

Introduction refers Ch 4

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OPTIONS APPENDIX

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1.0 Archaeological Site Stewardship Program

Beach clean up activities resulted in increased public knowledge of exact locations of archaeological sites throughout the oil spill area. Archaeological sites and artifacts affected by looting and vandalism, directly attributable to the oil spill, has been occurring at disturbing levels. The remoteness of most sites makes enforcement of archaeological protection laws difficult. A site stewardship program establishing a core of local citizens to watch over threatened archaeological sites would provide a significant means of resource protection.

Site stewardship is the recruitment, training, and coordination of a corps of local interested citizens to watch over threatened archeological sites located within their home districts. The Trustee Council has already begun work on this sub-option by approving a project which developed a guidance manual for a Site Stewardship program. However, to yield any beneficial results the project must be implemented and carried out over several years.

How will this help recovery?

Inherently, archaeological sites and artifacts are not restorable. The site stewardship program seeks to stop additional damage to these resource from continuing looting and vandalism by establishing a strong locally based watchdog and deterrent group.

In this way, communities will be given the options of participating directly in restoration if they are interested. Volunteers will become more knowledgeable of Alaska's past and are likely to share their experience and knowledge with others in their communities. Volunteers may receive small cash payments for expenditures associated their volunteer duties. The addition of cash in small communities may benefit some local businesses.

Additional information:

This option may be found under alternatives 3, 4 and 5.

The injury description for cultural resources is found on page ____.

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2.0 Intensify Fisheries Management to Protect Injured Stocks

Existing fisheries management programs are based on varying amounts of scientific data. For example, more is known about intensively managed species, such as salmon, than about rockfish, which have historically not been a management focus. However, in all cases, additional data would greatly improve existing management practices. More refined fisheries management could speed the natural recovery of injured stocks by restricting existing fisheries or redirecting them to alternative sites, while attempting to minimize impacts on human uses. Injured species targeted under this option include pink salmon, sockeye salmon, herring, rockfish, Dolly Varden, and cutthroat trout.

Successful restoration management depends on the ability to more precisely control stock-specific exploitation rates. Restoration based on stock-specific management requires varying amounts of additional data for different species. Additional research could potentially focus on better quantifying harvest levels from directed fisheries and bycatches, as well as stock characteristics such as age and size composition, natural mortality rates, seasonal movements, stock abundance and recruitment. Separation of discrete stocks through genetics research and other studies can also provide important information. Based on this data, the Alaska Department of Fish and Game could make management recommendations to the Board of Fisheries, which has the power to implement them in the form of new fishing regulations. Research costs involved with this option are variable. Data acquisition and plan implementation could take about two years.

How will this option help recovery?

Reducing human use of injured stocks is an effective restoration option that can greatly facilitate natural recovery of injured populations and the fisheries dependent on them. There are considerable fishing pressures on injured stocks throughout the spill area. For instance, commercial fisheries are often mixed-stock fisheries that harvest both injured and healthy stocks. If fisheries can be redirected through intensified management to selectively target only healthy stocks, injured stocks will have a better chance of recovery.

Additional Information:

This option can be found in alternatives 4 and 5 for cutthroat trout, Dolly Varden, herring, pink salmon, and rockfish and alternatives 3, 4, and 5 for sockeye salmon.

The injury descriptions can be found on page ____ for cutthroat trout, page ____ for Dolly Varden, page ____ for herring, page ____ for pink salmon, page ____ for rockfish, and page ____ for sockeye salmon.

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4.0 Reduce disturbance at marine bird colonies and marine mammal haulouts and concentration areas through regulation.

Human disturbance can adversely affect the fitness and reproductive success of marine birds and mammals. Species that gather in large numbers and traditionally make use of small, discrete sites are especially vulnerable. Disturbance at these important habitats can result in increased mortality of offspring or reduced health of adults. Existing management capabilities at important habitat sites are not always adequate to provide the extra protection from disturbance that is needed to help injured species recover. This option considers establishing buffer zones as special designation areas around important marine bird and marine mammal habitats.

Reduction of disturbance would be implemented through designation of buffer zones. Buffer zones can vary considerably between specific sites and are designed to meet the needs of each location. Most existing buffer zones encircle areas used by the species for reproducing or for resting during periods of physiological stress (i.e. harbor seal haul-out sites during molting). Restrictions within buffer zones can range from limiting the speed of boat traffic within a couple hundred feet of a specific site for a short time each year, to prohibiting boat or air traffic within a half mile or mile of the location. The different permitting agencies would be made aware of sensitive areas for the purposes of protecting the seals from unnecessary disturbances related to development activities.

How will this help recovery?

Human disturbance creates different problems for different species of marine birds and mammals. For common murres, loud noise can cause the adults to flush from the breeding ledges, kicking eggs off the cliffs and leaving eggs and young exposed to predators. The lower density and asynchronous nesting at the colonies within the oil-spill area already make the eggs and young more vulnerable to predation than prior to the oil spill. Modifying boat traffic around these colonies may reduce additional disturbance factors.

Haul-out sites are especially important for harbor seals. Rocks, isolated beaches, protective cliffs and sand/mud bars are used for resting, pupping and nursing young. Pair-bonds between females and their new pups can be weakened when the females are disturbed from the haul-out site, this can lead to the abandonment and death of the pups. Pups are sometimes crushed when the adults are forced to stampede into the water. Harbor seals rely on haul-out sites for resting during the molt. Protective measures for harbor seals should extend from mid-May to September to cover pupping and molting periods.

The importance of haul-out sites for sea otters is less understood. It is believed that haul-out sites may be important for sea otters in northern climates because of the colder water temperatures. It is reasonable to assume that haul-out sites in some way help maintain the health of sea otters and therefore affects their ability to reproduce. However, the irregular haul-out pattern of sea otters make chronic problems of human disturbance less likely than for harbor

seals. Little is known about the effects of activities on the uplands adjacent to sea otter concentration areas. Further study of this relationship will determine what, if any, actions should be taken to limit human activities in these areas.

Additional Information

This option can be found in alternative 5 for common murre and harbor seals and alternatives 3, 4 and 5 for sea otters.

The injury descriptions are found on page ____ for sea otters, page ____ for common murre and on page ____ for harbor seals.

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8.0 Develop Sport and Trapping Harvest Guidelines for Injured Species

Harlequin duck and river otter were injured in varying degrees by the oil spill and are also subject to human harvest pressure through hunting and trapping. Harvest pressure could be reduced or eliminated when it suppresses the natural recovery rates of the injured species. This can be achieved through temporary restriction or closure of sport harvests and trapping of the injured species in the oil-spill area. Harvest regulations for waterfowl and terrestrial mammals are created by the State Board of Game. Based on data on population levels and harvest rates, trustee agencies could recommend that the Board of Game close or reduce sport harvest and commercial trapping of injured species. Proposals for regulation changes may be submitted to the Board for review during the bi-annual meetings. 60-day public notices are required for any proposed regulation changes. In addition, harvests can also be closed by "emergency order" if it appears that existing regulations may allow overharvesting to occur. Emergency orders can be issued by the Alaska Department of Fish and Game within 24 hours and are effective for 120 days.

How will this help recovery?

Reduction in harvest of injured species would mean a greater opportunity for the spill zone populations to reproduce and increase their numbers by eliminating additional mortality. To the degree that harvest pressures suppress natural recovery rates, this option could aid population recovery.

Additional Information

This option is found in alternative 5.

The injury descriptions are found on page ____ for river otter and page ____ for harlequin duck.

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9.0 Minimize Incidental Take of Marine Birds By Commercial Fisheries

Entanglement of marine birds in gillnets deployed in high seas and coastal fisheries in the North Pacific is a recognized conservation problem. Studies have documented mortality to common murres and marbled murrelets due to entanglement in gillnets particularly in California, British Columbia and Alaska. Within and adjacent to the area affected by the *Exxon Valdez* oil spill, there are several coastal gillnet fisheries for salmon, including the Prince William Sound and Cook Inlet drift and setnet and Kodiak setnet fisheries. In both 1990 and 1991, observers found that only a small percentage of birds that came within 10 m of driftnets became entangled; almost no birds became entangled in setnets. It is estimated that over 460 common murres and about 300 marbled murrelets died due to entanglement in Prince William Sound driftnets in 1991. The significance of this level of mortality is unknown.

Under this option, the extent of marine bird mortality in these fisheries would be examined. If this mortality is found to represent a significant source of mortality for marine bird populations in the spill area, an effort to develop new technologies or strategies for reducing encounters between marine birds and gillnets would be made.

How will this option help recovery?

This option could facilitate recovery of marine bird species whose populations were reduced by the *Exxon Valdez* oil spill by reducing an ongoing source of mortality and reducing the time needed for injured marine bird populations to return to pre-spill levels. However, determining the potential effect of this option on injured resources is difficult because the extent of marine bird mortality due to gillnet entanglement has not been determined.

Additional information:

This option can be found in alternatives 3, 4, and 5 for marbled murrelets and in alternatives ____ for common murre.

The injury description is found on page ____ for common murres, and on page ____ for marbled murrelets.

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10.0 Preserve Archaeological Sites and Artifacts

Conservative estimates based on injury studies to date suggest that at least 113 archeological sites located on State and Federal land within the Exxon Valdez oil spill pathway sustained injury from oiling, oil spill cleanup activities, or vandalism. In a few cases, there is sufficient available information to determine if specific restoration measures are necessary to the continued preservation of the site values, and if so, which restorative activities are appropriate to the need. However, in many cases the injury data available from response records is not sufficiently detailed to reach an informed decision on treatment. If the Archeological Resource Protection ACT (ARPA) regulations are employed as a guide, individual, detailed assessments of injury are a first essential step in the restoration process. Once there is sufficient information, two basic categories of restorative treatment may be considered, physical repair or data recovery.

These two types of restorative treatment are not duplicative. They are often employed in conjunction with each other. Physical repair includes such actions as restoring trampled protective vegetation at a site or filling in a looter's pothole. Data recovery is used to recover what bits of information can be salvaged from the area of an illegal excavation--in a sense, restoring to the public what information has been potentially lost by means of scientific investigations. The initial focus would include the 24 archeological sites for which there is clear evidence of injury. The results would include the prevention of further injury and professional documentation on the restorative actions taken.

How will this option help recovery?

Since archaeology artifacts can not, in a biological sense recover from injury or looting, recovery will not be aided. However, this option has the potential to significantly reduce further degradation or decline of the resources and services associated with archaeological sites and artifacts.

Additional information:

This option can be found in alternatives 3, 4, and 5.

The injury description for cultural resources is found on page ____.

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11.0 Improve Freshwater Wild Salmon Spawning/Rearing Habitats

This option could be used to restore injured salmon runs to pre-spill levels or to enhance either injured or equivalent runs above pre-spill levels. There are a variety of techniques for improving or supplementing spawning and rearing habitats to restore and enhance the wild salmon populations. Specifically, three could be applied under this option. They are: (1) Construct salmon spawning channels and instream improvements; (2) Fertilize lakes to improve sockeye rearing success; and (3) Improve access to salmon spawning areas by building fish passes or removing barriers. Surveys of the oil-spill area will determine where mitigation will be required.

Pink salmon, which swim to sea in their first year, depend primarily on spawning and rearing habitat available within a stream channel. They may benefit from construction of improved spawning channels and fish passages, removal of barriers impeding access to upstream spawning habitats, and addition of woody debris to provide cover and food. Young sockeye salmon grow in lakes for 1-3 years before emigrating to sea. Appropriate restoration and enhancement techniques for sockeye salmon are determined by the amount of spawning and rearing habitat in the lake/river system. In lake systems with inadequate spawning habitat, spawning channel or fish passage improvement may be appropriate to increase the amount of available spawning habitat. In lake systems with damaged rearing habitat, chemical fertilizers may be added to lakes to temporarily supplement the nutrients needed to sustain the prey on which fry feed.

It is critical that use of any techniques be integrated into existing salmon management plans to prevent an overproduction of fry that could not be supported by available feeding, rearing and spawning habitats.

How will this help recovery?

The fry-to-adult survival of pink and sockeye fry reared under controlled conditions is double the natural survival rate. Marine survival is also much higher than under uncontrolled conditions. Wild pink salmon populations are would increase due to greater availability of spawning areas following improvements. The egg-to-fry survival of salmon in spawning channels is 5 to 6 times greater than survival in unimproved streams. Lake fertilization will greatly improve over-winter survival and smolt-to-adult survival, because the fish are larger in the fall and at outmigration into the ocean. Increased stock productivity and adult returns could result from these restoration techniques.

Additional Information:

This option may be found under alternative 5 for pink salmon and alternatives 4 and 5 for sockeye salmon.

The injury descriptions are found on page ____ for pink salmon and on page ____ for sockeye salmon.

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12.0 Creation of New Recreation Sites and Facilities

The spill area contains public lands that provide recreation services to the public. These lands include the Chugach National Forest, four National Wildlife Refuges, three National Parks, and five State Parks. Recreation use of public lands and facilities appears to have declined after the spill. Visitors may perceive their destinations differently after the spill and may have changed use patterns.

12.1 New Backcountry Public Recreation Facilities

Construction of new public recreation facilities such as mooring buoys, boat ramps, picnic areas, outhouses, caches, cabins, campsites, and trails could create opportunities for public use. They could also control use of and access to the area. Controlling use could reduce resource damage, improve safety, and divert activity away from sites injured by the spill. On the other hand, construction of new public facilities could also attract more people and increase use of a damaged ecosystem.

12.2 Marketing Public Land for New Commercial Facilities

This option consists of making public land available for commercial recreation facilities such as fuel stops, docks, campgrounds, and lodges. It would provide funds for planning and marketing these sites. This proposal would create opportunities for human use of the spill area and needed services. However, it could also increase use of a damaged ecosystem. Furthermore, private landowners are able to supply ample land for commercial recreation facilities.

How will this help recovery?

Developing new backcountry public recreation facilities and attracting new commercial recreation facilities onto public land aid recovery by enhancing pre-spill recreation opportunities. New sites and facilities will also enable the land manager to focus their education programs. Providing education on environmental awareness will enhance both the manager's capabilities and public knowledge for a common goal of sustained, sensitive, high-quality interaction with the environment.

Additional Information

This option is found under Alternative 3, 4, and 5. However, under Alternative 3 only those public recreation facilities that protect existing use would be promoted. Under Alternative 4, facilities that either protect or increase existing use would be funded. Alternative 5 includes public recreation facilities that either protect or increase existing use or encourage new use of the spill area.

The injury description for recreational use is found on page ____.

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13.0 Eliminate Oil From Mussel Beds

Persistent oil adjacent to mussel beds or anadromous streams represents a potential threat to living resources that utilize them as food or habitat. Chemical analyses of mussel tissue and sediments from contaminated mussel beds revealed very high levels of petroleum contamination.

The objective of this option to determine the geographic extent of persistent oil in and adjacent to oiled mussel beds and anadromous streams in Prince William Sound. The study will also determine the concentration of oil remaining in mussels, the underlying organic mat and substrate. This study will determine and implement, if necessary, the most effective and least intrusive method of cleaning oiled mussel beds and areas of contamination adjacent to anadromous streams. This study will also provide chemical data to assess the possible linkages of oiled mussel beds to harlequin ducks, black oystercatchers, juvenile sea otters, juvenile and adult river otters, and other organisms.

This option also includes a monitoring component designed to assess the efficacy of stripping on elimination of oil from mussel beds. Both the fate of oil in mussels and in the substrate and the effects of oil on growth and reproduction of mussels will be followed at oiled and unoled-control study sites.

How will this option help recovery?

Stripping or tilling of contaminated mussel beds will increase flushing of residual oil. By exposing buried oil to the air, residual oil will be eliminated through weathering and microbial degradation. Consequently, less oil will be available for bioaccumulation by mussels and other invertebrates. Less oil also will be available as contaminated prey for predator species such as harlequin duck, black oystercatcher, sea otter and river otter.

Additional information:

This option may be found alternatives 3, 4, and 5.

The injury description for coastal habitat is found on page ____.

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14.0 Accelerate Recovery of Upper Intertidal Zone

Much of the upper intertidal zone within the oil spill area was heavily oiled and subjected to intense clean-up. This zone is dominated by the brown alga, *Fucus gardneri* (popweed), which has been slow to recover. Moreover, many of the other life forms that use the upper intertidal zone are dependent upon *Fucus* for both cover and food. The scientific literature documents that *Fucus* is slow to recover and that its recovery affects the recovery of the rest of the intertidal community.

It is the objective of this restoration option to accelerate the recovery of this important habitat. This includes: 1) Installation of trickle irrigation system to enhance moisture retention, 2) Use of biodegradable materials, e.g., burlap, placed to provide additional substrate for germling attachment and cover, and 3) transplant of adult plants attached to small rocks and cobble. The proposed feasibility study will include an analysis of cost versus benefit.

Construction will be kept to a minimum, and research (habitat manipulation) will not further degrade the integrity of the intertidal ecosystem. Where possible, monitoring will be conducted using non-destructive and the least intrusive methods available.

How will this option help recovery?

If a new *Fucus* canopy can be established, other seaweeds, invertebrates and even terrestrial animals will be afforded a suitable habitat and/or source of food. It also has been observed that new *Fucus* plants are more likely to recruit in rock cracks, other rough surfaces and not on tar or bare rock; and the presence of adult *Fucus* enhanced local recruitment. Restoration approaches based on these research results could significantly increase the rate of *Fucus* recovery.

Additional information:

This option may be found in alternatives 3, 4, and 5.

The injury description for intertidal organisms is found on page ____.

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16.0 Increase Productivity and Success of Murre Colonies

Numerically, common murrens suffered the greatest direct mortality from the oil spill of any bird species. Based on restoration work with related species and an understanding of murre behavior, there are several techniques that hold some promise of increasing murre productivity. Methods that could be considered include enhancing social stimuli with the use of decoys and recorded calls to encourage nesting activity (See 16.1), and improving the physical characteristics of nest sites such as adding sills to ledges to increase productivity (See 16.2). These techniques are experimental and possibly intrusive, but if effective, have the potential to reduce the recovery time of murrens nesting in colonies in such places as the Barren Islands.

16.1 Increase Murre Productivity Through Enhanced Social Stimuli.

This suboption would include developing and implementing a feasibility study which experiments with techniques that could increase murre productivity by enhancing social stimuli. Common murrens have a synchronized breeding strategy which helps reduce predation pressure. Synchrony means that all the birds arrive at the colony as a single, large group and begin egg-laying at the same time. This synchronization was disrupted by the oil-spill and some populations have not resumed normal breeding patterns. The lack of synchrony could be a function of either the reduced numbers of birds, or the young age and lack of experience of the remaining birds. Enhancing social stimuli, such as using decoys and recorded calls to give the illusion of typical breeding densities may encourage a return to normal breeding patterns. These techniques have been successfully used on a variety of seabirds, including Alcids.

Nesting density is known to be an important factor in influencing breeding success at murre colonies. Murrens have their highest breeding success when they nest in high densities (greater than 10 birds/meter). The dense congregation of birds allows for protection from avian predators and is believed to help synchronize egg laying so that hatching and fledging occur simultaneously. Vocalizations are also believed to provide breeding stimulus. Synchronization is important because it allows for group defense of eggs and chicks. Studies have shown that scattered parent/chick groups were 100 times more likely to be depredated than larger groups of parents and chicks where the chicks are of a similar age and fledge together.

While it is technically feasible to use decoys and recordings to attract murrens to colonies, it is unknown whether the technique would influence the breeding synchrony of the injured populations. This option would first be implemented as a feasibility study. A management plan would be written to implement this option on a larger scale if the feasibility study is successful.

16.2 Improve the Physical Characteristics of Murre Nest Sites

This suboption would require development and implementation of a feasibility study to improve the physical characteristics of the nesting ledges to increase murre productivity. These techniques are largely experimental. Several ideas have been proposed by experts including: provide breeding ledges with sills, add partitions and/or roofs on nesting ledges, blanket-off or cover portions of breeding cliffs, enlarge nesting ledges on cliff faces and clear debris from otherwise suitable nesting sites. An implementation plan will be developed to expand this work if the feasibility study is successful.

Common and thick-billed murres lay their eggs on the bare surface of cliff ledges. Eggs are often lost when the adults are disturbed from the ledges and knock the eggs off of the cliffs. Sometimes the ledges are sloped outward which places the eggs in very precarious positions. Providing sills to the ledges could prevent or reduce this additional loss. Many of the young are lost to predation or accidents before they leave the colony. Predators such as gulls, eagles and ravens are especially effective when the density of nesting birds is low. Constructing partitions or creating roofs over nesting ledges may reduce predator access to the breeding birds. Techniques which reduce the loss of eggs from falling off of the ledges, or reduce the ability of predators to take eggs and chicks, will increase the productivity of a colony.

How will this help recovery?

If successful, decoys and recordings will make the birds believe they are in a healthy, productive colony. On-site manipulation may allow the populations to resume normal breeding patterns more rapidly, and may reduce predation of the existing breeding birds. Some murre colonies have not yet resumed synchronized breeding and have lost up to 70 percent of their breeding population during the oil spill. Murres are not expected to have recovery rates of more than 10 percent per year once they have started normal breeding behavior, and the predicted recovery time for populations injured by the Exxon Valdez Oil Spill is expected to exceed 70 years. Since pre-breeding murres often visit colonies other than their natal colony to investigate nesting space. Using playback recordings of murres at a large colony, may attract prospecting murres to the depleted colonies and reduce the recovery time of the population.

The natural recovery rate for common and thick-billed murres is believed to be less than 10 percent per year for a healthy colony. Constructing sills and reducing predator opportunity may significantly reduce disturbance to attending parents allowing a greater percentage of chicks to reach fledgling age and thereby increasing the rate of recovery.

Additional information:

This option may be found under alternatives 3, 4, and 5.

The injury description for common murres is found on page ____.

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17.0 Increase Productivity and Survival Of Marine Birds Through Predator Control

Predation can have a significant affect on the productivity of seabirds. Fox, which are not indigenous to many of the islands of the Aleutian chain and Gulf of Alaska, were introduced on more than 400 islands to be raised and trapped for their furs. Introduced fox reduced and even eliminated populations of surface, burrow and in some cases cliff-nesting birds in a matter of years. Birds were also harmed by incidental introductions of rodents, many of which were released to the islands to provide food for the fox. Eagles, gulls, ravens and crows are also known predators of murre and other seabirds.

The primary goal of this option would be to remove introduced fox from islands along the Alaska Peninsula and the Aleutians. Several steps would need to be taken to accomplish this task including identifying and prioritizing target islands, working with the Environmental Protection Agency and Department of Agriculture to secure registration for toxicants, and removing fox from up to 4 islands per year for a total of approximately 20 islands. Programs to eradicate red and arctic ("blue") fox on islands have been successful in the past and would increase Alaska's population of marine birds.

Reducing avian predators and terrestrial predators on mainland colonies is feasible, but would be difficult to implement for long term effects. Eagle predation could be reduced by providing young eagles to the eagle reintroduction program in the lower 48 states. Removing gulls from islands would require traps or poison baits but care would have to be taken to minimize killing non-target species. Reducing predation for nesting pigeon guillemots would be more difficult due to the dispersed nest locations. Initial predation studies would need to be completed to determine the feasibility of benefiting guillemots through predator removal. At least one season of intensive research is needed to determine if this program can be justified.

How will this help recovery?

On some small islands, spectacular increases in breeding birds have been documented after the disappearance or removal of fox. Their removal allows a variety of native birds, including seabirds and waterfowl, to re-inhabit these islands. Fox are voracious predators of chicks and eggs and climb among the nesting birds to feed. Their removal will allow the productivity of these islands to increase with increased survival of chicks and eggs.

Glaucous-winged gulls, northern ravens, and bald eagles are effective predators on murre colonies in the oil spill area. Murre eggs and chicks are especially vulnerable when the colony density is reduced or when nesting is not synchronized. These are both problems at colonies injured by the oil-spill. Gulls are believed to be a major source of egg mortality at some colonies, sometimes accounting for 40% of the egg loss. Reducing avian predator populations at murre colonies could increase the productivity.

Additional Information:

This option may be found under alternative 3, 4, and 5 for common murres and pigeon guillemots, and alternatives 4 and 5 for black oystercatchers.

The injury descriptions are found on page ____ for common murre, page ____ for pigeon guillemots, and page ____ for black oystercatchers.

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18.0 Replace Fisheries Opportunities by Creating New Salmon Runs

This option entails starting new salmon runs to replace fishing opportunities lost due to closures resulting from the oil spill. For example, if Kenai River sockeye fishing is closed or restricted for multiple years, alternative runs could partially compensate the loss. The option restores services by providing replacement harvests, but does not restore injuries suffered by impacted species of fish. Commercial, sport and subsistence fishermen could all potentially benefit.

The option would be implemented by starting terminal runs, originating from and returning to hatcheries or remote release sites. Returning fish would be harvested and brood stock would be used to artificially propagate the next generation. Since the runs would be dependent on artificial fertilization, the new runs could be terminated once recovery of target fisheries occurs.

ADF&G standards and requirements for genetic and disease screening and brood stock selection would have to be met. Also, Regional Planning Teams must approve any proposed actions. Planning concerns include avoiding harmful interactions with wild stocks and interceptions of existing stocks. There may be some areas for which this option is not appropriate.

How will this help recovery?

The aim of this option is to minimize additional injuries to user groups by providing alternative fishing opportunities when historical fishing areas are restricted. As an alternative to completely closing fisheries or reducing bag limits, fishing pressures could be redirected to target these new runs until injured stocks recover. This option could also be used to enhance fishing opportunities above pre-spill levels if new runs were continued after target species recover.

Additional Information:

This option may be found under Alternatives 3, 4, and 5 for Commercial Fishing and Recreation and Alternative 5 for Subsistence.

Injury descriptions are found on page ____ for Commercial Fishing, page ____ for Recreation and page ____ for Subsistence.

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19.0 Protect Undocumented Anadromous Streams by Updating the ADF&G Anadromous Stream Catalogue

This option pertains to updating the state's Catalog of Waters Important for the Spawning, Rearing or Migration of Anadromous Fishes and its associated atlas. Updating these documents through additional stream surveys would increase protection of injured anadromous species, their habitat, species that feed on them, and the services they provide. Anadromous streams listed in the catalog are automatically afforded legal protection under Alaska Department of Fish and Game (ADF&G) statutes. In addition, the information acquired during stream surveys will be necessary for the Trustees' evaluation of management, protection and acquisition options for restoring anadromous fish and their habitats. While many of the anadromous streams in the spill area are listed in the catalog, the list is not complete. Many new streams were noted during the spill response but were incompletely surveyed at the time. Others have never been surveyed and many surveys need to be updated.

How will this help recovery?

Listing anadromous streams in the state catalog will facilitate natural recovery of injured resources and services by providing protection against human activities stressful to already damaged species and habitats. Streams listed in the catalog are protected by state statutes and permit requirements not applicable to unlisted streams. State statutes regulate all instream disturbances and activities in the anadromous waters and require that ADF&G be informed of and issue permits for all such activities. The implementation of this option could prevent future habitat degradation and potentially improve natural recovery rates.

Additional Information:

This option may be found under alternative 5 for pink salmon and cutthroat trout.

The injury descriptions are found on page ____ for pink salmon and page ____ for cutthroat trout.

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30.0 Test Subsistence Foods For Hydrocarbon Contamination

The goal of this option is to restore the confidence of subsistence users in the safety of the subsistence resources. This will entail monitoring hydrocarbon levels in selected subsistence species, communicating findings to subsistence harvesters, and integrating findings of other studies of spill related injuries into previously developed health advice. Community participation in all aspects of this option is critical to ensure the credibility of results.

None of the other options are directly aimed at restoring the confidence of subsistence users in the safety of traditional foods. An overall restoration monitoring program may achieve some of the same objectives, but it may not target subsistence species in traditional harvest areas or involve the direct participation of residents in impacted communities.

Tissue and bile samples of subsistence species, including mussels, rockfish and harbor seals, will be collected from the harvest areas of impacted communities. Community representatives will assist in site selection, as well as collection of samples. The samples will be analyzed for the presence of hydrocarbon contamination. The results of the tests, along with findings from other damage assessment and restoration studies, will be interpreted by the Oil Spill Health Task Force, and reported to the communities in an informational newsletter and community visits.

This option will take one year to implement. At the end of that time, the degree of recovery of the resources, as well as that of the subsistence economy, should be re-evaluated to determine whether the program should be continued. The confidence of the subsistence users in the safety of subsistence foods is likely to lag behind the recovery of the resources to some extent.

How will this help recovery?

Only limited recovery to pre-spill subsistence harvest levels has occurred. A primary reason for continued relatively low levels of subsistence harvests are the communities' concerns about the long-term health effects of using resources from the spill area. By involving the communities in the monitoring of the recovery of the resources, and by bringing information concerning the safety of the resources back to the communities, it is anticipated that subsistence harvests will begin to approach pre-spill levels, and anxiety about their use will be reduced.

Additional Information:

This option may be found under alternatives 3, 4, and 5 for subsistence.

The injury description for subsistence is found on page ____.

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33.0 Education: Public Information Program Through Visitor Centers

This option proposes that the Trustees fund construction and operation of a large visitor-center or expand an existing visitor center somewhere in the affected area. Possible locations include Cordova, Valdez, Anchorage, Seward, Homer, or Kodiak.

Residents and visitors alike seek information about the oil spill and the status of recovery. By developing informational and educational products, and locating them in a visitor center dedicated to that information, the Trustees can help the public become better informed about this significant event in Alaska's history. Through information, people can understand what happened, and how they can participate in the efforts to speed recovery of injured resources. Information from the visitor's center could also be available to other visitor's centers, government agencies, organizations in the spill area, and school curricula.

This option assumes that the visitor center would be located in a town, or in some area designated for this use. It does not assess the land-use effects of locating the center.

How will this help recovery?

A visitor's center and its staff would design and develop information available from the damage assessment and restoration process to inform the public about the spill, and about how they can help injured resources recover from the spill and from the clean-up. Specifically, the information would explain the history of the spill, changes to the ecosystem, status of recovery, and how people can lessen any harmful effects they create when using the spill area.

Additional Information:

This option may be found under alternative 5 for recreation and commercial tourism.

The injury description for recreation and commercial tourism is found on page _

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34.0 Marine Environmental Institute and Research Foundation

This option would establish a new marine environmental institute within the oil spill affected area. Its purposes would be to study the marine environment and provide public education. The institute would also serve to coordinate recovery monitoring, basic and applied research, and environmental education programs dealing with the effects of the spill. Public exhibits and marine aquaria would be an integral part of the institute.

Research in the institute would focus on the ecology of nearshore Alaskan marine habitats; the biology of Alaskan sea life, marine mammals and seabirds and the monitoring of the effects of the Exxon Valdez oil spill on the marine environment. Research efforts and support would be coordinated with the University of Alaska's Institute of Marine Science. Environmental education programs would have the same goal. The public education effort would be facilitated by the live exhibits of both animals and habitats that are created and used by the scientists for their research. Field trips, for the public, would be conducted by institute staff. The environmental education program would be coordinated with that of the Alaska public school system and University of Alaska.

A major resource management effort would be based at the Institute. The goal of this program would be to develop baseline information on both species and habitat diversity within the oil spill area. The program would identify the area's animals and plants and their habitats and map those habitats on a Geographic Information System (GIS). This kind of information were sorely lacking at the time of the spill. If made available, as a result of this program, the data would provide invaluable assistance to oil spill response planners and for future damage assessment and restoration efforts in the event of another spill.

How will this help recovery?

The institute would provide support for certain direct restoration projects, feasibility studies, and monitoring of injured resources and services. Environmental education programs developed and implemented by the institute would help to minimize additional impacts on injured resources and services. Living exhibits would introduce the public to animals and habitats injured by the spill and facilitate an understanding of their life histories and sensitivities to human disturbance.

Additional Information:

This option is found under alternative ____.

The injury description for _____ is found on page ____.

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35.0 Negotiate With Museums and Agencies To Acquire Replacements For Artifacts Looted From the Spill Area

Conservative estimates based on injury studies to date suggest that at least 113 archeological sites located on State and Federal land within the Exxon Valdez oil spill (EVOS) pathway sustained at least some degree of injury from oiling, oil spill cleanup activities, or vandalism. This option seeks to replace and/or recover those artifacts that have been lost and place them in or return them to public ownership for appropriate public display and for scientific uses.

This option would identify institutions (non-Alaskan) and individuals with archaeological artifacts from the oil spill region who would be willing to sell some or all of their artifacts to the Exxon-Valdez oil spill Trustees (member agencies). In turn, the Trustees would transfer acquired artifacts to appropriate public institutions within the oil spill area for public display (i.e. museums) and appropriate scientific uses and study.

It is estimated that preparation of a list of owners, prioritization of, and actual acquisition would take a period of two years.

How will this help recovery?

This option will not improve recovery. It will return artifacts to appropriate public agencies and institutions in the oil spill area as a replacement for those artifacts lost.

Additional Information:

This option may be found under alternatives 4 and 5.

The injury description for archaeology is found on page ____.

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37.0 Habitat Protection and Acquisition

The acquisition of private lands or partial interests in private lands, by the Trustees, is a method for protecting habitats linked to resources and/or services injured by the oil spill. For purposes of the Restoration Plan, it has been designated as the Habitat Protection and Acquisition Process. Policy guidance for this process is set forth in the Plea Agreement and in the Memorandum of Agreement and Consent Decree. It is designed to respond to both potential, long term threats and to more immediate or imminent threats to injured resources and services. The intent of habitat protection or land acquisition is either to prevent additional injury to resources and/or services or to acquire lands that contain resources equivalent to those injured by the spill.

This approach to land acquisition is a multi-step evaluation process that includes threshold criteria for initial screening of proposals and more specific evaluation and ranking criteria. The threshold criteria are designed to eliminate proposals that are inappropriate or unreasonable. The evaluation and ranking criteria will be used by the Trustees to prioritize or rank those candidate lands that are in complete compliance with the threshold criteria.

In order to respond to proposed changes in land use that would foreclose habitat protection opportunities, an Imminent Threat Process was developed. This process was an accelerated assessment procedure that used short term protection tools, such as a moratorium or rights of first refusal, to give the Trustees adequate time to gather enough information to make an informed decision on acquisition. A threat analysis procedure was developed to test the immediacy of, what were perceived to be, imminent threats.

Long term protection tools that will be considered for use by the Trustees include: fee acquisition, conservation easements, acquisition of partial interests, and others. Subsequent to purchase, acquired parcels will be managed by the appropriate resource agency in a manner that is consistent with the restoration of the affected resources and/or services.

How will this help recovery?

The intent of land acquisition is to prevent further damage to, and to foster recovery of resources or services injured by the *Exxon Valdez* oil spill. Acquisition of title or partial interests, followed by appropriate management, will prevent degradation of upland habitats considered to be essential to recovery of affected resources. Acquisition and protection of uplands linked to affected services will also prevent degradation of the latter.

Additional Information:

This option may be found under alternative ____.

The injury descriptions for _____ are found on page ____.

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40.0 Special Designations

Marine and intertidal areas, and uplands in public ownership can be placed into special state or federal land designations which provide increased levels of regulatory protection. An important feature of special designations is that they can provide a regulatory basis for managing an area on an ecosystem level, with the primary objective of restoring spill injuries. Special designations are appropriate when they provide a beneficial level of protection, not provided by existing regulations, for recovering resources and services. Special designations may not be appropriate when they place significant restrictions on injured services or encourage intensive public use of recovering habitats.

Different designations place varying amounts of emphasis on providing resource protection, opportunities for public uses, and scientific research. The appropriate designation can be determined by examining which injured resources and services are present, any scientific monitoring opportunities offered by the area, what type of additional regulatory protection is required to assure continued recovery, and existing and planned human uses. Special designations under consideration include: Alaska State Parks, Alaska Department of Fish and Game Special Areas, National Marine Sanctuaries, National Estuarine Research Reserves, Research Natural Areas, Areas Meriting Special Attention established under the Alaska Coastal Management Program, Federal Wilderness Areas, and State Public Use Areas. A critical factor in the success of any special designation is sufficient funding to support future management and enforcement activities.

State park units would be managed primarily for recreational purposes, with the additional requirement that certain activities would require park use permits, as per 11 AAC 12. When considering this option, new parks should not be sited in areas which sustained heavy damage from the spill or support concentrations of injured species, since increased human use might inhibit the rate of natural recovery.

State-owned submerged lands and upland habitats can be designated as special areas by the Alaska legislature. Special areas include Critical Habitat areas and Game Refuges and Sanctuaries (as per AS 16.20). Such areas would be managed on an ecosystem level to restore damaged resources and services and provide opportunities for compatible public uses. Legal existing uses are permitted, although they must be compatible with special area regulations.

The Marine Protection, Research and Sanctuaries Act of 1972 authorizes the designation of National Marine Sanctuaries in federal and state waters to preserve or restore marine and coastal waters for their conservation, recreational, ecological, historical or aesthetic values. Sanctuary designations located within the territorial waters of a state can only be considered if the state's governor certifies that the designation is acceptable. In addition, significant public involvement is required throughout the designation process. The National Oceanic and Atmospheric Administration manages the sanctuaries but typically consults closely with state and local management agencies. Individual management plans and regulations are created for each site to achieve comprehensive and coordinated conservation and research, and to ensure that multiple uses are managed compatibly with resource protection. Sanctuaries do not necessarily prohibit pre-existing uses, although all activities must be

consistent with the purposes for which the sanctuary was established.

National Estuarine Research Reserve Sites are established to address threats to the nation's estuaries. The establishment of an estuarine research reserve could be integral to a comprehensive recovery monitoring program and could be used to assess recovery of natural resources injured by the oil spill. Permanent monitoring sites allow for the establishment of baseline environmental conditions to use as reference standards. In addition, research reserves are managed to maintain the ecological integrity of study sites and could provide additional protection to recovering resources. Individual sites are managed by the state in partnership with the National Oceanic and Atmospheric Administration.

Research Natural Areas can be established in the Chugach National Forest to "illustrate adequately or typify for research or educational purposes, the important forest and range types in each forest region, as well as other plant communities that have special or unique characteristics or scientific interest or importance." Practically, such a designation could serve essentially the same function as that of an estuarine research reserve. Research Natural Areas are managed by the U.S. Forest Service.

An Area Meriting Special Attention (AMSA) can be established under the Alaska Coastal Management Program (ACMP) in order to preserve, protect or restore exceptional natural resource values and human use opportunities. Statutes and regulations specify that AMSA's may include the following: important subsistence use areas; areas with high scientific or research values; potential estuarine or marine sanctuaries; areas of unique, scarce, fragile or essential habitat; areas of high natural productivity; and areas with substantial recreational value.

Designation and management of wilderness emphasizes the preservation of pristine qualities and opportunities for non-mechanized recreation as provided by the Wilderness Act and Alaska National Interest Land Claims Act (ANILCA). ANILCA permits established uses to continue, provided they are consistent with management intent. Changing management designations of all or part of the federal land near the EVOS could modify management direction to favor undeveloped recreational opportunities and wilderness qualities.

State Public Use designations are designed to acknowledge lands that are of public benefit. This can include recognition of fish and wildlife resource values, recreation, and other uses. The state is prevented from selling lands that are given this designation.

Finally, the Trustee Council may consider an entirely new special designation for lands that are acquired as a result of the habitat protection and acquisition process. A special designation could be used to assure that lands are managed consistent with the goal of promoting the recovery of injured fish and wildlife species and services. This would, at a minimum, require state legislative approval and could require Congressional approval if existing parks, refuges or sanctuaries are affected. State or federal land management agencies with lands adjacent to specially designated areas would likely assume management responsibilities.

How will this help recovery?

Enhanced protection of injured marine habitats will facilitate natural recovery by restricting activities stressful to already damaged resources. Special designations provide a mechanism for managing fairly large areas as complete ecosystems, rather than just targeting activities or protecting only certain organisms. They can also promote public education and compatible public uses by providing public access, interpretive signs, etc.

Some marine resources are afforded protection under current state or federal laws. However, marine resources are generally managed on a species by species basis. Often, the management emphasis is on how much a particular resource can be used during a given season, rather than on ecosystem-level management. In addition, efforts to coordinate research on multiple species and associated upland areas are generally considered inadequate. Specific regulations and management guidelines can be created for sanctuaries which address these deficiencies.

Much of the area impacted by the spill is heavily used for recreation and it is reasonable to expect that new parks established in suitable locations would receive substantial use. Designating state parks will help to meet this demand and will restore some of the lost recreational and aesthetic services injured by the spill. In addition, it could refocus recreational uses away from habitats damaged by the spill.

Undesignated state lands which support injured resources and services exist throughout the spill area. Some of these lands are subject to ongoing or planned commercial and public use activities which conflict with habitat requirements of injured species and the services they support. Increased protection of these areas would ensure that restoration objectives would receive management priority.

Additional Information:

This option may be found under alternatives 2, 3, 4, and 5.

This option potentially benefits all injured resources and services listed in Chapter ____.

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45.0 Facilitate Changes in Black Cod Fishery Gear

This option would examine the feasibility of subsidizing a voluntary change of gear types in the Prince William Sound black cod (sablefish) fishery. The existing fishery uses longlines and has historically attracted killer whales. The whales learned to strip the cod off the lines. In the past, this has resulted in harassment and shooting of killer whales. While this has not been a major problem recently, upcoming changes in the way the fishery will be conducted may increase interactions. However, in areas such as British Columbia where black cod are caught in pots, whales are unable to take the fish and are not generally attracted to the boats.

Several factors must be considered to determine the feasibility of subsidizing a gear change, one of which is the willingness of fishermen to make the switch. Also, boats must be above a certain size in order to safely handle pots and, if large numbers of small boats currently participate in the fishery, the gear change would not be feasible. Other factors to study would be the history and location of problem areas, and the impact of the upcoming changes in the way the fishery is regulated, which will result in fewer boats fishing for longer periods. This may provide more sustained opportunities for whales to steal fish from boats they have learned to associate with longline fishing.

How will this help recovery?

If changing gear types is feasible and fishermen are willing to make the change, the switch will reduce interactions between fishermen and killer whales. Since killer whales are not able to take black cod from pots, they will not be as attracted to the boats attracted to pot fisheries and won't be as subject to harassment by fishermen. This reduction in disturbance and should facilitate recovery of killer whales in the Prince William Sound area.

Additional information:

This option is found in Alternatives 4 and 5.

The description of injury for killer whales is found on page ____.

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46.0 Cooperative Program With Commercial Fishermen to Reduce Bycatch of Harbor Seals

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47.0 Cooperative Program With Subsistence Users to Assess Marine Mammal Harvest Levels

Harbor seals and sea otters are legally harvested by subsistence users in the spill area. This option provides a means for agency wildlife biologists and subsistence users to cooperatively assess the need for voluntary harvest reductions. If it was mutually agreed that an injured species was being overharvested, subsistence users and biologists could determine voluntary reductions in subsistence harvest levels which would remain in place until populations had recovered from oil spill injuries. Harvest reductions would enhance the rate of natural recovery of injured species by reducing harvest pressures. Subsistence harvest and other services dependent on these species would also benefit in the long-run from population recovery.

Funding would be used to pay for biologists to travel to subsistence areas and meet with subsistence hunters and, possibly, to reimburse subsistence hunters for assistance provided in gathering relevant biological information or samples. This would facilitate regular, face-to face discussion of the latest information on the injury status of subsistence species and would supplement ongoing public information efforts, such as newsletters and videos put out by the Subsistence Division of the Alaska Department of Fish and Game. This option would be closely coordinated with all such ongoing agency programs.

How will this help recovery?

If current subsistence harvest levels are slowing species recovery and voluntary harvest reduction can be mutually agreed upon, reduced harvest pressures could enhance the rate of recovery. Increased communication between agency biologists and subsistence users could help the users decide if their traditional harvest activities might be slowing the recovery of the injured populations. Face-to-face contact between agency researchers and subsistence users increases community trust in scientific data and facilitates discussion of the politically and culturally sensitive topic of subsistence harvest levels. In addition, biological and harvest information provided to agency biologists by subsistence hunters could provide useful supplements to existing data.

Additional information:

This option is found in alternatives 3, 4, and 5 for harbor seals and alternatives ____ for sea otters.

The injury descriptions are found on page ____ for sea otters, and on page ____ for harbor seals.

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48.0 Improve Survival of Salmon Eggs and Fry

This option could be used to restore injured salmon runs to pre-spill levels or to enhance either injured or equivalent runs above pre-spill levels. Two techniques could be applied under this option as described below. As part of a project-level monitoring program, a representative group of fry may be coded-wire tagged to evaluate the success of the program and reduce exploitation of damaged stocks in the fishery. Recoveries of coded-wire tagged fish when they return as adults will provide additional information fishery managers need to direct exploitation away from damaged stocks.

48.1 Improve survival with remote egg takes and rearing in egg boxes or hatcheries.

Artificial spawning techniques could be used to fertilize eggs taken from wild salmon. Fertilized eggs could then be placed in egg boxes adjacent to streams utilized by damaged wild stocks or nearby areas. Fry will outmigrate from the boxes on their own in the spring. Alternatively, wild stock eggs could be incubated in existing hatcheries and released into their native spawning areas when conditions were favorable for survival. The fry would then imprint on their home streams and return there as adults to spawn. Either of these techniques would increase the egg to fry survival rates and, given favorable marine conditions, would increase adult returns.

48.2 Improve survival with remote fry rearing in net pens.

Fry to smolt survival could be increased by rearing and feeding hatchery fish in net pens until environmental conditions and food availability were optimal for survival. At this time, the fish would be released into their native spawning areas and would, as mentioned above, return to these areas to spawn. It may, in some cases, be possible to rear wild fry in net pens, but capturing and transporting large numbers of fry could be problematic. It should also be noted that net pen rearing should be done very carefully to mitigate increased risks of disease transmission caused by confining large numbers of fry in a relatively small space.

How will this help recovery?

The fry-to-adult survival of pink and sockeye fry reared under controlled conditions is double the natural survival rate. Marine survival is also much higher than under uncontrolled conditions. Increased stock productivity and adult returns could result from this restoration technique.

Additional information:

This option may be found under alternative 3, 4, and 5 for sockeye salmon and under alternative 5 for pink salmon.

The injury descriptions are found on page ____ for pink salmon and on page ____ for sockeye salmon.

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49.0 Provide Subsistence Users Access to Traditional Foods

As a result of the oil spill, some species traditionally harvested by subsistence communities have declined or are suspected by many subsistence users to be contaminated (e.g., harbor seals, shellfish and waterfowl). This option would provide funds for subsistence users from impacted areas to travel to unimpacted areas to harvest traditional subsistence resources. Funding may also be provided to allow people in other subsistence communities to assist impacted communities by gathering, preserving and sending subsistence foods.

Continuation of harvest activities would also help ensure that traditional hunting skills will continue to be passed down and that the cultural importance of harvesting and sharing foods is not diminished. The option would continue until subsistence resources are no longer contaminated, populations have recovered injuries, and foods are no longer perceived to be contaminated. This option will undergo legal review.

How will this help recovery?

The option will improve subsistence recovery by providing traditional subsistence foods to villages for which they are not readily available. It would also minimize the damage to culture and community cohesiveness that could result from continued interruption of subsistence harvests.

Additional information:

This option is found under Alternatives 3, 4 and 5.

The injury description for subsistence is found on page ____.

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50.0 Replace Subsistence Harvest Opportunities for Bivalve Shellfish

Bivalve shellfish populations, such as mussels and clams, were impacted by the oil spill and by the cleanup efforts following. All of the affected populations were used to by either humans, marine and terrestrial mammals, birds or fishes. This project would provide the facilities and infrastructure to restore, replace and/or enhance affected shellfish populations and, in particular, the subsistence use of shellfish.

50.1 Develop Subsistence Mariculture Sites: This part of the option would fund development of shellfish mariculture in subsistence communities. Species which could be cultured include oysters, mussels, scallops and a variety of clams. Common culture methods include growing shellfish on rafts, longlines, hanging nets or on beaches. The shellfish would be used to supplement subsistence harvest, as a replacement for traditional foods contaminated by the spill. (**note to RPWG: the original option also dealt with raising shellfish commercially, which raises problems with making a direct tie to injury - we can discuss whether to include this aspect).

Some villages have already begun to develop oyster mariculture, using oyster seed imported from out of state. In these areas, existing operations could be expanded to include more sites as well as Alaskan species of clams, mussels and scallops. In areas where mariculture sites do not exist, initial efforts would focus on locating suitable sites and acquiring necessary permits. In many cases, however, the lack of readily available shellfish seed and knowledge of growing requirements for some species could prove to be a handicap. For this reason, Option 50.2, proposing a shellfish hatchery and research center, would compliment this option.

50.2 Bivalve Shellfish Hatchery and Research Center: Utilizing concepts already developed for the Seward shellfish hatchery and the ADF&G Mariculture Technical Center, a feasibility analysis of the project will be conducted. Engineering and biological expertise will be retained to conduct the analysis. If construction funds are later approved, direct restoration, replacement and/or enhancement of bivalve shellfish will be accomplished via an onshore production hatchery operated by the private sector using technology developed at a State-operated research center. The combination of the two facilities is necessary to accomplish the overall production objectives of this project because of the lack of technology for indigenous species. The hatchery would then provide seed stock for mariculture operations or the re-seeding of beaches. However, this would only be done for those species for which it was both possible and efficient to culture artificially.

How will this help recovery?

Shellfish farming in subsistence communities will provide a food source to replace traditional food sources which were contaminated or reduced by the spill or are perceived to be unsafe to eat. Farmed shellfish can be a replacement for contaminated shellfish or other types of traditional foods

which are less available because of the spill.

By providing a source of shellfish for mariculture operations as well as technological expertise and advice for growers, a hatchery and research center will facilitate farming of Alaskan species of bivalve shellfish as well as oysters. Farmed shellfish could take the place of wild shellfish and other traditional foods in subsistence diets, until wild foods were no longer contaminated and were perceived to be safe to eat. There is also potential to use hatchery shellfish to re-seed native species on beaches damaged by oiling or cleanup, once those beaches are no longer oiled. This might speed recovery of the beach and provide a food source for multiple species.

Additional information:

This option is found in Alternative 5 for subsistence.

The injury description for subsistence is found on page _____.

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51.0 Relocate or Change Timing of Existing Hatchery Salmon Runs

This option entails shifting the location and, possibly, the timing of salmon runs released from hatcheries. For instance, hatchery-produced sockeye runs in Prince William Sound might be changed to result in adults returning to hatcheries earlier in the season. This strategy could decrease fishing pressure on wild-stock pink salmon which use similar migration corridors but return later in the season. Alternatively, hatchery fish could be released and harvested at remote sites not heavily utilized by wild-stocks. In either case, the objective is to decrease interception of injured, wild-stock pink salmon returning to spawning streams. If fishing effort is directed away from migration corridors used by wild-stocks, interceptions will decrease and the injured populations will recover more rapidly.

Implementing this option requires considerable planning and coordination between agency biologists, aquaculture associations and Regional Planning Teams. Factors to be considered include the impacts of shifting run timing or location on existing runs of hatchery and wild fish. Obviously, it would not be desirable to decrease interception of one run at the expense of greatly increasing interceptions of another. The types of information required to implement these changes include surveying locations of wild-stocks, evaluating existing and potential degrees of wild-stock interception, and possible genetic impacts on wild-stocks caused by straying of hatchery fish.

How will this help recovery?

This option is designed to reduce interception of injured, wild-stock pink salmon by commercial fishermen who are targeting runs of hatchery-reared salmon. By shifting the location and, possibly, the timing of returning hatchery runs, fishing could, in some cases, be directed away from injured stocks. Recovery of wild-stock pink salmon would be aided by reducing fishing mortalities. This option would effectively promote recovery of wild-stocks suffering population-level injuries, but would not be particularly effective for restoring sublethal injuries.

Additional information:

This option is found in Alternatives 4 and 5 for pink salmon.

The injury description for pink salmon is found on page ____.