in the distribution or abundance of food resources. Information on the distribution and abundance of prey is needed, primarily over the continental shelf and shelf break in the southern Bering Sea and in the eastern North Pacific Ocean from the Gulf of Alaska to California. Simultaneous collection of oceanographic and atmospheric data is essential to understand the factors governing the location of animals at sea, their migratory pathways, their foraging efforts and habits, and the

relationships between distribution of seals, physical environment, and prey resources.

3.1.8 Conduct appropriate studies to assess the impact of predation (e.g., killer whales, Steller sea lions, sharks) on fur seal populations

Predation by killer whales, Steller sea lions, and sharks in the Bering Sea and North Pacific Ocean may presently have an affect on fur seal populations. That these predators consume fur seals is not in doubt, but the relative nature and magnitude of the impact of this predation may have changed. Studies need to be designed to determine the overall effect of predation on fur seals and, when feasible, appropriate management measures implemented to reduce or mitigate this impact. Predation of fur seal pups may play an important role in first year pup survival. Pups concentrate around the Pribilof Islands when they first enter the water, and because they are inexperienced, they are likely to be susceptible to predation. Predation on fur seal pups by adult Steller sea lions has been studied only at St. George Island (Gentry and Johnson 1981). A study at St. Paul Island is warranted, particularly to assess predation by killer whales on seal pups.

3.1.9 Promote joint research and collaborative programs

NMFS should foster comparative research between northern fur seals and other Bering Sea and North Pacific marine species. Working jointly with organizations interested in and affected by fur seal research promotes the highest quality results. Collaboration among Tribes, academic institutions, federal agencies, international research organizations, and environmental groups promotes efficient use of resources and expertise as well as utilizing cutting-edge research techniques and information exchange. Collaboration also promotes local capacity-building supportive of research aimed at answering critical local and regional management issues.

3.2 Improve assessment of the effects of disease

A comprehensive study of diseases is recommended. Although many dead pups have been collected annually since 1986 on St. Paul Island to assess the presence of disease, body condition and cause of death, routine collections have not been made of adult fur seals. Future studies should be done throughout the breeding season and expanded to all age-classes to determine the types of pathogens in the population, and their potential effect on population recovery. Blood, and oral and anal smears are needed from a small sample of adult females and their pups each year to assess disease (and contaminant transfer: action 1.5.2) between mother and pup. Samples should come from juvenile males killed during the subsistence harvest, from animals found dead on the beach, from those taken incidentally in fisheries, or possibly from collecting animals directly if no other source is available. Initially, a screening test will be used to determine if a large-scale study is warranted.

3.2.1 Compile and evaluate existing data

Compile and evaluate existing data and theory to determine whether and how diseases may have caused or contributed to the Eastern Pacific northern fur seal stock decline. Some pathogens have a history of impacting pinniped populations. *Leptospirosis* killed approximately 15% of the California sea lions (*Zalophus californianus*) passing through Oregon in 1984-85. The San Miguel sea lion virus may also have been important in an increase in miscarriages in California sea lions off California (DeLong et al. 1973). A canine distemper-like virus caused the deaths of 50% of the harbor seal populations in the North Sea in 1987-89 (Osterhaus et al. 1988a, b). No such known major events have occurred in Pribilof fur seals, but a full evaluation of disease

conditions over the past decade has not been made.

3.2.2 Determine and mitigate disease effects

Maintain long-term disease monitoring studies and undertake such additional studies or conservation actions as may be necessary to better determine and mitigate the effects of disease. If additional studies indicate that disease is inhibiting the recovery of the fur seal population, additional conservation measures may be necessary to eliminate or mitigate the effects of disease. These measures can not be identified until the disease is known and appropriate actions identified.

3.2.3 Continue management program to prohibit disease transmission to fur seals from introduced species

That fur seals are declining suggests that the population is susceptible to numerous diseases that may exacerbate the decline. Exposure to virulent diseases concurrent with the present decline may have devastating effects. Disease transmitted to fur seals from dogs, rats or other mammalian vectors must be prohibited. NMFS, other Federal agencies, and the Tribal governments must take appropriate and necessary management actions to prohibit exposure of fur seals to these animals and the diseases that they transmit.

3.3 Describe and monitor essential fur seal habitats

Develop and implement a program to effectively detect and monitor possible deleterious changes in habitats essential to the survival and recovery of the Eastern Pacific northern fur seal stock.

3.3.1 Compile and evaluate available habitat-use data

Investigate changes in distribution of breeding northern fur seals on the rookeries. Investigate various surveys and platform of opportunity sighting data to reliably estimate the at-sea density of northern fur seals. Develop and implement a program to effectively detect and monitor possible deleterious changes in habitats essential to the survival and recovery of the Eastern Pacific northern fur seal stock.

3.3.2 Conduct oceanographic and fishery surveys based on pelagic fur seal habitat use

Coordinate with actions described in action 1.3.1 (*Study the natural and anthropogenic influences on fur seal feeding ecology)* to determine and conduct such additional oceanographic and fishery surveys or other studies to delineate and characterize areas of special biological importance to the Eastern Pacific northern fur seal stock. The physiological condition of foraging adult female fur seals may be affected by changes in the distribution or abundance of food resources. Information on the distribution and abundance of prey is needed, primarily over the continental shelf and shelf break in the southern Bering Sea and in coastal and offshore regions of the North Pacific Ocean. Simultaneous collection of oceanographic and atmospheric data is essential to understand the factors governing the location of animals at sea, their migratory pathways, their foraging efforts and habits, and the relationships between distribution of seals, physical environment, and prey resources.

3.4 Identify and evaluate natural ecosystem changes

Identify and evaluate the likelihood of natural changes in the marine ecosystem accounting for the changes in abundance and distribution of northern fur seals in the Eastern Pacific stock.

3.4.1 Reevaluate carrying capacity

The Alaska Scientific Review Group suggests NMFS reevaluate carrying capacity of the Bering Sea for managing threats to northern fur seals. Changes in carrying capacity could alter management actions and recovery criteria depending on the outcome. NMFS needs to evaluate current methods, available data, and the level of certainty required to determine how carrying capacity differs from the current estimates.

3.4.2 Continue and evaluate Pribilof Islands Sentinel Program

Local resident's biological and environmental observations are optimized by the Pribilof Island Sentinel Program. It provides year-round observations of marine mammal abundance and distribution on and around the islands, while identifying environmental anomalies. It has engaged local residents as sentinels promoting the importance of stewardship and responsibility for understanding the Pribilof Islands many life systems in a holistic fashion. The Pribilof Island Sentinel Program is currently a local repository for a significant number of interrelated environmental observations of the Pribilof ecosystem. The value of this program is its integration of observations based on practices of indigenous cultures, with systematic recording of those observations. Standardization of data collection to support comparisons among areas and different times of years is going to be a key element for continuing (and expanding) the Sentinel Program at other locations. Evaluation of the database and the ability of users to generate meaningful summaries and reports is a critical element to its continuation.

3.4.3 Compile and evaluate existing physical environmental data

Numerous organizations compile and archive physical environmental data relevant to understanding northern fur seal behavior, biology, and abundance. NMFS should compile and evaluate existing oceanographic, climate, and environmental data for the Bering Sea and North Pacific. These data are also relevant to estimates of fur seal prey abundance and other predators in the ecosystem (seabirds and other marine mammals).

3.4.4 Select appropriate environmental indices

Select the most appropriate environmental indices and sampling schedules (based on action 3.4.3), and initiate periodic, long-term sampling programs to detect changes and monitor trends in key components and characteristics of essential fur seal habitats. Early oceanic survival of northern fur seals has been shown to be correlated with near-shore surface temperature in the Gulf of Alaska. Published accounts indicate that the Southern Hemisphere Oscillation Index and the North Eastern Pacific Index (NEPI) of atmospheric pressures are also related to survival of northern fur seals at sea. The North Pacific Ocean has undergone periodic large-scale climate shifts (regime shifts). An analysis of this relationship of these shifts and population indices of northern fur seals is warranted.

3.4.5 Quantify environmental effect on behavior and productivity

In general, it is advisable to determine how abiotic and biotic factors affect fur seals either directly or through their prey. Studies should be started to investigate the effects of environmental conditions and climate on pup survival, health, weaning, and migratory behavior.

Studies should be conducted to investigate how these factors influences female foraging behavior, reproduction, and survival. Establishing links between fur seals (and other top predators) and dynamics of prey species is suggested as well as monitoring fur seal food habits and foraging cycles and to compare with ongoing surveys of commercial fish species in the Bering Sea. Surveys should be expanded to include non-commercial marine mammals and seabird prey species (i.e., osmerids, cephalopods).

3.4.6 Ecosystem modeling

Integrating data from fur seals and other species may provide insight into mechanisms of population regulation that are currently not understood. Determine and undertake such studies and ecosystem modeling as may be necessary based on actions 3.4.3, 3.4.5, and others to fill critical data gaps concerning the nature, magnitude, or possible effects of natural changes or long-term trends in the marine ecosystem throughout northern fur seal range.

Objective 4. Coordinate and assess the implementation of the conservation plan, based on implementation of conservation actions and completion of high priority studies.

4.1 Establish conservation plan coordinator position

NMFS should support a full-time person to coordinate and as practical implement the conservation actions outlined in this plan. The conservation plan coordinator would be based in the Alaska Regional Office. The coordinator would act as the principal agency personnel on St. Paul and St. George Islands and represent the agency during marine mammal harvest activities. The coordinator would be responsible for determining whether Endangered Species Act Section 7 consultations might have relevance to northern fur seals, and take action as appropriate. The coordinator would annually assess the implementation of the conservation plan.

4.2 Develop and implement education and outreach programs

The plan coordinator must coordinate the education and outreach of the affected public to successfully implementing management actions. Effective education programs foster public support regarding the integrated science-based program being implemented. Communicating the results of research is important, but conveying them in a manner appropriate to the particular audience is the key aspect of educational programs for various stakeholder groups. The coordinator would provide information to regional Fisheries Management Councils, enforcement agencies, state agencies, researchers and other stakeholders of emerging issues.

4.3 Develop and promote international conservation efforts

The United States and Russia share conservation interests of northern fur seals because all known rookeries occur within their territorial waters. Because fur seals move freely across the boundaries separating these and other nations, conservation efforts and research activities put in place by those nations should be closely coordinated. Close coordination of research activities is also desirable to maintain consistency and comparability of data collected across the species range. In this regard, Federal agencies should develop and implement agreements to coordinate conservation and research efforts for northern fur seals with Canada, Russia and Japan. The approved Conservation Plan and implementation schedule should be sent to appropriate agencies and organizations in Canada, Russia and Japan. Management issues that should be considered include adequacy of protective regulations, and mechanisms for allocating allowable take of fur seals between jurisdictions. Joint research programs to examine interchange of animals between

areas and to compare biological characteristics and population parameters among regions are needed.

4.4 Enforce existing regulations

In addition to its role in directly protecting animals, enforcement of regulations is an important educational tool. However, the successful enforcement of regulations around the rookeries requires extensive field work and is expensive. If information is gathered that is likely to result in successful conviction of violators of fur seal protective regulations, such cases should be given high priority by appropriate enforcement entities. It is essential that violators are prosecuted in a timely fashion so that the seriousness of regulations and the effectiveness of enforcement are made evident.

IV. IMPLEMENTATION SCHEDULE

The implementation schedule (Table 4) provides a specified listing of the priority, anticipated duration, and regularity of the conservation actions. NMFS has estimated rough costs to implement these conservation actions over the five years subsequent to finalization of the revised conservation plan. NMFS has included annual cost increases for many of the proposed conservation actions and an annual inflation adjustment of 7% to reflect the reality of the marketplace. Actual costs for specific projects will vary from those indicated here.

TABLE 4. NORTHERN FUR SEAL IMPLEMENTATION SCHEDULE

Plan Task	Task Number	Priority	Task Duration	Est. Fiscal Year Costs (thousands of $) FY 1	FY 2	FY 3	FY 4	FY 5	Comments
1. Identify/eliminate causes of human-related mortality									
1.1 Marine Debris									
disentanglement	1.1.1	2	Ann.	75	75	75	75	75	
debris removal and surveys	1.1.2	2	Ann.	20	20	20	20	20	
laboratory and field debris studies	1.1.3	3	Tri.		40			40	
statutes, regulations, education, enforcement	1.1.4	2	Ann.[2]	10	10	10	10	10	
Determine marine debris sources	1.1.5	2	Ann.	10	10	10	10	10	
1.2 Monitor incidental take									
observer programs	1.2.1	3	Ann.[2]	20		20		20	
review observer data	1.2.2	2	Ann.[2]	15	10		10		
1.3 Evaluate harvests and harvest practices									
monitor and manage subsistence harvest	1.3.1	1	Ann.	75	50	55	60	65	
Develop & implement harvest sampling program	1.3.2	2	Ann.	15	15	15	15	15	
compile and evaluate existing data	1.3.3	2	1 yr	30					
identify and evaluate illegal harvests	1.3.4	1	Ann.	10	10	10	10	10	
2. Assess and avoid adverse effects of development									
Tribal consultation & Co-management agreements	2.1	1		200	220	245	270	300	
Advise the relevant action agencies and industries	2.2	1	Ann.						Existing staff work
Review plans and make recommendations	2.3	1	Ann.						Existing staff work & NEPA
Conduct studies to quantify effects	2.4	2	Per.	25	75	50		50	Costs depend on development
Undertake conservation or management measures	2.5	2	Ann.	?	?	?	?	?	Costs depend on projects

				Est. Fiscal Year Costs					
	Task		Task		(thousands of $)				
Plan Task	Number	Priority	Duration	FY 1	FY 2	FY 3	FY 4	FY 5	Comments
2.6 Assess and monitor pollutants									
compile and evaluate existing data	2.6.1	1	1 yr	20					
evaluate environmental pollutant exposure	2.6.2	2	Per.	50		50			every fifth year
evaluate carcass salvage programs	2.6.3	3	Per.	25				25	every fifth year
oil spill response plans	2.6.4	2	Per.	10		10		10	
2.7 Fur seals/fisheries/resources									
fur seal feeding ecology	2.7.1	1	Ann.	200	220	245	270	300	
evaluate pelagic fur seal sampling	2.7.2	3	Per.[3]		150				Every fifth year
report fishery interactions	2.7.3	2	Ann.	20	20	20	20	20	
determine impact of fisheries	2.7.4	1	Per.	100	100	150	200	200	Concurrent studies with fisheries
3. Monitor trends and essential habitat									
3.1 Monitor changes in the fur seal population									
analyze fur seal teeth	3.1.1	2	5 yrs	35	25	25	25	25	
monitor male and pup abundance at all breeding Islands	3.1.2	1	Ann.	85	10	85	10	85	
estimate pup survival	3.1.3	1	Ann.	25	25	25	25	25	
evaluate marking & resighting program	3.1.4	1	5 yrs	100	25	25	25	25	
estimate vital rates	3.1.5	1	Ann.	100	150	150	120	130	Resighting and retagging annually
behavioral/physiological studies	3.1.6	2	Per.	50	55	60	65	70	
comparative studies on other islands	3.1.7	2	Ann.	150	165	180	200	220	
predation studies	3.1.8	3	Per.	150		150		150	
Promote joint research	3.1.9	1	Ann	15	15	15	15	15	
3.2 Improve assessment of disease effects									
compile and evaluate existing data	3.2.1	2	Per.	20				20	
determine and mitigate disease effects	3.2.2	2	Ann.		25	15	15	15	Long-term monitoring

				Est. Fiscal Year Costs					
	Task		Task		(thousands of $)				
Plan Task	Number	Priority	Duration	FY 1	FY 2	FY 3	FY 4	FY 5	Comments
manage introduced species	3.2.3	1	Ann.						Existing staff work
3.3 Monitor essential habitat									
compile and evaluate available habitat use data	3.3.1	1	1 yr	50			50		
conduct oceanographic and fishery surveys	3.3.2	1	Tri.		200			200	
3.4 Identify and evaluate natural ecosystem changes									
Reevaluate carrying capacity	3.4.1	1	1 yr		75			75	
Continue Sentinel program	3.4.2	2	Ann	75	85	95	105	120	
compile and evaluate existing data	3.4.3	1	5 yrs	25	50	25	50	25	
select appropriate environmental indices	3.4.4	3	5 yrs			50	50	50	
physiological/survival studies	3.4.5	2	5 yrs			50	50	50	
ecosystem modeling	3.4.6	2	5 yrs			50	50	50	
4. Implement Plan									
Conservation Plan Coordinator	4.1	1	Ann				50		Begin plan update in FY 4
Education & Outreach Programs	4.2	2	Ann	25	25	25	25	25	
International Conservation	4.3	2	Ann	20	15	15	15	20	
Enforce Regulations	4.4	1	Ann	50	50	50	50	50	
Total costs ($K)[4]				1910	2025	2080	1970	2620	
Inflation Adjustment (7% of total)					138	142.8	137.9	183.4	

Priority: 1= highest, 2 = moderate, 3 =lowest

[1] Triennial

[2] Annual Periodic as needed

[3] Periodic as needed

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VI. LIST OF PREPARERS

This Conservation Plan for the Northern Fur Seal relies heavily on the original 1993 Plan prepared by the National Marine Mammal Laboratory, Alaska Fisheries Science Center, Seattle, WA, and the Office of Protected Resources, National Marine Fisheries Service, Silver Spring, MD.

Early revisions of this new plan were prepared under contracts to LGL Alaska Research Associates, Inc. from the Pribilof Islands communities of St. George and St. Paul islands through their comanagement agreements. Subsequent revisions were made by the National Marine Mammal Laboratory, Alaska Fisheries Science Center, Seattle, WA, and by TRL Wildlife Consulting, Redmond, WA. Final revisions and preparations were made by NOAA Fisheries, Alaska Region.

Appendix A. St. Paul Co-management Agreement

AGREEMENT
BETWEEN THE
ALEUT COMMUNITY OF ST. PAUL ISLAND
AND THE
NATIONAL MARINE FISHERIES SERVICE

I. PARTIES AND SCOPE

This document constitutes an agreement between the National Marine Fisheries Service (NMFS) and The Aleut (Unangan) Community of St. Paul Island, Alaska, otherwise referred to as the Parties.

A. This Agreement covers the species *Callorhinus ursinus* and *Eumetopias jubatus*, referred to as the laaqun (Unangan) or northern fur seal, and the qawan (Unangan) or Steller sea lion, hereafter referred to as fur seal and sea lion, respectively. It encompasses St. Paul Island, Alaska and associated interaction areas (Walrus, Otter Islands and Sea Lion Rock). However, specific actions taken or recommendations made pursuant to this Agreement may be limited to certain regions or sub-areas, as deemed appropriate.

B. NMFS is the congressionally mandated federal agency responsible for the protection, conservation and management of fur seals and sea lions within jurisdiction of the United States of America.

C. The Tribal Government of St. Paul (TGSNP) represents the conservation and co-management interests of fur seal and sea lion hunters and customary/traditional practices of the Aleut Community of St. Paul Island, Alaska.

II. AUTHORITIES

The Parties recognize and acknowledge that:

A. NMFS has the authority to enter into this Agreement with the TGSNP under Section 119 (16 U.S.C. 1388) of the Marine Mammal Protection Act of 1972, as amended (MMPA), and the Endangered Species Act of 1973, as amended (ESA) (16 U.S.C. 1531 et seq.).

B. The TGSNP has the authority to enter into this Agreement according to its constitution and bylaws for the Aleut Community of St. Paul Island.

III. PURPOSE

The TGSNP, representing the interests of the Unangan (Aleuts) of St. Paul Island and NMFS, representing the interests of the citizens of the United States of America, desire to work in partnership for the purpose of:

A. Promoting the conservation and preservation of fur seals and sea lions;

B. Utilizing traditional knowledge, wisdom and values, and conventional science in research, observation, and monitoring efforts to establish the best possible management actions for the protection and conservation of fur seals and sea lions;

C. Establishing a process of shared local responsibilities regarding the management and research of fur seals and sea lions on behalf of the citizens of the United States;

D. Identifying and resolving through a consultative process any management conflicts that may arise in association with fur seals and sea lions; and

E. Providing information to hunters and the affected community, as a means of increasing the understanding of the sustainable use, management, and conservation of fur seals and sea lions.

To achieve these purposes, this Agreement provides for:

1. Cooperation between members of the TGSNP and NMFS in the conservation and management of fur seals and sea lions for the year 2000 and thereafter; and

2. The establishment of a St. Paul Island Co-Management Council under this Agreement.

IV. BACKGROUND

In April 1994, the MMPA was amended to include Section 119 "Marine Mammal Cooperative Agreements in Alaska." Section 119 formalizes the rights of Alaska Native Organizations to participate in conservation-related co-management of subsistence resources and their use. Section 119 also authorized the appropriation of funds to be transferred by NMFS to Alaska Native Organizations to accomplish these activities.

V. GUIDING PRINCIPLES

A. The best way to conserve and provide for stewardship of fur seals and sea lions critical to traditional practices and the Unangan way of life is through a partnership between the TGSNP and NMFS that provides for full participation by the Unangan of St. Paul, through the TGSNP, in decisions affecting the management of marine mammals used for subsistence purposes .

B. As the primary customary/traditional users of the fur seals and sea lions in the Bering Sea Region, the Aleut Community of St. Paul is committed to long term sustainable use of these animals for cultural continuity, food, clothing, arts, and crafts. The rich Unangan tradition and ancestral interaction with fur seals and sea lions provides a unique understanding and knowledge of these animals.

C. Under the MMPA as amended, NMFS is mandated to employ the best conventional science and natural resource management practices available to maintain marine mammal stocks and populations at levels necessary to sustain customary/traditional uses by indigenous peoples of Alaska, including the Unangan of St. Paul.

D. A key to the success of this partnership is to incorporate the spirit and intent of co-management by building trust and by establishing close cooperation and communication between the two Parties. Shared decision making shall be through consensus, based on mutual respect and understanding the cultural perspective of each party.

VI. CO-MANAGEMENT OF FUR SEALS AND SEA LIONS ON ST. PAUL ISLAND, ALASKA

Understanding that the structure, process and responsibilities associated with the successful implementation of this Agreement and effective co-management of fur seals and sea lions on St. Paul must be clearly defined, the Parties agree that;

A. Operational Structure

1. Regarding the need for a cooperative effort to conserve fur seal and sea lion populations and to maintain a sustainable harvest for traditional uses, the Parties agree to establish a St. Paul Island Co-Management Council (hereafter referred to as Council).

2. Upon the effectness of this Agreement, the TGSNP and NMFS shall each

appoint three (3) members to the Council. The members of the Council shall serve at the pleasure of the Party by which they were appointed. The Council shall select co-chairs by consensus. One (1) co-chair shall be a representative of the TGSNP and one (1) a representative of NMFS.

3. The Council shall hold at least two (2) meetings a year and may hold other meetings, as necessary, at the request of either Party. Council meetings shall be held and conducted on St. Paul Island Alaska, unless mutually agreed otherwise. The Co- Chairs shall circulate a draft agenda for comment two (2) weeks prior to each meeting. A quorum of four (4) members is required to conduct a meeting. Decisions of the Council shall be through consensus, based on mutual respect. Meetings of the Council shall be open to the public.

4. The Council shall perform the following actions:

a. Develop annual management plans, monitoring programs, and research programs for St. Paul Island;

b. Review annually the contents, performance and responsibilities in this Agreement;

c. Review and assess progress towards implementation of this Agreement;

d. Identify challenges to achieving the purpose of this Agreement;

e. Recommend solutions to any identified challenges;

f. Identify future courses of action; and

g. Review laws and regulations governing the subsistence take and use of fur seals and sea lions.

B. Cooperative Responsibilities:

Guided by the Council, the TGSNP and NMFS will share the following responsibilities in each of the subject areas identified:

1. Management Plans: Develop local management plans for fur seals, sea lions, and their associated haul-out and rookery areas. The management plans will be reviewed annually. The management plans will include the topics and items deemed appropriate and necessary by the Council such as:

a. Monitoring and Research Programs; Harvest and Rookery

Management; Local Regulations and Enforcement Plans for the protection of fur seals, sea lions and their haulouts or rookeries;

b. Education and Information; Training; Funding; Summary of recent progress and new information;

c. Outline of future goals and activities; Identify information and conservation needs and; and

d. Other items as deemed necessary.

2. Monitoring Programs: To establish consistent year-round rookery and shoreline observations to document and respond to activities on the rookeries that might include, but not be limited to, wildlife behavior, disturbance, oil spills, and other activities as appropriate. The Parties agree to:

a. Develop and implement long term monitoring programs for local fur seal and sea lion populations, associated rookeries and haul out areas to document and respond to any observed changes;

b. Conduct seasonal debris clean-ups and surveys at rookeries and beaches identified by the Council; and

c. Identify the appropriate equipment, facilities, and technical assistance to conduct rookery and beach clean up programs and surveys as necessary.

3. Research Programs: As advised and monitored by the Council, the Parties agree to promote and continue the following specific research efforts:

a. Assessment of population abundance and trends by stock and, as possible, by sub-areas within those stocks using conventional science methods;

b. Assessment of habitat use and seasonal movements (including information on preferred haulout sites, foraging areas, and prey composition);

c. Assessment of sources of mortality and the extent, timing, and location of such mortality; and

d. Assessment of population status (including age structure, vital rates, and indices of physical condition).

4. Disentanglement Program: To reduce the level of entanglement and effect the release of fur seals and sea lions from marine debris, the Parties agree to promote and continue the following efforts and activities :

a. Collection of information regarding date, location, sex, age, age class, debris type, capture attempts, disentanglements, degree of wound, re-sightings, animals sheared, animals with shear marks, scarred animals, and tagged animals and numbers;

b. Calculation of entanglement rates incorporating data from the annual subsistence fur seal harvest including debris type, width, mesh diameter, twine size and other information as appropriate; and

c. Maintenance of existing research and identification of the appropriate equipment, facilities, and technical assistance to conduct the disentanglement program.

5. Local Opportunities for Scientific Research Projects: Recognizing the need for and value of community awareness and involvement regarding the protection and conservation of fur seals and sea lions, the Parties agree to undertake a collaborative effort to accomplish the following:

a. Establish mentoring opportunities for local youth regarding environmental science and natural resource management;

b. Work with the local school district regarding support of and participation in science fairs and special projects regarding environmental education and natural resource management; and

c. Coordinate with local entities and programs to establish employment opportunities regarding environmental science and natural resource management.

6. Maintenance of Fur Seal Rookeries: To improve the condition and ensure continued use of the fur seal rookery and haulout areas, the Parties agree to:

a. Design, construct, and maintain permanent signs for each rookery;

b. Put up road barricades at Reef, Ketovi, and Northeast Point Rookeries as specified by the governing regulations;

c. Identify the appropriate equipment and materials to maintain the rookery catwalks, tripods, signs, and barricades; and

d. Repair and maintain annually, all catwalks and tripods identified by the Council.

7. Co-Managing the Harvest: To improve and advance the viability and sustainability of the subsistence take of fur seals the Parties agree:

a. To support and continue the annual Humane Observer contract for the subsistence fur seal harvest to ensure that the harvest continues to be conducted in a humane manner;

b. To negotiate and establish the beginning date of each annual fur seal harvest, in accordance with current regulations;

c. That the Tribal Ecosystem Conservation Office (ECO) Co-Directors, in consultation with the Harvest Foreman and the NMFS Representative, and in accordance with current regulations, will determine which fur seal rookery to harvest on a daily basis;

d. That the ECO Co-Directors and Harvest Foreman will accept responsibility for ensuring an absolute minimum of heat stressed animals as is possible. Jointly with the Humane Observer and NMFS Representative, they will have the authority to shut down the harvest for that day due to temperature or other factors contributing to heat stress;

e. The ECO Co-Directors and Harvest Foreman will accept responsibility for keeping the number of females taken to the following levels;

(i). When five (5) females have been killed the harvest will stop for a period of two (2) days so that the harvest workers can discuss the reasons why females were harvested and correct problems contributing to the take of females, and

(ii). When eight (8) females have been killed the harvest may be stopped for that season.

f. The ECO Co-Directors and Harvest Foreman will insure the entire harvest operation is done in an efficient manner to avoid or minimize unnecessary injury and mortality, and also that the harvest fields are left litter-free;

g. The ECO Co-Directors will work with NMFS to promote and establish "full utilization" by making every attempt within the law to use all parts of the animals taken at the harvest. All parts means the pelts, teeth, guts,

bacula ("seal sticks"), carcasses and other inedible by-products of the subsistence harvest the Tribe can use within existing laws and regulations to cover harvest and processing costs;

h. The ECO will conduct local surveys of the subsistence take of fur seals and sea lions. The surveys will include:

(i). Number harvested;
(ii). Number struck and/or lost;
(iii). Total take (harvest plus struck and lost);
(iv). Sex of harvested or recovered animals;
(v). Categories harvested or recovered (number of pups, subadults, or adults);
(vi). Designated fur seal haul outs and sea lion hunting sites as determined annually by the Council; and
(vii). The collection of biological samples if deemed necessary by the Council;

8. Providing Education and Information: Recognizing the value of an informed public regarding the protection, conservation and management of fur seals and sea lions, the Parties agree to:

a. Educate and inform subsistence harvest workers in the most appropriate methods for harvesting and processing fur seals;

b. Educate and inform the Aleut Community of St. Paul about the health and status of northern fur seals and sea lion populations on St. Paul Island including factors contributing to the sea lion's decline or increase;

c. Educate and inform St. Paul sea lion hunters in the proper methods for hunting sea lions;

d. Develop a training and internship program to directly involve local people in harvest monitoring, bio-sampling, and research programs;

e. Involve hunters and customary/traditional users in the development of regulatory and management decisions affecting the subsistence use of fur seals and sea lions through representation on the Council; and

f. Designate the TGSNP as the primary local contact for exchange of information regarding fur seals and sea lions.

C. Training

To establish a fair and equitable co-management relationship and a level of practical experience and technical expertise, the Parties agree to:

1. Work in partnership to develop and provide cross cultural information, including understanding of Unangan ways of life, traditional ways of knowing, local concerns and issues regarding fur seal and sea lion use by the Aleut Community of St. Paul (e.g., food, medicinal, handicraft, arts, and spiritual uses), as well as agency policies, legal and administrative constraints, and scientific approaches for managers, researchers and others coming to the island;

2. Obtain appropriate training for local Conservation Officers in Tribal and federal regulations;

3. Provide mentors and research opportunities for local individuals whenever possible; and

4. Share TGSNP/NMFS planning, research, and data collection procedures and provide appropriate training in those procedures.

VII. CONSULTATION

To facilitate the implementation of this Agreement and ensure an equitable working relationship, the Parties agree that:

A. The TGSNP and NMFS shall consult on a routine basis as set forth in this Agreement. In addition, the TGSNP President and NMFS Representative for St. Paul Island shall communicate on an as needed basis concerning matters related to northern fur seals and sea lions; and

B. Should disagreement arise on interpretation of the provisions of this Agreement (or amendments and/or revisions thereto) that cannot be resolved at the operating level, the Parties shall submit written statements regarding the disagreement to the Council. Within thirty (30) days from receipt of the written statements, the Council shall provide copies to each Party and convene a meeting of the Council for the purpose of resolving the disagreement. If disagreement remains unresolved after the thirty day period and absent a mutual agreement by the Parties to extend the time period, the Council shall refer the matter to higher levels of the respective Parties for appropriate action.

VIII. REGULATION AND ENFORCEMENT

To effectively implement this Agreement, the Parties agree that:

A. The TGSNP recognizes the Secretary of Commerce's authority to enforce the provisions of the MMPA, ESA and Fur Seal Act applicable to the subsistence harvest of fur seals and sea lions; and

B. NMFS recognizes the existing Tribal authority to govern and regulate their members and conduct regarding the traditional uses of fur seals and sea lions, and acknowledges tribal authority to conduct the following in cooperation with NMFS:

1. Conduct rookery disturbance monitoring and local enforcement upon closing of the rookeries and to monitor sea lion hunting activities;

2. Conduct access permitting for the fur seal viewing blinds and fur seal harvest;

3. Develop and implement Tribal ordinances governing the hunting of sea lions and harvesting of fur seal and provide NMFS with up to date Tribal ordinances;

4. Develop and implement effective local processes for informing the public regarding applicable Federal and Tribal laws and regulations;

5. Develop and implement cooperative enforcement plans between Federal, local and Tribal authorities; and

6. Review, recommend, and advise on revisions to federal regulations governing fur seals and sea lions.

IX. FUNDING

A. Recognizing that certain costs may be associated with the implementation of this Agreement, both Parties agree that long term funding for sustained co-management and conservation programs is important for the health of fur seals and sea lions. No financial commitment on the part of any Party is required by this Agreement. Any requirement of this Agreement for the obligation or expenditure of funds by NMFS or TGSNP shall be subject to the availability of appropriated funds.

B. The TGSNP and NMFS will assist each other in seeking funding from a variety of sources to support research and management projects of mutual benefit regarding fur seals and sea lions.

C. TGSNP will submit a yearly budget to NMFS to fulfill specific responsibilities stated in this Agreement for each fiscal year the Agreement is in effect.

D. NMFS will review the annual budget and, after consultation with the TGSNP, will assist with the obligation and provision of funding as deemed appropriate under the authorities specified in Section II (A) of this Agreement.

X. OTHER PROVISIONS

A. Nothing in this Agreement is intended or shall be construed to authorize any expansion or change in the respective jurisdiction of Tribal, Federal, or State Governments over fish and wildlife resources, or alter in any respect the existing political or legal status of Alaska Native entities.

B. Except as expressly provided herein, nothing in this Agreement shall restrict or limit any right or privilege of the TGSNP (Unangan Community of St. Paul) with respect to fisheries, customary/traditional uses, or other use of any species.

C. Nothing herein is intended to conflict with current National Oceanic and Atmospheric Administration or NMFS directives. If the terms of this Agreement are inconsistent with existing laws, regulations, or directives of either of the Parties entering into this Agreement, then those portions of this Agreement which are determined to be inconsistent shall be invalid, but the remaining terms and conditions not affected by the inconsistency shall remain in full force and effect. At the first opportunity for revision of this Agreement, all necessary changes will be accomplished by either an amendment to this Agreement or by entering into a new Agreement, whichever is deemed expedient to the interests of both Parties.

D. This Agreement will stand as an official management tool for fur seals and sea lions as identified in Section I (A) of this Agreement.

E. Both Parties shall strive to support a policy of "no surprises" concerning contact with the media on potentially sensitive issues pertaining to northern fur seals and Steller sea lions. Each Party shall endeavor to consult with the other prior to initiating contact with the media on topics contained within this Agreement. Under circumstances in which the media initiates contact with one Party, the contacted Party shall inform the other Party and provide details on the nature of the information communicated. In addition, when a Party is contacted by the media concerning issues relevant to this Agreement, that Party shall provide the other Party's contact information to the media representative and request that the media representative contact the other Party.

F. Whenever possible, all scientists who plan to conduct research on behalf of either Party on or around St. Paul (as defined in Section I of this agreement) are required to advise the Council established herein in a timely manner as to the purpose, goals, and time-frame of the research, data gathering techniques, expected results and possible adverse impacts of the proposed research. The Council shall review this information and upon reaching a consensus, may provide comments and recommendations accordingly.

XI. ADOPTION, DURATION, AND MODIFICATION

A. This Agreement shall take effect upon the latest date of signature of the respective Parties and shall remain in effect until terminated by either of the Parties in accordance with the termination provision of this Agreement.

B. Modification of this agreement may be proposed at any time by either Party and shall become effective upon written approval by both Parties.

C. This Agreement may be terminated by either Party by providing forty-five (45) days prior written Notice of Termination to the other Party. Such Notice shall be addressed to the principal contact for the receiving Party.

XII. SIGNATORIES

In Witness Whereof, the Parties hereto have executed this Agreement to be effective as of the last written date below:

National Marine Fisheries Service

6.13.00

James W. Balsiger Date
Administrator, Alaska Region
National Marine Fisheries Service
U. S. Department of Commerce
P. O. Box 21668
Juneau, Alaska 99801

Aleut Community of St. Paul Island

M. Richard Zacharof

Richard Zacharof Date
President, Tribal Government of St. Paul
P.O. Box 86
St. Paul Island, Alaska 99660

Appendix B. St. George Co-management Agreement

CO-MANAGEMENT AGREEMENT BETWEEN THE ALEUT COMMUNITY OF ST. GEORGE ISLAND AND THE NATIONAL MARINE FISHERIES SERVICE

I. PARTIES AND SCOPE

This document constitutes an agreement between the National Marine Fisheries Service and The Aleut (Unangan) Community of St. George Island, Alaska, otherwise referred to as the Parties.

A. This Agreement covers the species *Callorhinus ursinus* and *Eumetopias jubatus*, referred to as the laaqux (Unangan) or northern fur seal, and the qawax (Unangan) or Steller sea lion, hereafter referred to as fur seal and sea lion, respectively; and in addition, the use and management of the structure referred to locally as the old sealing plant. This Agreement encompasses activities and program developed and/or conducted by the parties on and adjacent to St. George Island, Alaska in the geographical and topical areas specified by the Co-management Council established pursuant to this Agreement.

B. The National Marine Fisheries Service (NMFS) is the congressionally mandated federal agency responsible for the protection, conservation and management of fur seals and sea lions within jurisdiction of the United States of America.

C. The St. George Traditional Council (STGTC), organized pursuant to the Indian Reorganization Act of 1934, is the legally recognized tribal organization for the Aleut people of St. George and it represents the conservation and co-management interests of fur seal and sea lion hunters and customary/traditional practices of the Aleut Community of St. George Island, Alaska.

II. AUTHORITIES

The Parties recognize and acknowledge that:

A. NMFS has the authority to enter into this Agreement with the STGTC under Section 119 (16 U.S.C. 1388) of the Marine Mammal Protection Act of 1972, as amended (MMPA), and the Endangered Species Act of 1973, as amended (ESA) (16 U.S.C. 1531 et seq.), and the Department of Commerce Joint Project Authority (15 U.S.C. 1525).

B. The STGTC has the authority to enter into this Agreement according to its constitution and bylaws for the Aleut Community of St. George Island. Additional guidance is provided by Executive Order #13084, May 14, 1998 ("Consultation and Coordination with Indian Tribal Governments"; 63 FR 27655"); Presidential Memorandum, April 29, 1994 ("Government-to-Government Relations with Native American Tribal Governments"; 59 FR No.85).

III. PURPOSE

The STGTC, representing the interests of the Unangan (Aleuts) of St. George Island and NMFS, representing the interests of the citizens of the United States of America, desire to work in partnership for the purpose of:

A. Promoting the conservation and preservation of fur seals and sea lions;

B. Utilizing traditional knowledge, wisdom and values, and the best available science in research, observation, and monitoring efforts to establish the best possible management actions for the protection and conservation of fur seals and sea lions;

C. Establishing a process of shared local responsibilities regarding the management and research of fur seals and sea lions.

D. Identifying and resolving, through a consultative process, any conflicts that may arise in association with the management and conservation of fur seals and sea lions on and adjacent to St. George Island, Alaska.

E. Providing information to hunters and the affected community, as a means for increasing the understanding of sustainable use, management, and conservation of fur seals and sea lions.

F. Establishing a process of shared responsibility for the use, management, operation, and upkeep of the structure locally known as the old sealing plant.

To achieve these purposes, this Agreement provides for:

1. Cooperation between members of the STGTC and NMFS in the conservation and management of fur seals and sea lions for the year 2001 and thereafter, and;

2. The establishment of a St.George Island Co-Management Council under this Agreement.

IV. BACKGROUND

In April 1994, the MMPA was amended to include Section 119 "Marine Mammal Cooperative Agreements in Alaska." Section 119 formalizes the rights of Alaska Native Organizations to participate in conservation-related co-management of subsistence resources and their use. Section 119 also authorized the appropriation of funds to be transferred by NMFS to Alaska Native Organizations to accomplish these activities.

V. GUIDING PRINCIPLES

A. The best way to conserve and provide for stewardship of fur seals and sea lions critical to traditional practices and Unangan way of life, is through a partnership between the STGTC and the federal statutory management authority, which to the maximum extent allowed by law, provides for full participation by Unangan of St. George, through the STGTC, in decisions affecting the management of marine mammals used for subsistence purposes.

B. As the primary customary/traditional users of the fur seals and sea lions on and adjacent to St. George Island, Alaska, the Aleut Community of St. George is committed to long term sustainable use of these animals for cultural continuity, food, clothing, arts, and crafts. The rich Unangan tradition and ancestral interaction with fur seals and sea lions provides a unique understanding and knowledge of these animals.

C. Under the MMPA as amended, NMFS is mandated to employ the best available science and natural resource management practices to maintain marine mammal stocks and populations at levels necessary to sustain customary/traditional uses by Unangan of St. George Island and other indigenous peoples of Alaska.

D. A key to the success of this partnership is to incorporate the spirit and intent of co-management by building trust and by establishing close cooperation and communication between the two Parties. Shared decision making shall be through consensus, based on mutual respect and understanding of each Party's cultural perspectives.

VI. CO-MANAGEMENT OF FUR SEALS AND SEA LIONS ON ST. GEORGE ISLAND, ALASKA

Understanding that the structure, process and responsibilities associated with the

successful implementation of this Agreement and effective co-management of fur seals and sea lions on St. George Island must be clearly defined, the Parties agree that;

A. Operational Structure

1. Regarding the need for a cooperative effort to conserve fur seal and sea lion populations and to maintain a sustainable harvest for traditional uses, the Parties agree to establish a co-management body to be called the St. George Island Co-Management Council (here after referred to as the Co-Management Council).

2. Upon effect of this Agreement, the STGTC and NMFS shall each appoint three (3) members to the Co-Management Council. The members of the Co-Management Council shall serve at the pleasure of the Party by which they were appointed. The Co-Management Council shall select co-chairs by consensus. One (1) co-chair shall be a representative of the STGTC and one (1) a representative of NMFS.

3. The Co-Management Council shall hold at least two (2) meetings a year and may hold other meetings, as necessary, at the request of either Party. Co-Management Council meetings shall be held and conducted on St. George Island Alaska, unless mutually agreed otherwise. The Co- Chairs shall circulate a draft agenda for comment two (2) weeks prior to each meeting. A quorum of four (4) members is required to conduct a meeting. Decisions of the Co-Management Council shall be through consensus, based on mutual respect. Meetings of the Co-Management Council shall be open to the public. The Co-Management Council may also hold executive sessions.

4. The Co-Management Council shall perform the following actions:

   a. Develop annual management plans, monitoring programs, and research programs for St. George Island.

   b. Annually review the contents, performance and responsibilities in this Agreement.

   c. Review and assess progress towards implementation of this Agreement.

   d. Identify challenges to achieving the purpose of this Agreement.

   e. Recommend solutions to any identified challenges.

   f. Identify future courses of action.

g. Review applicable laws and regulations governing the subsistence take and use of fur seals and sea lions for the purpose of making recommendations for appropriate change to NMFS.

B. Cooperative Responsibilities:

Guided by the Co-Management Council and process, the STGTC and NMFS will share the following responsibilities in each of the subject areas identified:

1. **Management Plans:** Develop local management plans for fur seals, sea lions, and their associated haul-out and rookery areas. Develop a management plan for the sealing plant. The management plans will be reviewed annually. The management plans will include the topics and items deemed appropriate and necessary by the Co-Management Council such as:

a. Monitoring and Research Programs; Harvest and Rookery Management; Local Regulations and Enforcement for the protection of fur seals, sea lions and their haul-outs or rookeries;

b. Education and Information; Training; Funding; Summary of recent progress and new information;

c. Outline of future goals and activities; Identify information and conservation needs;

d. A joint-use agreement for the use of the structure locally known as the old sealing plant for fur seal pelt processing, research, and interpretation and:

e. Other items as deemed necessary.

2. **Monitoring Programs:** To establish consistent year-round rookery and shoreline observations to document and respond to unusual or specific events including wildlife behavior, disturbance, oil spills, etc. the Parties agree to;

a. Develop and implement long term monitoring programs for local fur seal and sea lion populations, associated rookeries and haul out areas to document and respond to any observed changes;

b. Conduct seasonal debris clean-ups and surveys at rookeries and beaches identified by the Co-Management Council; and

c. Identify the appropriate equipment, facilities, and technical assistance necessary to conduct rookery and beach clean up programs and surveys.

3. **Research Programs:** As directed by the Co-Management Council, the Parties agree to promote and continue the following specific fur seal and sea lion research efforts, including, but not limited to:

a. Assessment of population abundance and trends by stock and, as possible, by sub-areas within those stocks using conventional science methods;

b. Assessment of habitat use and seasonal movements (including information on preferred haul-out sites, foraging areas, and prey composition);

c. Assessment of sources of mortality and the extent, timing, and location of such mortality;

d. Assessment of population status (including age structure, vital rates, and indices of physical condition);

4. **Disentanglement Program:** To reduce the level of entanglement and effect the release of fur seals and sea lions from marine debris, the Parties agree to promote and continue the following efforts and activities:

a. Collection of information regarding date, location, sex, age, age class, debris type, capture attempts, disentanglements, degree of wound, re-sightings, animals sheared, animals with shear marks, scarred animals, and tagged animals and numbers;

b. Calculation of entanglement rates incorporating data from the annual subsistence fur seal harvest including debris type, width, mesh diameter, twine size and other information as appropriate;

c. Maintenance of existing research and identify the appropriate equipment, facilities, and technical assistance to conduct the disentanglement program.

5. **Local Opportunities for Scientific Research Projects:** Recognizing the need for and value of community awareness and involvement regarding the protection

and conservation of fur seals and sea lions, the Parties agree to undertake a collaborative effort to accomplish the following:

a. Establish mentoring opportunities for local youth regarding environmental science and natural resource management;

b. Work with the local school district regarding support of and participation in science fairs and special projects regarding environmental education and natural resource management;

c. Coordinate with local entities and programs to establish employment opportunities regarding environmental science and natural resource management.

d. Annually meet for the purpose of assessing progress under this section, and to strategically plan new initiatives.

e. Develop such other activities, projects, and/or programs as the parties may agree to undertake from time to time.

6. **Maintenance of Fur Seal Rookeries:** To improve the condition and ensure continued use of the fur seal rookery and haul-out areas by local people and visitors, the Parties agree to:

a. Design, construct, and maintain permanent signs for each rookery.

b. Such other actions as deemed appropriate by the Co-Management Council.

7. **Co-Managing the Harvest:** To improve and advance the viability and sustainability of the subsistence take of fur seals the Parties agree:

a. To negotiate and establish the beginning date of each annual fur seal harvest, in accordance with applicable federal regulations;

b. That the Harvest Foreman and NMFS Representative will, in accordance with applicable federal regulations determine which fur seal rookery subsistence seal harvesting will be conducted on a daily basis;

c. That the Harvest Foreman will accept responsibility to ensure that the number of fur seals experiencing heat stressed is kept to the absolute minimum number as possible. The Harvest Foreman and the NMFS

Representative, will have the authority to shut down the subsistence harvest any day when the temperature or other factors contributing to heat stress;

d. The Harvest Foreman will accept responsibility for keeping the number of females taken to the following levels:

(i). When five (5) females have been killed the subsistence harvest will stop for a period of two (2) days so that the subsistence harvest workers can discuss the reasons why females were harvested and correct problems contributing to the take of females.

(ii). When eight (8) females have been killed the subsistence harvest may be stopped for that season.

e. The Harvest Foreman will insure the entire subsistence harvest operation is done in an efficient manner, and which avoids or minimizes unnecessary injury and mortality to the fur seals and the subsistence harvest workers;

f. The Harvest Foreman will ensure that the subsistence harvesting activities will not result in litter or undue damage to habitat and tundra;

g. The Co-Management Council will work with NMFS to promote and establish "full utilization" of fur seals taken in the subsistence harvest by making every attempt to use, to the maximum extent practical and allowed by law, all parts of the animals taken at the subsistence harvest. In addition to edible parts, the term "all parts" includes the pelts, teeth, guts, bacula ("seal sticks"), carcasses and other inedible by-products of the subsistence harvest which may be legally utilized to cover subsistence seal harvest and processing costs.

h. The Co-Management Council will conduct local surveys of the subsistence take of fur seals and sea lions on an annual basis. The surveys will include:

(i). Number harvested.
(ii). Number struck and/or lost.
(iii). Total take (harvest plus struck and lost).
(iv). Sex of harvested or recovered animals.
(v). Categories harvested or recovered (number of pups, sub-adults, or adults).

(vi). Designated fur seal haul outs and sea lion hunting sites as determined annually by the Co-Management Council.

(vii). The collection of biological samples if deemed necessary by the Co-Management Council.

i. Identify the appropriate equipment, facilities, and technical assistance necessary to conduct the subsistence fur seal harvest.

8. **Providing Education and Information:** Recognizing the imperative and value of an informed public regarding the protection, conservation and management of fur seals and sea lions, the Parties agree to:

a. Educate and inform subsistence harvest workers as to the most appropriate and best available methods for harvesting and processing fur seals;

b. Educate and inform the Aleut Community of St. George as to the health and status of northern fur seals and sea lion populations on St. George Island including factors contributing to the fur seal's and/or sea lion's decline or increase;

c. Educate and inform St. George Island sea lion hunters in the proper methods for hunting sea lions;

d. Develop a training and internship program to directly involve local people in harvest monitoring, bio-sampling, and research programs;

e. Involve hunters and customary/traditional users in the development of regulatory and management decisions affecting the subsistence use of fur seals and sea lions through representation on the Co-Management Council;

f. Designate the STGTC as the primary local contact for exchange of information regarding fur seals and sea lions.

C. Training

To establish a fair and equitable co-management relationship and an appropriate level of practical experience and technical expertise, the Parties agree to:

1. Work in partnership to develop and provide cross cultural training and information for efforts to increase understanding of Unangan ways of life,

traditional ways of knowing, local concerns and issues regarding fur seal and sea lion use by the Aleut Community of St. George (i.e. food, medicinal, handicraft, arts, and spiritual uses). In addition, the training will involve orientation on such issues as agency policies, legal and administrative constraints, and scientific approaches;

2. Obtain appropriate training for a local Conservation Officer, especially regarding the identification and proper documentation of Tribal and federal regulations;

3. Provide mentors and research opportunities for local individuals whenever possible;

4. Network and share STGTC/NMFS planning, research, and data collection procedures with the community of St. George and to provide the appropriate training in those procedures.

VII. CONSULTATION

To facilitate the implementation of this Agreement and ensure an equitable working relationship, the Parties agree that:

A. The STGTC and NMFS shall consult on a routine basis as set forth in this Agreement. In addition, the STGTC President and NMFS Representative for St. George Island shall communicate on an "as needed basis" concerning matters related to northern fur seals and sea lions that either Party deems suitable for such consultation.

B. Should disagreement arise on the interpretation of the provisions of this Agreement, or amendments and/or revisions thereto, that cannot be resolved at the operating level, the Parties shall submit written statements regarding the disagreement to the Co-Management Council created herein. Within thirty (30) days from receipt of the written statements, the Co-Management Council shall provide copies to each Party and convene a meeting of the Co-Management Council for the purpose of resolving the disagreement. In the event that the disagreement remains unresolved after the thirty day period and absent a mutual agreement by the Parties to extend the time period, the Co-Management Council shall refer the matter to higher levels of the respective Parties for appropriate action.

VIII. REGULATION AND ENFORCEMENT

To effectively implement this Agreement, the Parties agree that:

A. The STGTC recognizes the Secretary of Commerce's authority to enforce the provisions of the MMPA, ESA and Fur Seal Act applicable to the subsistence harvest of fur seals and sea lions.

B. NMFS recognizes the existing STGTC authority to govern and regulate their own members and their conduct regarding the traditional uses of fur seals and sea lions, and all parties acknowledge the authority of the tribe to conduct the following in cooperation with NMFS:

1. Conduct rookery disturbance monitoring and local enforcement upon closing of the rookeries and to monitor sea lion hunting activities;

2. Conduct access permitting for the fur seal viewing blinds and subsistence fur seal harvest;

3. Develop and implement Tribal ordinances governing the hunting of sea lions and harvesting of fur seal and provide NMFS with up to date Tribal ordinances;

4. Develop and implement an effective local processes for informing the public regarding fur seal and sea lion federal and tribal laws and regulations;

5. Review, recommend, and advise on revisions to federal regulations governing fur seals and sea lions.

IX. FUNDING

Recognizing that certain costs may be associated with the implementation of this Agreement, both Parties agree:

A. That long term funding for sustained co-management and conservation programs is important for the health of fur seals and sea lions. No financial commitment on the part of any Party is required by this Agreement. Any requirement of this Agreement for the obligation or expenditure of funds by NMFS or STGTC for the use of staff or agency resources provided by specific appropriations, shall be subject to the availability of appropriated funds.

B. The STGTC and NMFS will assist each other in seeking funding from a variety of sources to support research and management projects of mutual benefit regarding

fur seals and sea lions, as stated in this Agreement.

C. The STGTC will submit a yearly budget to NMFS to fulfill specific responsibilities stated in this Agreement for each fiscal year the Agreement is in effect.

D. The NMFS will review the annual budget and after consultation with the STGTC, will assist with the obligation and provision of funding as deemed appropriate under the authorities specified in Section II (A) of this Agreement.

X. OTHER PROVISIONS

A. Nothing in this Agreement is intended or shall be construed to authorize any expansion or change in the respective jurisdiction of Tribal, Federal, or State Governments over fish and wildlife resources, or alter in any respect the existing political or legal status of Alaska Native entities.

B. Except as expressly provided herein, nothing in this Agreement shall restrict or limit any right or privilege of the STGTC (Unangan Community of St. George Island) with respect to fisheries, customary/traditional uses, or other use of any species.

C. Nothing herein is intended to conflict with current National Oceanic and Atmospheric Administration or NMFS statutory requirement and mandate. If the terms of this Agreement are inconsistent with existing laws, regulations, or legal mandates of either of the Parties entering into this Agreement, then those portions of this Agreement which are determined to be inconsistent shall be invalid, but the remaining terms and conditions not affected by the inconsistency shall remain in full force and effect. At the first opportunity for revision of this Agreement, all necessary changes will be accomplished by either an amendment to this Agreement or by entering into a new Agreement, whichever is deemed appropriate to the interests of both Parties.

D. This Agreement will stand as an official management tool for fur seals, sea lions and the structure locally know as the old seal plant as identified in Section I (A) of this Agreement.

E. Both Parties shall strive to support a policy of "no surprises" concerning contact with the media on potentially sensitive issues pertaining to northern fur seals and Steller sea lions. Each Party shall endeavor to consult with the other prior to initiating contact with the media on topics

contained within this Agreement. Under circumstances in which the media initiates contact with one Party, the contacted Party shall inform the other Party and provide details on the nature of the information communicated. In addition, when a Party is contacted by the media concerning issues relevant to this Agreement, that Party shall provide the other Party's contact information to the media representative and request that the media representative to contact the other Party.

F. All scientists who plan to conduct research on behalf of either Party on or around St. George Island as defined in Section I of this agreement are required to advise the Co-Management Council established herein in a timely manner as to the purpose, goals, and time frame of the research, data gathering techniques, expected results and possible adverse impacts of the proposed research. The Co-Management Council shall review this information and upon reaching a consensus, may provide comments and recommendations accordingly.

XI. ADOPTION, DURATION, AND MODIFICATION

A. This Agreement shall take effect upon the latest date of signature of the respective Parties and shall remain in effect until terminated by either of the Parties in accordance with the termination provision of this Agreement.

B. Modification of this agreement may be proposed at any time by either Party and shall become effective upon approval by both Parties.

C. This Agreement may be terminated by either Party by providing forty-five (45) days prior written Notice of Termination to the other Party. Such Notice shall be addressed to the principal contact for the receiving Party.

XII. SIGNATORIES

In Witness Whereof, the Parties hereto have executed this Agreement to be effective as of the last written date below:

National Marine Fisheries Service

7/22/01

James Balsinger — Date

for

Administrator, Alaska Region
National Marine Fisheries Service
U. S. Department of Commerce
P. O. Box 21668
Juneau, Alaska 99801

Aleut Community of St. George Island

Boris Merculief — Date

President, St. George Traditional Council
P.O. Box 940
St. George Island, Alaska 99591