

activities. Another suggestion was to enhance our information on services, e.g., recreation, subsistence, etc. Accordingly, we intend to modify the options assessment decision process (including database), adding to our database where necessary, and continue using it to generate alternatives. This effort is underway and a draft should be complete by mid-December and ready for review in early January. Soon after, we will have for your review all pertinent restoration options for each alternative.

As an aid to your review of the attached table, I have developed the following brief descriptions of the six candidate themes. They are:

Alternative 1 is the no action (natural recovery) alternative. Alternative 2 is a protection alternative. Alternatives 3 through 6 vary according to the nature and certainty of injury, level of knowledge of recovery, the perceived effectiveness of restoration techniques, and where restoration will be implemented; ie., inside or outside the spill-affected area.

Alternatives 3 and 4 are limited to resources injured at the population level and injured services. However, Alternative 3 takes the most limited approach; restoration is considered only where there is a high certainty of success and knowledge of the status of recovery. Also, restoration will be limited to the spill-affected area. Alternative 4 differs from Alternative 3 by considering restoration for injured resources and services even if we do not have a clear, substantiated understanding of rate and degree of recovery. In Alternative 4, replacement and acquisition of equivalent resources and services options also can be considered, even outside the spill-affected area.

Alternatives 5 and 6 address all injured resources and services and include enhancement. However, in Alternative 5 restoration can only be undertaken within the spill area whereas in Alternative 6, restoration may be undertaken outside the spill-affected area. Alternative 5 will include only the most effective restoration techniques. Alternative 6 takes the most comprehensive approach. All reasonable actions including enhancement are taken to restore injured resources and services, even those where injury and our knowledge of recovery are not well documented.

Once we have your concurrence on the general approach to constructing alternatives we will further elaborate on each alternative by addressing the following subjects:

1. Restoration options
 - a. By resource or service
 - b. Timing and priority
2. Monitoring Program
3. Evaluation

- a. Effect on recovery of resource or service (time and extent)
- b. Ecosystem effects
- c. Geographic distribution (including maps)
- d. Social benefits (including economic impact)
- e. Cost and methods of estimation or derivation
- f. Certainty of the above factors

We would appreciate all comments, but especially responses to the following questions:

1. Variables: The following variables have been used to construct the draft alternative themes. Do you agree with the choice and use of these variables? If not; what variables would you add or delete?
 - a. Injury
 - b. Knowledge of recovery
 - c. Effectiveness of restoration activities
 - d. Geographic constraint
2. Objectives: We assume that the restoration process will address the following objectives, but we would like your concurrence or other suggestions.
 - a. Recovery to pre-spill conditions
 - b. Protection from further degradation or decline [relationship to habitat protection]
 - c. Cost effectiveness
 - d. Social benefits (education, economic stability)
 - e. Geographic distribution
 - (1) Equal distribution
 - (2) Distribution where it will do the most good
 - (3) Irrelevant
 - f. Benefit to the entire ecosystem, not just to single species

We need concurrence that we are using the right variables and that these themes will provide a reasonable range of alternatives. Thank you.

Attachment

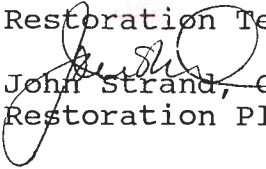
DRAFT ALTERNATIVE THEMES 1

	Alternative 1 Natural Recovery	Alternative 2 Protection	Alternative 3 Limited Restoration	Alternative 4 Moderate Restoration
Theme¹	No action other than monitoring and normal agency management.	Protect injured resources and services from further degradation or disturbance in order to complement natural recovery.	Use only the most effective techniques to protect and restore injured services and resources injured at a population level.	Allow for actions to restore and recover a population.
Variables²:				
1. Injury	N/A	All injured resources and services. Includes sublethal effects and injuries not well documented.	Limited to resources injured at a population level and injured services.	Limited injured level and services.
2. Knowledge of Recovery	N/A	Known and unknown.	Known.	Known.
3. Effectiveness of Restoration Activities	N/A	Most certain to prevent further degradation or decline.	Most certain to produce the greatest improvement in rate and/or degree of recovery or prevent further degradation or decline.	Reasonable to produce moderate improvement in rate and/or degree of recovery or prevent further degradation or decline.
4. Geographic Constraint	N/A	Within EVOS area only.	Within EVOS area only.	May include outside EVOS area.
Settlement Characteristics	N/A	Direct Restoration and Replacement.	Direct Restoration	Direct Restoration and Replacement, Acquisition, Resource

¹All alternatives include monitoring.

²Major variables used to construct alternatives. Other factors have been considered in the evaluation of options.

November 4, 1992

To: Restoration Team
From:  John Strand, Chair
Restoration Planning Working Group
Subject: Preferred Alternative for the EIS

Since providing the RT with the Draft Alternative Themes on 10/30/92, the RPWG has continued to address the issue of whether to recommend a preferred alternative. We recommend a new approach to developing the preferred alternative(s). The RPWG requests the concurrence of the Restoration Team **and** Legal Team on this approach.

The issue of selecting a preferred alternative has been a difficult one for RPWG. In recent peer review workshops, the reviewers strongly recommended that the public participate in selecting the preferred restoration plan. They were concerned that the process currently being considered would force the Trustee Council to make a decision too early in the decision-making process. The RPWG recognized, as well, that it would be difficult for the Trustees to select a specifically defined preferred alternative **prior** to public comment.

The RPWG also recognizes that the EIS must contain a preferred alternative or alternatives in order to strictly meet the procedural requirements. (EIS's have been successfully prepared by individual agencies that have not been challenged which did not identify the agency's preferred alternative; however, the RPWG believes this may be a risky approach.)

The RPWG took the peer reviewers recommendation along with the requirements contained in NEPA and developed a strategy we think will accommodate all the concerns.

The NEPA requires that the EIS include the following information concerning the development and presentation of alternatives:

- Identify all reasonable alternatives,
- Include the alternative of no action, and
- Identify the preferred alternative or alternatives.

(Additional requirements are not being overlooked, they are not relevant to this discussion.)

The Restoration Framework (Chapter VII) identifies six conceptual alternatives that the Trustees may consider in the development of

the Restoration Plan. Subsequently, the RPWG developed six draft alternative themes which it presented to you on 10/30/92. The following table compares the conceptual alternatives in the Restoration Framework with the 10/30/92 draft alternatives themes.

Framework Alternatives	Draft Alternative Themes (10/30/92)
A. No Action	Alternative 1. Natural Recovery
B. Management of Human Uses	
C. Manipulation of Resources	
*D. Habitat Protection and Acquisition	Alternative 2. Protection
E. Acquisition of Equivalent Resources	
*F. Combination Alternative	Alternative 3. Limited Restoration
* Combination Alternative	Alternative 4. Moderate Restoration
* Combination Alternative	Alternative 5. Expanded Restoration
* Combination Alternative	Alternative 6. Comprehensive Restoration

* preferred alternatives which will be the only alternatives considered in the Restoration Plan. All alternatives will be considered in the EIS.

We believe the development and public scoping associated with the Framework alternatives meet the NEPA requirement of identifying all reasonable alternatives.

The RPWG proposes that the Trustee Council identify the Habitat Protection and Acquisition and Combination Alternatives as the preferred alternatives. (More than one preferred alternative is allowed under NEPA.)

RPWG recommends this approach in order to meet the requirements of NEPA, and to allow the Trustees to consider public comments before making any substantive decision. We believe this approach meets the peer reviewers recommendations and would be viewed by the public as an important improvement in meaningful public participation. In addition, our process has a unique problem. A consensus among all Trustees must be reached before a single preferred alternative could be identified. Forging consensus among the trustees prior to receiving public comment on the DEIS and Restoration Plan may be a difficult process. Once consensus is reached, there may be a certain inertia against doing it again. In this case, the public may be suspicious that the preferred alternative is the actual decision and the public comment is just for show.

If this approach is accepted, the current list of Alternatives to be considered in the Restoration Plan and which are identified as preferred alternatives now looks like this:

Habitat Protection and Acquisition,
Combination Alternative: Limited Restoration,
Combination Alternative: Moderate Restoration,
Combination Alternative: Expanded Restoration, and
Combination Alternative: Comprehensive Restoration.

All alternatives listed in the previous table will be considered in the EIS. Implementing this particular approach will not impact the Restoration Plan schedule.

cc: RPWG



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Office of Oil Spill Damage
Assessment and Restoration
P.O. Box 210029
Auke Bay, Alaska 99821

October 26, 1992

MEMORANDUM FOR: Sharon Saari
FROM:  John Strand
SUBJECT: Restoration Alternatives

In our conversation on Tuesday (October 20th), you mentioned that you had received the "alternatives package" forwarded by Ray Thompson. You also indicated that you were beginning some measure of analyses based on these very preliminary alternatives.

Having had a few days to reflect on our conversation I am a little uneasy with your moving ahead so rapidly to conduct analyses of the four very preliminary themes (not really alternatives) that Ray sent to you. The Restoration Planning Work Group (RPWG) has moved well beyond this point and are now in the process of refining a package of five to seven draft alternatives that soon will be presented to the Restoration Team (RT) and the EIS Work Group. I believe the due date to submit draft alternatives to the RT is October 30th. A meeting to review draft alternatives will likely be called the week of November 2nd. Accordingly, I think it is somewhat premature to analyze the alternative themes that you now hold, and I recommend that you wait for a more definitive package that has been reviewed and approved by the RT and the EIS Work Group. It is my understanding that the RT expects to approve the draft alternatives before they are forwarded to you by the EIS Work Group.

Also, the package that you received from Ray was not an "alternatives package." Rather this was a package of information sent out in advance of our Restoration Planning Review Meeting that contained a draft annotated outline of the Draft Restoration Plan, a draft summary of injury (tabular form), draft restoration options, and a description of our process to develop restoration alternatives (including draft alternative themes).

Sharon, I don't want you to think that I am trying to prevent you from doing your work, but I also don't want you to analyze the wrong alternatives. Assuming the concurrence of the RT, I think that we are still about two weeks away from having a package of alternatives that you can begin to analyze. Please let me know what you think.

cc: Byron Morris
Ken Rice
RPWG



CREATING ALTERNATIVES USING THE OPTIONS EVALUATION DATABASE

Description of RPWG's Process

The Basics: Three Questions. The draft restoration plan is built on the answers to three questions concerning each injured resource or service.

- Was it injured?
- Is it recovering?
- What are the possibilities for restoration?

The correct answers to these questions are the basics upon which we construct the restoration plan. The only reason why we do not do all useful restoration options is their combined cost is more than we have available. Thus, we have to make decisions. We construct alternatives -- groups of restoration options for public review -- in order to gather public preferences on the options, and to show the implications of choosing some projects over another.

Options: Groups of Restoration Projects. Rather than make decisions among hundreds (thousands?) of different restoration projects, RPWG grouped similar projects into categories of projects. For example, there are a variety of potential techniques to increase the breeding productivity of murre: decoys, sound recordings, and many physical nest site improvements, all of these are grouped into Option 16 "Increase productivity and success of murre colonies". We used the name Restoration Options for these categories. The options are categories of similar restoration projects. The grouping used the following approach:

1. Ask the public, agencies and resource or service experts what they can think of to do. (1990)
2. Group projects into similar categories: options. (1990)
3. Apply simple criteria to eliminate ineffective projects and groups of projects (ones which will not have significant effect on the resources or services, or which are not within the guidelines of the settlement.) (1991)
4. Ask the public and agencies to review our options. (Restoration Framework Vol I, 1992)
5. Modify options based on public review. (Summer 1992)

Why a database? Answer: Be Systematic. RPWG developed criteria to evaluate options for their effect on an injured resource or service (including some indirect effects such as benefit/cost, or negative impacts on other resources or services). These criteria are presented separately in this package. The criteria definitions were used to evaluate each relevant option for each injured resource or service. In this way, RPWG hoped to eliminate biases from the evaluation and create a systematic repeatable process for developing alternatives. The database evaluates how each option will affect each resource or service. The most important evaluations are: will the option help the rate or degree of recovery, prevent an additional stress from habitat degradation that will hurt the resource or service, enhance the resource or service. Others address technical feasibility, cost, adverse impacts, etc.

In completing the ratings RPWG considered the type of injury. For example, an injury to habitat is usually most effectively restored with an option that addresses habitat. Productivity problems such as non-breeding are not addressed by options that focus on protection only. The database also includes descriptive categories that identify if the focus of an option is manipulation, management of human uses, or protection as well as if it qualifies as direct restoration, replacement, acquisition of equivalent resources or enhancement as described in the settlement document.

The Next Step: Creating Alternatives. RPWG can use the database to organize the options into alternatives. By sorting the database using different perspectives on either the resource/services or on some combination of criteria we are able to identify which options would be included in a particular alternative. For example, what alternatives are available to address the most severely injured species that we know aren't recovering. Which of those are the most effective. The database can also be used to guide implementation of the options and will help RPWG create a coordinated restoration plan.

This step is not yet complete. The purpose of next week's peer review is to look at the overall process to ensure that there are no serious errors, and to review the database evaluation to ensure that we evaluated the options correctly.

Draft Alternative Themes Status Report for RT Review

INTRODUCTION.

RPWG was asked to provide a description of the alternatives in advance of actually constructing them for RT review. This brief paper provides general descriptions of draft alternatives. However, the RT should expect some changes as RPWG builds the alternatives for RT review. As the options are grouped, we will undoubtedly find that changes in the descriptions provided here would improve the alternatives.

As discussed in a previous RT meeting, an alternative is a list of restoration options and their implications (funding, timing, geographic scope, etc.). To make each group of options more understandable, each alternative is typically given a title, and a description of the essential elements of the alternative. This last part, the title and description, is described here. A more complete version of the draft alternatives (with options grouped by alternative) will be available in approximately two weeks. We expect more detailed review at that time.

CONCEPTS FOR BUILDING ALTERNATIVES.

Some concepts to keep in mind when reviewing descriptions of the alternatives:

- We are aiming to have 3-5 alternatives (including a "no action" alternative).
- Alternatives should cover the range of significant public and agency opinion.
- We do not create straw-man alternatives (if the agencies are unwilling to implement an alternative, we should not present it to the public).

DRAFT ALTERNATIVE THEMES AND DESCRIPTIONS FOR RT REVIEW

Alternative #1: Natural Recovery (No Action)¹

This alternative assumes that natural resources and services will recover without human intervention. In this alternative, nothing, except monitoring, is done beyond pre-spill management activities.

Alternative #2: Natural Recovery with Protection

This alternative uses natural recovery as the primary tool to aid recovery. However, it also emphasizes protection of habitat and populations to prevent further degradation and stresses to injured resources and services. State and federal agencies apply management protection, and the trustees fund purchase of threatened habitat. These protection activities will provide a "breathing space" for injured resources to recover. In this alternative, the Trustees will fund active restoration (including replacement) when an injured resource or service is not recovering. Finally, this and all other alternatives include monitoring.

Alternative #3: Active Restoration: Emphasis on Resource Restoration

This alternative assumes that over the life of the settlement, the trustees will use all effective techniques to address the range of injured resources on an as-needed basis. However, in light of limited funds, (the final payment is not due until the year 2001), the trustees will schedule options according to immediate needs and most effective techniques. For example, priority will be given to the most effective techniques, and those which if not done soon will result in a lost opportunity (e.g., imminent threats, declining populations, etc.). This alternative addresses services by addressing injuries to the resources they are based upon. The alternative also includes monitoring.

Alternative #4: Active Restoration: Emphasis Resource Restoration and Human Use

This alternative is the same as Alternative #3. That is, it uses effective techniques to accelerate the restoration for resources but puts additional emphasis on those options that will ensure the continuity or enhancement of human use that was interrupted by the spill - fishing, hunting, recreation, and subsistence. It also includes monitoring.

¹ There is some question whether or not this alternative would qualify under NEPA as a "no action" alternative. For example, some money would be spent for monitoring. If this alternative is not the "no action" alternative, another "no action" alternative will be needed. RPWG hopes that a new alternative can be avoided, because Natural Recovery/No Monitoring is unrealistic. It would be a straw-man alternative that the agencies would be unwilling to stand behind.

QUESTIONS NOT ADDRESSED IN ALTERNATIVES

Some important questions are not packaged into alternatives because they apply to all alternatives. These include:

- An endowment;
- Level of monitoring;
- Programmatic options such as public information, education, or law enforcement; and
- A Science Center.

These questions could potentially apply to all alternatives, and it is confusing to place them into one alternative alone. The public should be questioned about these decisions at the same time that alternatives are presented.

Finally, it is appropriate to get additional detail from the public concerning habitat acquisition. This issue is one of the most important issues facing the Trustees, and it is important to get additional direction on the questions of "How much? Where? And Why?" RPWG, however, cannot generate these questions alone. The overlap with the Habitat Working Group is too great. We assume that much of the work will be completed by the Habitat Working Group.

	ALT #1	ALT #2	ALT #3	ALT #4
Alternative: Title	Natural Recovery (No Action) ¹	Natural Recovery with Protection	Active Restoration: Emphasis on Resource Restoration	Active Restoration: Emphasis on Resource Restoration and Human Use
Explanation	<ul style="list-style-type: none"> ○ Assumes that natural resources and services will recover without human intervention. ○ Nothing is done beyond pre-spill management activities. ○ Monitoring 	<ul style="list-style-type: none"> ○ Natural recovery ○ Protection from further degradation to injured resources and services. ○ Active restoration (including replacement) when an injured resource or service is not recovering. ○ Monitoring. 	<ul style="list-style-type: none"> ○ Over the life of the settlement, use all effective techniques to address the range of injured resources. ○ Addresses services by addressing injuries to resources they are based upon. ○ In light of limited funds, schedule options according to immediate needs and most effective techniques. ○ Monitoring. 	<ul style="list-style-type: none"> ○ Same as Alternative #3; uses effective techniques to accelerate resources' restoration but puts additional emphasis on those options that will ensure the continuity or enhancement of human use -- fishing, hunting, recreation, and subsistence -- that was interrupted by the spill. ○ Monitoring.
Resources: <u>Manipulation & Replacement</u>	None	When a resource is not recovering.	Use all effective techniques scheduled according to immediate needs and effectiveness across all injured resources.	Same as #3 except, emphasize those techniques which contribute resources that are part of the human use of the spill area.
<u>Management of Human Use</u>	Normal agency management.	Management to protect injured resources. Management could entail some cost to human use.	Protective management applied where it significantly accelerates recovery of a resource.	Avoid protective management that causes significant cost to human use. Do so by substituting, if possible, manipulation or replacement options.
<u>Protection and Acquisition</u>	None	<p>Recommend that state and federal agencies use protective management until resources recover.</p> <p>Emphasis on acquiring private habitat to prevent further stresses and degradation to injured resources.</p>	Targeted habitat acquisition as needed to ensure protection of the injured resources as they recover.	Same as Alternative #3. For differences in acquisitions between Alternatives #3 and #4, see Services.


Alternatives (cont'd)	Alt #1	Alt #2	Alt #3	Alt #4
Services: <u>Manipulation & Human Use</u>	Normal agency management.	None; however, incidental benefit from protection options directed at resources.	Injuries to services are addressed by addressing the injuries to the resources they are based upon.	Those options which accelerate recovery of services.
<u>Protection & Acquisition</u>	None	None	None	Purchases to include public recreation sites and access.
Other Special Designations Etc	None	Use special designation(s) appropriate to increased protection.		

Note: Monitoring is done in all alternatives.

¹ There is some question whether or not Alternative #1, Natural Recovery, would qualify under NEPA as a "no action" alternative. For example, some money would be spent for monitoring. If this alternative is not the "no action" alternative, another "no action" alternative will be needed. RPWG hopes that such an alternative can be avoided, because Natural Recovery/No Monitoring is an unrealistic alternative. It would be a straw-man alternative that the agencies would be unwilling to stand behind.

RPWG
I

**RESTORATION PLANNING WORK GROUP
EXXON VALDEZ OIL SPILL OFFICE
645 "G" STREET
ANCHORAGE, ALASKA 99501**

TO: Restoration Team **DATE:** October 30, 1992
FROM:  John Strand, Chair
Restoration Planning Work Group
SUBJECT: Draft Alternative Themes

Attached for your review and comment are the Planning Group's most recent version of draft alternative themes. It is my understanding that time has been scheduled on November 6th to discuss these alternative themes, and that we would be most pleased to attend your meeting and lead the discussion. We would appreciate any written comments on the draft alternative themes by C.O.B. November 9th to make whatever changes are required.

As you know, the decision process for the Draft Restoration Plan was recently subjected to peer review. Peer reviewers found it generally sound but suggested a few refinements. One of the major suggestions was to explicitly reflect the level of certainty in our estimates of injury and assessments of the effectiveness of restoration activities. Accordingly, we intend to modify the options assessment decision process (including database) and continue using it to generate alternatives. The peer reviewers also suggested a few other ways of approaching alternatives. These are listed under question 2 below.

As an aid to your review of the attached table, I have developed the following brief descriptions of the six candidate themes. They are:

Alternative 1 is the no action (natural recovery) alternative. Alternative 2 emphasizes protection from further degradation or decline in injured resources or services. Alternatives 3 through 6 vary according to the nature and certainty of injury, level of knowledge of recovery, the perceived effectiveness of restoration techniques, and where restoration will be implemented; i.e., inside or outside the EVOS area.

Alternatives 3 and 4 are limited to resources injured at the population level and injured services. However, Alternative 3 takes the most limited approach; restoration is considered only where there is evidence of failure to recover. Alternative 3 also assumes that restoration will only be implemented where there is a high certainty of success, and that restoration will be limited to the EVOS area. Alternative 4 differs from Alternative 3 by considering restoration for injured resources and services even if we do not have a clear understanding of rate and degree of recovery. In Alternative 4, replacement and acquisition of equivalent resources options also can be considered, even outside the spill area.

Alternatives 5 and 6 address all injured resources and services and include enhancement. However, in Alternative 5 restoration can only be undertaken within the spill area whereas in

Alternative 6, restoration may be undertaken outside the EVOS area. Alternative 5, however, will include only the most effective restoration techniques. Finally, Alternative 6 takes the most comprehensive approach. All reasonable actions including enhancement are taken to restore injured resources and services, even those where injury and our knowledge of recovery is not well documented.

Once we have your concurrence on the general approach to alternatives we will further elaborate on each alternative by addressing the following subjects:

1. Restoration options
 - a. By resource or service
 - b. Timing and priority
2. Monitoring Program
3. Evaluation
 - a. Effect on recovery of resource or service (time and extent)
 - b. Ecosystem effects
 - c. Geographic distribution (including maps)
 - d. Social benefits (including economic impact)
 - e. Cost and methods of estimation or derivation
 - f. Certainty of the above factors

We would appreciate all comments, but especially responses to the following questions:

1. Variables: The following variables have been used to construct the draft alternative themes. Do you agree with the choice and use of these variables? If not; how would you approach this task?

- a. Injury
- b. Knowledge of recovery

1. (continued)

- c. Effectiveness of restoration activities
- d. Geographic constraint

2. Objectives: We assume that the restoration process will address the following objectives, but we would like your concurrence or other suggestions.

- a. Recovery to pre-spill conditions
- b. Protection from further degradation or decline [relationship to habitat protection]
- c. Cost effectiveness
- d. Social benefits (education, economic stability)
- e. Geographic distribution
 - (1) Equal distribution
 - (2) Distribution where it will do the most good
 - (3) Irrelevant
- f. Benefit to the entire ecosystem, not just to single species

-
3. Alternatives: Do you understand how the alternatives were derived? Do you support the basic themes of the alternatives proposed? If not, would you prefer a different approach to alternatives. Those other approaches suggested by the peer reviewers are the following:
- a. Allocate funding by categories such as direct restoration, replacement, acquisition of equivalent resources, enhancement, or by nature and certainty of injury.
 - b. Allocate funding by geographic area.
 - c. Distribute at least one project to each injured resource or service.
 - d. Cluster options by services, e.g., subsistence resources, commercial fishing, and recreation.

We need concurrence that we are using the right variables and that these themes provide a reasonable range of alternatives. Thank you.

Attachment

cc: RPWG

DRAFT ALTERNATIVE THEMES 10/30/92

	Alternative 1 Natural Recovery	Alternative 2 Protection	Alternative 3 Limited Restoration	Alternative 4 Moderate Restoration	Alternative 5 Expanded Restoration	Alternative 6 Comprehensive Restoration
Theme¹	No action other than monitoring.	Protect injured resources and services from further degradation or disturbance in order to complement natural recovery.	Use only the most effective techniques to protect and restore injured services and resources injured at a population level.	Allow for all reasonable actions to protect and restore injured services and resources injured at a population level.	Use only the most effective techniques to protect, restore, and enhance all injured resources and services.	Allow for all reasonable actions to protect, restore, and enhance all injured resources and services.
Variables²: 1. Injury	N/A	All injured resources and services. Includes sublethal effects and injuries not well documented.	Limited to resources injured at a population level and injured services.	Limited to resources injured at a population level and injured services.	All injured resources and services. Includes sublethal effects and injuries not well documented.	All injured resources and services. Includes sublethal effects and injuries not well documented.
2. Knowledge of Recovery	N/A	Known and unknown.	Known.	Known and unknown.	Known and unknown.	Known and unknown.
3. Effectiveness of Restoration Activities	N/A	Most certain to prevent further degradation or decline.	Most certain to produce the greatest improvement in rate and/or degree of recovery or prevent further degradation or decline.	Reasonably certain to produce at least moderate improvement in rate and/or degree of recovery or prevent further degradation or decline.	Most certain to produce the greatest improvement in rate and/or degree of recovery or prevent further degradation or decline.	Reasonably certain to produce at least moderate improvement in rate and/or degree of recovery or prevent further degradation or decline.
4. Geographic Constraint	N/A	Within EVOS area only.	Within EVOS area only.	May include areas outside EVOS.	Within EVOS area only.	May include areas outside EVOS.
Settlement Characteristics	N/A	Direct Restoration	Direct Restoration	Direct Restoration, Replacement, and Acquisition of Equivalent Resources	Direct Restoration, Replacement, Acquisition of Equivalent Resources, and Enhancement	Direct Restoration, Replacement, Acquisition of Equivalent Resources, and Enhancement

¹All alternatives include monitoring.

²Major variables used to construct alternatives. Other factors have been considered in the evaluation of options.



National Marine Fisheries Service
Office of Oil Spill Damage Assessment and Restoration
P.O. Box 210029
or
11305 Glacier Hwy
Auke Bay, Alaska 99821
Telephone: (907) 789-6600
Fax: (907) 789-6608

RAPIDFAX TRANSMISSION: 2 PAGES TO FOLLOW

DATE: 11/13/92

FROM: John Strand

TO: Barbara Tseeh

FAX NO: _____

SUBJECT: Recent memo from Pam Bergmann

COMMENTS: Barbara, please distribute to
each RPNW member. Thanks



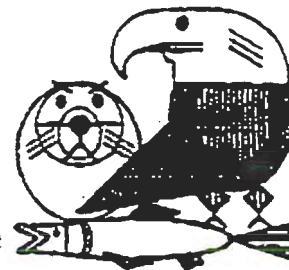
11-13-92 10:59 AM

Exxon Valdez Oil Spill Trustee Council

Restoration Office

645 "G" Street, Anchorage, AK 99501

Phone: (907) 278-8012 Fax: (907) 276-7178



November 13, 1992

Memorandum

To: John Strand, Chairperson
Restoration Planning Working Group

From: *AB* Pamela Bergmann, DOI Restoration Team Member

Subject: Comments on November 4, 1992 Memorandum Entitled "Preferred Alternative for the EIS"

This correspondence is in response to your memorandum dated November 4, 1992 regarding the preferred alternative for the Draft Environmental Impact Statement (EIS). As stated in memorandum dated October 29, 1992, and November 5, 1992, from the DOI Trustee Council Representative to the Interim Administrative Director, we do not agree that public scoping associated with the possible restoration alternatives contained in the Restoration Framework satisfy National Environmental Policy Act (NEPA) requirements.

To date, scoping meetings have not provided the public with an opportunity to address environmental issues associated with a detailed proposed action or detailed alternatives. We continue to maintain that the proposed action identified in the Restoration Framework (i.e., ". . . to restore natural resources and natural resource services in the areas affected by the Exxon Valdez oil spill to their pre-spill condition") is a goal, and not a proposed action. We also continue to maintain that restoration alternatives contained in the Restoration Framework (see Chapter VII) do not contain sufficient specificity to allow meaningful public comment to occur.

Once a detailed proposed action and detailed alternatives have been identified, formulated, and accepted by the Trustee Council, another series of complete scoping meetings must occur to provide the public with an opportunity to determine the scope of issues to be addressed in the Draft EIS and to identify significant issues relating to the proposed action. Following these scoping meetings, the Draft EIS must be prepared taking public comments into account. Prior to distribution of the Draft EIS, the Trustee Council must decide, and the Draft EIS must then reflect, whether the proposed action will remain as the proposed action or whether one of the alternatives will become the proposed action.

11/13/92 10:59 AM

As you know, at their November 6, 1992 meeting, it was agreed by the Restoration Team that the Restoration Planning Working Group would not identify a "preferred alternative" or recommend a proposed action to the Restoration Team. Therefore, the recommendation contained in your November 4, 1992 memorandum is no longer relevant. As indicated above, the selection for a proposed action should be made by the Trustee Council before the next round of public scoping meetings and again before the preparation of the Draft EIS.

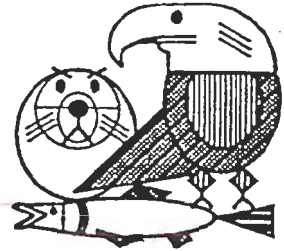
cc: Restoration Team

Exxon Valdez Oil Spill Trustee Council

Restoration Office

645 "G" Street, Anchorage, AK 99501

Phone: (907) 278-8012 Fax: (907) 276-7178



TO: Trustee Council

DATE: February 8, 1993

FROM: Dave Gibbons *dg*
Interim Executive Director

TELE: 278-8012

FAX: 276-7178

SUBJECT: Summary of Injury and Alternatives

This packet presents draft tables summarizing injury and alternatives for the draft restoration plan. The information is preliminary, and we expect that some of the details, format, and wording will change. However, assuming concurrence from the Trustee Council, the basic content and organization is unlikely to change.

The information, along with a significant amount of explanatory text, will be used for the "Alternatives Information Packet" scheduled for publication in March. It will also be used for public meetings in April.

The tables presented here have been prepared by the Restoration Planning Working Group and reviewed by the Restoration Team. The summary of injury to resources has been reviewed by the Chief Scientist.

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Resources: Summary of Results of Injury Assessment Studies

The next few pages summarize the results of the injury assessment studies for resources completed after the *Exxon Valdez* oil spill. The table has been reviewed by the Restoration Team and the Chief Scientist.

The "Description of Injury," columns focus on injury that took place during 1989. The table shows whether there was initial mortality caused by the spill, whether the spill caused a population-level injury, and whether there is evidence of sublethal or chronic effects on the resource. For some resources, an estimate is available for the total number of animals initially killed by the spill. When available, that estimate is shown in parentheses under the initial mortality column. For many resources, the total number killed will never be known.

The "Status of Recovery" columns show the best estimate of recovery using information current through 1992. These columns show resources' progress toward recovery to the population levels that scientists estimate would have occurred in the absence of the spill. The "Current Population Status" column shows a resource's progress from any "Decline in Population after the Spill." Similarly, the column labeled "Evidence of Continuing Sublethal or Chronic Effects" shows whether a initial chronic or sublethal injury is continuing.

The "Geographic Extent of Injury" column shows whether the injury occurred in the geographic areas shown in Figure X. (Injury may have been more extensive in some regions than others.)

TABLE X Natural Resources: Summary of Results of Injury Assessment Studies Done After the *Exxon Valdez* Oil Spill

Resource	Description of Oil Spill Injury			Status of Recovery in December, 1992		Geographic Extent of Injury (a)				Comments/Discussion
	Initial Oil Spill Mortality (total mortality estimate)(b)	Measured Decline in Population after the spill	Evidence of Sublethal or Chronic Effects (c)	Current Population Status	Evidence of Continuing Sublethal or Chronic Effects	PWS	Kenai	Kodiak	Alaska Penin.	
MARINE MAMMALS										
Harbor Seals (d)	YES (345)	YES	YES	POSSIBLY STABLE, BUT NOT RECOVERING	NO	YES	YES (e)	UNKNOWN	UNKNOWN	Many seals were directly oiled . There was a measurable difference in populations between oiled and unoiled areas in PWS in 1989 and 1990. Population was declining prior to the spill and r recovery evident in 1992. Oil residues found in seal bile were 5 to 6 times higher in oiled areas than unoiled areas in 1990.
Humpback Whales	NO	NO	NO	(f)	(f)	(f)	(f)	(f)	(f)	Other than fewer animals being observed in Knight Island Passage in summer 1989, which did not persist in 1990, the oil spill did not have a measurable impact on humpback whales.
Killer Whales	POSSIBLY (g)	POSSIBLY (g)	POSSIBLY (g)	RECOVERING	UNKNOWN	YES	UNKNOWN	UNKNOWN	UNKNOWN	13 whales of the 36 in AB pod are missing and presumed dead. Circumstantial evidence links whale disappearance to oiling. Several adult males have collapsed dorsal fins. Social disruption of family units has been observed. In AB pod, no new births were recorded in 1989 or 1990; one birth was recorded in 1991; and two births were recorded in 1992.

(a) There may have been an unequal distribution of injury within each region, see map for location of regions;

(b) Adjusted for carcasses not found, not reported, scavenged, or otherwise lost;

(c) Evidence of sublethal or chronic effects is defined as an observed physiological or behavioral change in an injured species;

(d) Population was declining prior to the spill;

(e) Based on recovery of dead animals from this region of the spill zone;

(f) If no injury was detected or known, no assessment of recovery could be made.

(g) "Possibly" was used if there was disagreement over the conclusions to be drawn from the results of the damage assessment studies.

Resource	Description of Oil Spill Injury			Status of Recovery in December, 1992		Geographic Extent of Injury (a)				Comments/Discussion
	Initial Oil Spill Mortality (total mortality estimate)(b)	Measured Decline in Population after the spill	Evidence of Sublethal or Chronic Effects (c)	Current Population Status	Evidence of Continuing Sublethal or Chronic Effects	PWS	Kenai	Kodiak	Alaska Penin.	
Sea Lions (d)	UNKNOWN	UNKNOWN	NO	CONTINUING DECLINE	(f)	(f)	(f)	(f)	(f)	Several sea lions were observed with oiled pelts and oil residues were found in some tissues in 1989. It was not possible to determine population effects or cause of death of carcasses recovered in 1989. Sea lion populations were declining prior to the oil spill.
Sea Otters	YES (3,500 TO 5,000)	YES	YES	STABLE, BUT NOT RECOVERING	YES	YES	YES	YES (e)	YES (e)	Post-spill surveys showed measurable difference in populations and survival between oiled and unoiled areas in 1989, 1990 and 1991. Survey data have not established a significant recovery. Carcasses of prime-age animals were found on beaches in 1989, 1990 and 1991. Proportions of prime-age carcasses found on beaches in 1992 is not significantly different from pre- or post-spill data. Sea otters feed in the lower intertidal and subtidal areas and may still be exposed to hydrocarbons in the environment.

- (a) There may have been an unequal distribution of injury within each region, see map for location of regions;
- (b) Adjusted for carcasses not found, not reported, scavenged, or otherwise lost;
- (c) Evidence of sublethal or chronic effects is defined as an observed physiological or behavioral change in an injured species;
- (d) Population was declining prior to the spill;
- (e) Based on recovery of dead animals from this region of the spill zone;
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- (g) "Possibly" was used if there was disagreement over the conclusions to be drawn from the results of the damage assessment studies.

Resource	Description of Oil Spill Injury			Status of Recovery in December, 1992		Geographic Extent of Injury (a)				Comments/Discussion
	Initial Oil Spill Mortality (total mortality estimate)(b)	Measured Decline in Population after the spill	Evidence of Sublethal or Chronic Effects (c)	Current Population Status	Evidence of Continuing Sublethal or Chronic Effects	PWS	Kenai	Kodiak	Alaska Penin.	
TERRESTRIAL MAMMALS										
Black Bear	NO	UNKNOWN	UNKNOWN	(f)	(f)	(f)	(f)	(f)	(f)	No field studies were completed.
Brown Bear	NO	NO	NO	(f)	(f)	(f)	(f)	(f)	(f)	Hydrocarbon exposure was documented on Alaska Peninsula in 1989 including high hydrocarbon level in the bile of one dead yearling, although it is unknown if this was the cause of death. Brown bears feed in the intertidal zone and may still be exposed to hydrocarbons in the environment.
River Otters	YES (NUMBER UNKNOWN)	UNKNOWN	YES	UNKNOWN	YES	YES	UNKNOWN	UNKNOWN	UNKNOWN	Exposure to hydrocarbons and sub-lethal effects were determined, but no effects were established on population. Sub-lethal indicators of possible oil exposure remained in 1991. River otters feed in the intertidal and shallow subtidal areas and may still be exposed to hydrocarbons in the environment.
Sitka Black-tailed Deer	NO	NO	NO	(f)	(f)	(f)	(f)	(f)	(f)	Elevated hydrocarbons were found in tissues in some deer in 1989 in PWS.

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 (c) Evidence of sublethal or chronic effects is defined as an observed physiological or behavioral change in an injured species;
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 (e) Based on recovery of dead animals from this region of the spill zone;
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 (g) "Possibly" was used if there was disagreement over the conclusions to be drawn from the results of the damage assessment studies.

Resource	Description of Oil Spill Injury			Status of Recovery in December, 1992		Geographic Extent of Injury (a)				Comments/Discussion
	Initial Oil Spill Mortality (total mortality estimate)(b)	Measured Decline in Population after the spill	Evidence of Sublethal or Chronic Effects (c)	Current Population Status	Evidence of Continuing Sublethal or Chronic Effects	PWS	Kenai	Kodiak	Alaska Penin.	
BIRDS										
Bald Eagles	YES (more than 200 to 300)	POSSIBLY	YES	RECOVERED OR RECOVERING	UNKNOWN	YES	YES	YES (e)	YES(e)	Productivity in PWS was disrupted in 1989, but returned to normal in 1990. Exposure to hydrocarbons and some sub-lethal effects were found in 1989 and 1990, but no continuing effects were observed on populations. In 1989, 151 carcasses were recovered from beaches.
Black-legged Kittiwakes	YES (ESTIMATE UNKNOWN)	NO	NO	NO CHANGE	NO	YES	YES (e)	YES (e)	YES (e)	Total reproductive success in oiled and unoiled areas of PWS has declined since 1989. Hydrocarbon contaminated tissues were detected in 1989. Hydrocarbon contaminated stomach contents were detected in 1989 and 1990. This species is known for great natural variation and reproductive failure may be unrelated to the oil spill. In 1989, 1225 carcasses were recovered from beaches.
Black Oystercatchers	YES (ESTIMATE UNKNOWN)	YES	YES	RECOVERING	YES	YES	YES (e)	YES (e)	YES (e)	Differences in egg size between oiled and unoiled areas were found in 1989. Exposure to hydrocarbons and some sublethal effects were determined. Populations declined more in oiled areas than unoiled areas in post-spill surveys in 1989, 1990 and 1991. Black oystercatchers feed in the intertidal areas and may be still be exposed to hydrocarbons in the environment. In 1989, nine carcasses were recovered from beaches.

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 (d) Population was declining prior to the spill;
 (e) Based on recovery of dead animals from this region of the spill zone;
 (f) If no injury was detected or known, no assessment of recovery could be made.
 (g) "Possibly" was used if there was disagreement over the conclusions to be drawn from the results of the damage assessment studies.

Resource	Description of Oil Spill Injury			Status of Recovery in December, 1992		Geographic Extent of Injury (a)				Comments/Discussion
	Initial Oil Spill Mortality (total mortality estimate)(b)	Measured Decline in Population after the spill	Evidence of Sublethal or Chronic Effects (c)	Current Population Status	Evidence of Continuing Sublethal or Chronic Effects	PWS	Kenai	Kodiak	Alaska Penin.	
Common Murres	YES (175,000 to 300,000)	YES	YES	DEGREE OF RECOVERY VARIES BY COLONY	YES	NO	YES	YES	YES	Measurable impacts on populations were recorded 1989, 1990 and 1991. Breeding was still inhibit in some colonies in the Gulf of Alaska in 1992. 1989, 10,428 carcasses were recovered from beach
Glaucous-winged gulls	YES (ESTIMATE UNKNOWN)	NOT DETECTED	NO	NO CHANGE	NO	YES (e)	YES (e)	YES (e)	YES (e)	While 555 dead birds were recovered in 1989, there is no evidence of a population level impact when compared to historic (1972, 1973) population levels.
Harlequin Ducks	YES (423)	YES	YES	STABLE OR CONTINUING DECLINE	YES	YES	YES (e)	YES (e)	YES (e)	Post-spill samples showed hydrocarbon contamination and poor body conditions in 1989 and 1990. Survivors in 1990-1992 indicated population declines and a total reproductive failure. Harlequin ducks feed in the intertidal and shallow subtidal areas and may still be exposed to hydrocarbons in the environment. In 1989, 213 carcasses were recovered from beaches.
Marbled Murrelets (d)	YES (8,000 TO 12,000)	YES	UNKNOWN	STABLE OR CONTINUING DECLINE	UNKNOWN	YES	YES (e)	YES (e)	YES (e)	Measurable population effects were recorded in 1989, 1990 and 1991. Marbled murrelet populations were declining prior to the spill. In 1989, hydrocarbon contamination was found in livers of adult birds. In 1989, 612 carcasses were recovered from beaches.

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 (d) Population was declining prior to the spill;
 (e) Based on recovery of dead animals from this region of the spill zone;
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Resource	Description of Oil Spill Injury			Status of Recovery in December, 1992		Geographic Extent of Injury (a)				Comments/Discussion
	Initial Oil Spill Mortality (total mortality estimate)(b)	Measured Decline in Population after the spill	Evidence of Sublethal or Chronic Effects (c)	Current Population Status	Evidence of Continuing Sublethal or Chronic Effects	PWS	Kenai	Kodiak	Alaska Penin.	
Peale's Peregrine Falcons	UNKNOWN	UNKNOWN	NO	(f)	(f)	(f)	(f)	(f)	(f)	When compared to 1985 surveys a reduction in population and lower than expected productivity measured in 1989 in the PWS. Cause of these changes are unknown. In 1989, two carcasses were recovered from beaches.
Pigeon Guillemots (d)	YES (1,500 TO 3,000)	YES	NO	STABLE OR CONTINUING DECLINE	UNKNOWN	YES	YES (e)	YES (e)	YES (e)	Pigeon guillemot populations were declining prior to the spill. In 1989, hydrocarbon contamination was found in birds and, externally, on eggs. In 1989, 614 carcasses were recovered from beaches.
Storm Petrels	YES (ESTIMATE UNKNOWN)	NO	UNKNOWN	NO CHANGE	UNKNOWN	YES (e)	YES (e)	YES (e)	YES (e)	Although 363 carcasses were recovered in 1989 an petrels ingested oil and transferred oil to their eggs, reproduction was normal in 1989.
Other Seabirds	YES (ESTIMATE UNKNOWN)	UNKNOWN	UNKNOWN	UNKNOWN	UNKNOWN	YES (e)	YES (e)	YES (e)	YES (e)	Seabird recovery has not been studied. Species collected dead in 1989 include 216 common, 87 yellow-billed, 18 pacific, 5 red-throated loon; red-necked and 277 horned grebe; 426 northern fulmar; 360 sooty and 2,460 short-tailed shearwater; 38 double-crested, 418 pelagic, and red-faced cormorant; 8 herring and 33 mew gull; arctic and 1 Aleutian tern; 67 Kittlitz's and 31 ancient murrelet; 48 Cassin's, 5 least, 31 parakeet, and 141 rhinoceros auklet; and 139 horned and 361 tufted puffin.

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Resource	Description of Oil Spill Injury			Status of Recovery in December, 1992		Geographic Extent of Injury (a)				Comments/Discussion
	Initial Oil Spill Mortality (total mortality estimate)(b)	Measured Decline in Population after the spill	Evidence of Sublethal or Chronic Effects (c)	Current Population Status	Evidence of Continuing Sublethal or Chronic Effects	PWS	Kenai	Kodiak	Alaska Penin.	
Other Sea Ducks	YES (ESTIMATE UNKNOWN)	NO	UNKNOWN	UNKNOWN	UNKNOWN	YES	YES (e)	YES (e)	YES (e)	Species collected dead in 1989 include 4 Stellar's king and 17 common eider; 342 white-winged, 175 surf and 132 black scoter; 185 oldsquaw; 21 bufflehead; 6 common and 33 Barrow's goldeneye; 2 common and 33 red-breasted merganser. Sea ducks tend to feed in the intertidal and shallow subtidal areas which were most heavily impacted by oil.
Other Shorebirds	YES (ESTIMATE UNKNOWN)	UNKNOWN	UNKNOWN	UNKNOWN	UNKNOWN	YES	YES (e)	YES (e)	YES (e)	Species collected dead in 1989 include 1 golden plover; 2 lesser yellowlegs; 1 semipalmated, 5 western, 4 least and 1 Baird's sandpiper; 3 surfbird; 1 short-billed dowitcher; 1 common snipe; 2 red and 7 red-necked phalarope.
Other Birds	YES (ESTIMATE UNKNOWN)	UNKNOWN	UNKNOWN	UNKNOWN	UNKNOWN	YES (e)	YES (e)	YES (e)	YES (e)	Species collected dead in 1989 include 2 emperor and 1 Canada goose; 3 brant; 11 mallard; 4 northern pintail; 5 green-winged teal; 27 greater and 2 lesser scaup; 1 ruddy duck; 1 great blue heron; 1 long-tailed jaeger; 1 willow ptarmigan; 3 great-horned owl; 1 Steller's jay; 7 magpie; 18 common raven; 34 northwestern crow; 2 robin; 1 varied air; 1 hermit thrush; 3 yellow warbler; 1 pine grosbeak; 1 savannah and 4 golden-crowned sparrow; 8 white-winged crossbill.

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Resource	Description of Oil Spill Injury			Status of Recovery in December, 1992		Geographic Extent of Injury (a)				Comments/Discussion
	Initial Oil Spill Mortality (total mortality estimate)(b)	Measured Decline in Population after the spill	Evidence of Sublethal or Chronic Effects (c)	Current Population Status	Evidence of Continuing Sublethal or Chronic Effects	PWS	Kenai	Kodiak	Alaska Penin.	
FISH										
Cutthroat Trout	YES	POSSIBLY (g)	YES	UNKNOWN	UNKNOWN	YES	UNKNOWN	UNKNOWN	UNKNOWN	Differences in survival and growth between anadromous adult populations in the oiled and unoiled areas persisted from 1989 to 1991 despite decrease in exposure indicators. This could be due to continuing injury to the food base.
Dolly Varden	YES	POSSIBLY (g)	YES	UNKNOWN	UNKNOWN	YES	UNKNOWN	UNKNOWN	UNKNOWN	Differences in survival between anadromous adult populations in the oiled and unoiled areas persisted from 1989 to 1991 despite a decrease in exposure indicators. This could be due to continuing injury to the food base.
Pacific Herring	YES, TO EGGS AND LARVAE	UNKNOWN	YES	UNKNOWN	NO	YES	UNKNOWN	UNKNOWN	UNKNOWN	Measurable difference in egg counts between oiled and unoiled areas were found in 1989 and 1990. Lethal and sublethal effects on eggs and larvae were evident in 1989 and to a lesser extent in 1990; in 1991 there were no differences between oiled and unoiled areas. It is possible that the 1989 year class was injured and could result in reduced recruitment to the adult population.

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	Initial Oil Spill Mortality (total mortality estimate)(b)	Measured Decline in Population after the spill	Evidence of Sublethal or Chronic Effects (c)	Current Population Status	Evidence of Continuing Sublethal or Chronic Effects	PWS	Kenai	Kodiak	Alaska Penin.	
Pink Salmon (Wild) (d)	YES, TO EGGS	POSSIBLY (g)	YES	UNKNOWN	YES	YES	UNKNOWN	UNKNOWN	UNKNOWN	There was initial egg mortality in 1989. Egg mortality continued to be high in 1990 and 1991. Abnormal fry were observed in 1989. Reduced growth of juveniles was found in the marine environment 1989 and 1991, which correlates with reduced survival.
Rockfish	YES (ESTIMATE UNKNOWN)	UNKNOWN	YES	UNKNOWN	UNKNOWN	YES	YES	UNKNOWN	UNKNOWN	Twenty dead fish were found in 1989, but only a few were in condition to be analyzed. Exposure to hydrocarbons with some sub-lethal effects was determined in those fish, but the effects on the population was unknown. Closures to salmon fisheries increased fishing pressures on rockfish which may be impacting population.
Sockeye Salmon	UNKNOWN	YES	YES	SEE COMMENTS	YES	UNKNOWN	YES	YES	NO	Smolt survival continues to be poor in the Red Lake and Kenai River systems due to overescapements in Red Lake in 1989, and in the Kenai River in 1987 and 1988, 1989. As a result, adult returns are expected to be low in 1994 and successive years. Trophic structures of Kenai and Skilak Lakes have been altered by overescapement.

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 (d) Population was declining prior to the spill;
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Resource	Description of Oil Spill Injury			Status of Recovery in December, 1992		Geographic Extent of Injury (a)				Comments/Discussion
	Initial Oil Spill Mortality (total mortality estimate)(b)	Measured Decline in Population after the spill	Evidence of Sublethal or Chronic Effects (c)	Current Population Status	Evidence of Continuing Sublethal or Chronic Effects	PWS	Kenai	Kodiak	Alaska Penin.	
SHELLFISH										
Clam	YES (ESTIMATE UNKNOWN)	UNKNOWN	UNKNOWN	UNKNOWN	UNKNOWN	YES	YES	YES	YES	Native littleneck and butter clams were impacted both oiling and clean-up, particularly high pressure, hot water washing. Additional data are still being evaluated.
Crab (Dungeness)	UNKNOWN	UNKNOWN	UNKNOWN	(f)	(f)	(f)	(f)	(f)	(f)	Insufficient data to determine injury.
Oyster	UNKNOWN	UNKNOWN	UNKNOWN	(f)	(f)	(f)	(f)	(f)	(f)	Although studies were initiated in 1989, they were not completed because they were determined to be of limited value.
Sea Urchin	UNKNOWN	UNKNOWN	UNKNOWN	(f)	(f)	(f)	(f)	(f)	(f)	Studies limited to laboratory toxicity studies.
Shrimp	UNKNOWN	UNKNOWN	NO	(f)	(f)	(f)	(f)	(f)	(f)	No conclusive evidence presented for injury link to oil spill.

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 (d) Population was declining prior to the spill;
 (e) Based on recovery of dead animals from this region of the spill zone;
 (f) If no injury was detected or known, no assessment of recovery could be made.
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Resource	Description of Oil Spill Injury			Status of Recovery in December, 1992		Geographic Extent of Injury (a)				Comments/Discussion
	Initial Oil Spill Mortality (total mortality estimate)(b)	Measured Decline in Population after the spill	Evidence of Sublethal or Chronic Effects (c)	Current Population Status	Evidence of Continuing Sublethal or Chronic Effects	PWS	Kenai	Kodiak	Alaska Penin.	
INTERTIDAL/SUBTIDAL COMMUNITIES										
Intertidal Organisms/Communities	YES	YES	YES	VARIABLE BY SPECIES	YES	YES	YES	YES	YES	Measurable impacts on populations of plants and animals were determined 1989 to 1992. The lower intertidal and, to some extent, the mid intertidal is recovering. Some species (e.g. Fucus) in the upper intertidal zone have not recovered, and oil persists in and under mussel beds. Intertidal organisms were impacted by both oiling and clean up, particularly high pressure, hot water washing
Subtidal Communities	YES	YES	YES	VARIABLE BY SPECIES	YES	YES	UNKNOWN	UNKNOWN	UNKNOWN	Measurable impacts on population of plants and animals were determined in 1989. Eel grass and some species of algae appear to be recovering. Amphipods in eel grass beds recovered to pre-spill densities in 1991. Leather stars and helmet crabs show little sign of recovery through 1991.

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- (c) Evidence of sublethal or chronic effects is defined as an observed physiological or behavioral change in an injured species;
- (d) Population was declining prior to the spill;
- (e) Based on recovery of dead animals from this region of the spill zone;
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- (g) "Possibly" was used if there was disagreement over the conclusions to be drawn from the results of the damage assessment studies.

TABLE XXX Other Natural Resources and Archaeology: Summary of Results of Injury Assessment Studies Done After the Exxon Valdez Oil Spill (b)

RPWG draft 2/8/93

Resource	Description of Injury	Status of Recovery in December, 1992	Geographic Extent of Injury (a)				Comments/Discussion
			PWS	Kennai	Kodiak	Alaska Penin.	
Air	Air quality standards for aromatic hydrocarbons were exceeded at the spill site. Health and safety standards for permissible exposure levels were exceeded up to 400 times.	Recovered	YES	UNKNOWN	UNKNOWN	UNKNOWN	Impacts diminished as oil weathered and lighter fractions evaporated.
h1 Sediments	Oil coated beaches and became buried in beach sediments. Oil laden sediments were transported off beaches and deposited on subtidal marine sediments.	Oil remains intertidally on rocks and beaches and buried beneath the surface at other beach locations. Oil concentrations have increased in subtidal marine sediments and have spread to greater depths (to 720 meters) over time.	YES	YES	YES	YES	Unweathered buried oil will persist for many years in protected low-energy sites in Prince William Sound.
Water	State of Alaska water quality standards were not exceeded in open sea conditions. In small bays and near shore, hydrocarbon concentrations may have exceeded the 10 micrograms per liter standard immediately after the spill. Federal oil discharge standards of no visible sheen were exceeded.	Recovered	YES	UNKNOWN	UNKNOWN	UNKNOWN	Impacts were patchy and transient during the early stages of the spill. Impacts diminished as oil weathered and lighter fractions evaporated.
Archaeologic sites/artifacts	Currently, 24 sites are known to have been adversely affected by oiling, clean-up activities, or looting and vandalism linked to the oil spill. 113 sites are estimated to have been similarly affected. Injuries attributed to looting and vandalism (linked to the oil spill) are still occurring.	Archaeological sites and artifacts cannot recover, they are finite non-renewable resources.	YES	YES	YES	YES	* Injury studies are not yet complete (January 1993).

(a) There may have been an unequal distribution of injury within each region, see map for location of regions;
 (b) This page has not yet been reviewed by the Chief Scientist;

Services: Summary of Results of Injury Assessment Studies

The next few pages summarize information concerning services damaged by the spill. The information in this table has not yet been peer reviewed and is subject to change.

Much of the damage to services, and the information about those damages, is not quantitative. The table reflects the qualitative content of the information. The "Description of Injury" column recounts the situation for each service in the year following the spill. The "Status of Recovery in 1992" shows the 1992 situation for that service.

The information used for this table is taken from injury assessment studies, information from agency managers, and, for recreation, a Key Informant Interview study conducted by the Restoration Planning Working Group in December 1992.

TABLE XX Services: Summary of Results of Injury Assessment Studies Done After the Exxon Valdez Oil Spill

RPWG draft 2/8/93

WORKING DRAFT - NOT FOR PUBLIC RELEASE

Service	Description of Injury	Status of Recovery in December, 1992	Geographic Extent of Injury				Comments/Discussion
			PWS	Kenai	Kodiak	Alaska Penin.	
Passive Use Values (Option, existence and non-use values)	In 1991, over 90% of those surveyed (nation-wide) said they were aware of the Exxon Valdez oil spill. Over 50% believed that the spill was the largest environmental accident caused by humans anywhere in the world. The median household willingness to pay for future prevention was \$31. Multiplying thus by the number of U.S. household results in a damage estimate of \$2.8 billion.	Data is not available to determine the status of recovery.	N/A	N/A	N/A	N/A	The study, <u>A Contingency Valuation Study of Lost Passive Use Values Resulting From the Exxon Valdez Oil Spill</u> , was developed between July 1989 and January 1991, at which time it was put into the field. Respondents were comprised of people in the lower 48 states.
91 Recreation and Tourism	The nature and extent of injury varied by user group and by area. About a quarter of key informants interviewed reported no change in their recreation experience, but others reported avoidance of the spill area, reduced wildlife sightings, residual oil, and more people. They also reported changes in their perception of recreation opportunity in terms of increased vulnerability to future oil spills, erosion of wilderness, a sense of permanent change, concern about long-term ecological effects, and, in some, a sense of optimism. Overall, recreation, tourism and sport fishing declined significantly in 1989 and improved markedly in 1990 although there were residual effects. Sport hunting of harlequin duck was affected by restrictions imposed in 1991 in response to damage assessment studies.	Declines in recreation activities reported in 1989 appear to have reversed, although there is no data to support or deny this perception. Harvest restrictions are expected to continue through 1993.	YES	YES	YES	YES	

TABLE XX Services: Summary of Results of Injury Assessment Studies Done After the *Exxon Valdez* Oil Spill

Service	Description of Injury	Status of Recovery in December, 1992	Geographic Extent of Injury				Comments/Discussion
			PWS	Kenai	Kodiak	Alaska Penin.	
<p>17</p> <p>Sport and Commercial Fishing</p>	<p>During 1989, emergency commercial fishery closures were ordered in PWS, Cook Inlet, Kodiak and the Alaska Peninsula. This affected salmon, herring, crab, shrimp, rockfish and sablefish. The 1989 closures resulted in sockeye over-escapement in the Kenai River and in the Red Lake system (Kodiak Island).</p> <p>In 1990 a portion of PWS was closed to shrimp fishing.</p> <p>Between 1989 and 1990 a decline in sport fishing (number of anglers, fishing trips and fishing day) were recorded for PWS, Cook Inlet and the Kenai Peninsula. In 1992 an emergency order restricting cutthroat trout fishing was issued for western PWS due to low adult returns.</p>	<p>Currently there are no oil spill-related commercial closures in effect. The 1992 sport fishing closure for cutthroat trout is expected to continue at least through 1993.</p> <p>EVOS related sockeye over-escapement in the Kenai River and Red Lake system is anticipated to result in low adult returns in 1994 and 1995. These over-escapements may result in closure or harvest restrictions during these and perhaps in subsequent years.</p>	YES	YES	YES	YES	<p>Injury in the Alaska Peninsula is for Commercial fishing only. Injuries and recovery status of rockfish, shellfish and herring are uncertain. Therefore, future impacts on these fisheries is unknown.</p>

TABLE XX Services: Summary of Results of Injury Assessment Studies Done After the *Exxon Valdez* Oil Spill

Service	Description of Injury	Status of Recovery in December, 1992	Geographic Extent of Injury				Comments/Discussion
			PWS	Kenai	Kodiak	Alaska Penin.	
81 Subsistence	<p>Subsistence harvests of fish and wildlife in 9 of 15 villages surveyed declined from 4 - 78% in 1989 when compared to pre-spill averages. Approximately 7 of the 15 villages show continued declines in use in the period 1990-1991; this decline is particularly noticeable in the Prince William Sound villages of Chenega and Tatitlek.</p> <p>In 1989, chemical analysis indicated that most resources tested, including fish, marine mammals, deer, and ducks, were safe to eat, but that shellfish from oiled beaches should not be used.</p> <p>In addition, village residents believe that subsistence species continue to decline or have not recovered from the oil spill.</p>	Many subsistence users believe that continued contamination to subsistence food sources is dangerous to their health.	YES	YES	YES	NO	For detailed information on village subsistence use see table __, page__.
Wilderness Values	<p>There is a perception of lost values to designated federal and state wilderness areas in parks, refuges and forests. People report that their feeling about the spill area has changed. There is wide-spread feeling that something has been lost. Approximately __, __ miles of wilderness coastline were affected by oil. Some oil remains embedded in the sediments of these areas.</p>	<p>Some people's feelings of lost values are diminishing (recovery). To others the values remain injured (lack of recovery).</p> <p>Oil has degraded substantially in many areas but remains in others. Until oil is completely removed or degrades naturally, injury to wilderness values will continue.</p>	YES	YES	YES	YES	

Draft Alternatives

These pages summarize the alternatives proposed for the draft restoration plan. Some of the details are likely to change, tables may be reformatted during publication, and much explanatory text will accompany the tables. But the tables contain the basic information proposed for the alternatives. With Trustee concurrence, these alternatives are intended for the draft restoration plan, and the "Alternative Information Package" scheduled for March publication.

Five tables are presented for each alternative.

1. Summary of the theme and policy variables that apply to that alternative.
2. The Resources and Services addressed in that alternative. Alternatives two, four, and five address all resources. Alternative three addresses only resources that show a population-level injury. All alternatives (except alternative #1, the "no-action alternative") address all services.
3. Restoration Options applicable to that alternative.
4. Geographic Distribution of Restoration Options
5. Cost Allocation
6. Option by Option Cost Summary

A Note About Costs. All costs are in thousands of 1993 dollars. The inflation-adjusted value of the remainder of the settlement is approximately \$522 million in 1993 dollars (after deducting an estimate of reimbursements to governments). Inflation adjustments use the projection from mid-range scenario of the Alaska Department of Revenue's Fall 1993 revenue forecast.

Costs for each alternative are summarized into the broad categories described below.

- 1. Administration and Information.** Includes costs for administration and public information.
- 2. Monitoring**
- 3. Habitat Protection**
- 4. Other Restoration.** This category includes all restoration except habitat protection.
- 5. Other Restoration Reserve.** The "other restoration" category includes the projected cost of all restoration options known today that fit into the policy variables of each alternative. Other effective options may be suggested. This reserve provides a source of funds for effective options that are not known today.

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	Alternative 1 Natural Recovery	Alternative 2 Habitat Protection	Alternative 3 Limited Restoration	Alternative 4 Moderate Restoration	Alternative 5 Comprehensive Restoration
THEME	No action other than monitoring and normal agency management.	Protect injured resources and services from further degradation or disturbance.	Take highly effective actions to protect and restore injured services and resources whose population has declined. Maintain the existing character of the affected area.	Take highly effective actions to protect and restore all injured resources and services. Increase, to a limited extent, opportunities for human use in the affected area.	Take all effective actions to protect, restore, and enhance all injured resources and services. Increase opportunities for human use in the affected area.
VARIABLES					
Injuries Addressed	N/A	All injured resources and services.	Injured services and resources whose populations declined.	All injured resources and services.	All injured resources and services.
Status of Resource Recovery	N/A	Resources not recovered and resources recovered.	Resources not recovered.	Resources not recovered.	Resources not recovered and resources recovered.
Effectiveness of Restoration Actions	N/A	All effective habitat protection actions.	Only highly effective actions.	Only highly effective actions.	All effective actions.
Strategies for Public Use	N/A	Protect or increase existing use through habitat protection.	Protect existing use.	Protect or increase existing use.	Protect or increase existing use or encourage appropriate new use.

Monitoring and information programs are included in all alternatives.

Restoration actions may be undertaken for injured resources, services, or their equivalents in all alternatives.

Table ____ . Summary of Draft Restoration Plan Alternatives

Table V-__ shows which resources showed a population decline, and which showed chronic or sublethal injury without a detectable change in population. The table shows the injuries that occurred as of 1989, the spill year and does not take into account recovery.

Table V-__. Degree of Injury

<u>Resources whose populations declined because of the spill.</u>	<u>Sublethal or Chronic Effects. No Detectable spill-related population decline</u>
Harbor seals	River otters
Sea otters	Bald eagles*
Common murre	Killer Whales*
Marbled murrelet	Pink salmon*
Pigeon Guillemots	Pacific herring
Harlequin ducks	Rockfish
Black oystercatchers	Dolly Varden*
Sockeye salmon smolts	Cutthroat Trout*
Intertidal organisms	
Subtidal organisms	

* For these species, the Trustees' scientists have considerable disagreement over the conclusions to be drawn from the results of the damage assessment studies.

Alternative 1 - Natural Recovery

THEME	No action other than monitoring and normal agency management.
VARIABLES	
Injuries Addressed	N/A
Status of Resource Recovery	N/A
Effectiveness of Restoration Actions	N/A
Strategies for Public Use	N/A

Monitoring and information programs are included in all alternatives.

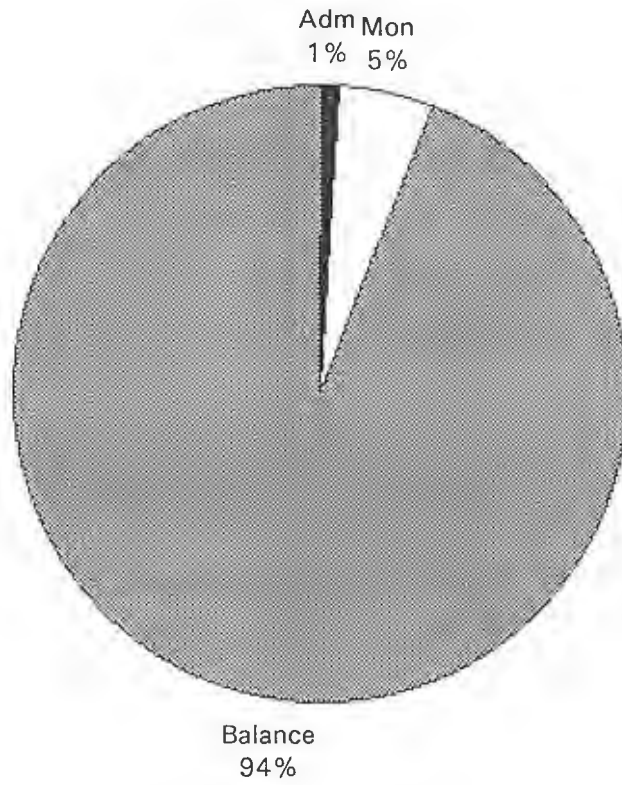
Restoration actions may be undertaken for injured resources, services, or their equivalents in all alternatives.

What would happen to resources and services within the Exxon Valdez oil spill area if no restoration options were implemented? Normal agency management continues, current trends in human use of the affected area continue, and planned development of private lands continue. These trends influence the environment that injured resources face in order to recover. Ideally, the exact injury would be known, and enough would be known about each resource to develop a population model. Unfortunately, such detailed information is not available for most resources; therefore, estimates are based on discussions with agency experts and peer reviewers, and from experience with similar species in different areas (Note: the literature synthesis information is not yet incorporated into this DRAFT!). Similarly, there is limited information on the injury to services.

The objectives of this alternative are to describe the potential rate and degree of recovery for the injured resources with only normal agency management; identify the missing information that make the recovery estimates uncertain; describe the recovery of services; and to describe the monitoring and public information program that would be funded through the Trustee Council.

Allocation of Remainder of Settlement Funds							Total \$	%
Adm							5200.0	1%
Mon							25250.0	5%
Balance							491550.0	94%

Alternative 1 - Allocation



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NB: All costs are expressed in units of \$1,000 (1993 \$). The inflation-adjusted value of the remainder of the settlement is about \$522 million.

Alternative 1 - Natural Recovery													
Opt	DESCRIPTION	ResSvc	UNIT	ANNUAL COST			DURATION			TOTAL COST			
				Exp	Low	High	Type	Years			10-Year Maximum		
								E	L	H	Expected	Lower	Higher
P1.00	Administration	Multiple resources									5200.0	5200.0	36500.0
P2.00	Monitoring	Multiple resources									25250.0	25250.0	52500.0

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NB: All costs are expressed in units of \$1,000 (1993 \$). The inflation-adjusted value of the remainder of the settlement is about \$522 million.

Alternative 2 - Habitat Protection

THEME	Protect injured resources and services from further degradation or disturbance.
VARIABLES	
Injuries Addressed	All injured resources and services.
Status of Resource Recovery	Resources not recovered and resources recovered.
Effectiveness of Restoration Actions	All effective habitat protection actions.
Strategies for Public Use	Protect or increase existing use through habitat protection.

Monitoring and information programs are included in all alternatives.

Restoration actions may be undertaken for injured resources, services, or their equivalents in all alternatives.

The goal of this alternative is for the spill-affected area to return to prespill conditions on its own without further disturbance. This alternative addresses all injured resources and services whether or not they have recovered. Table ____ lists the resources and services addressed in this alternative. As these resources and services recover, protective actions would continue so that they are not subject to additional stress.

RESOURCES			SERVICES
Population Decline	Sublethal/Chronic	Other	
Black oystercatcher *Common murre Harbor seal Harlequin duck *Intertidal organisms Marbled murrelet *Pigeon guillemot *Sea otter Sockeye salmon *Subtidal organisms	Bald eagle Cutthroat trout Dolly Varden *Killer whale *Pacific herring Pink salmon *River otter *Rockfish	*Archaeology	*Commercial fishing Recreation *Sport fishing *Subsistence Wilderness

* Resources and services for which no restoration action(s) are included in this alternative.

Table ____. Resources and Services Addressed in Alternative 2

DRAFT 2/8/93 Restoration Options for Alternative 2**

RESOURCE/SERVICE	RESTORATION OPTION
Black oystercatcher	40.0 Land and water management actions
Common murre	None identified
Harbor seal	37.0 Habitat protection and acquisition
Harlequin duck	37.0 Habitat protection and acquisition
Intertidal organisms	None identified
Marbled murrelet	37.0 Habitat protection and acquisition 40.0 Land and water management actions
Pigeon guillemot	None identified
Sea otter	None identified
Sockeye salmon	37.0 Habitat protection and acquisition
Subtidal organisms	None identified
Bald eagle	37.0 Habitat protection and acquisition
Cutthroat trout	37.0 Habitat protection and acquisition
Dolly Varden	37.0 Habitat protection and acquisition
Killer whale	None identified
Pacific herring	None identified
Pink salmon	37.0 Habitat protection and acquisition 40.0 Land and water management actions
River otter	None identified
Rockfish	None identified
Archaeology	None identified
Commercial fishing	None identified
Recreation	37.0 Habitat protection and acquisition 40.0 Land and water management actions
Sport fishing	None identified
Subsistence	None identified
Wilderness and non-use values	37.0 Habitat protection and acquisition 40.0 Land and water management actions

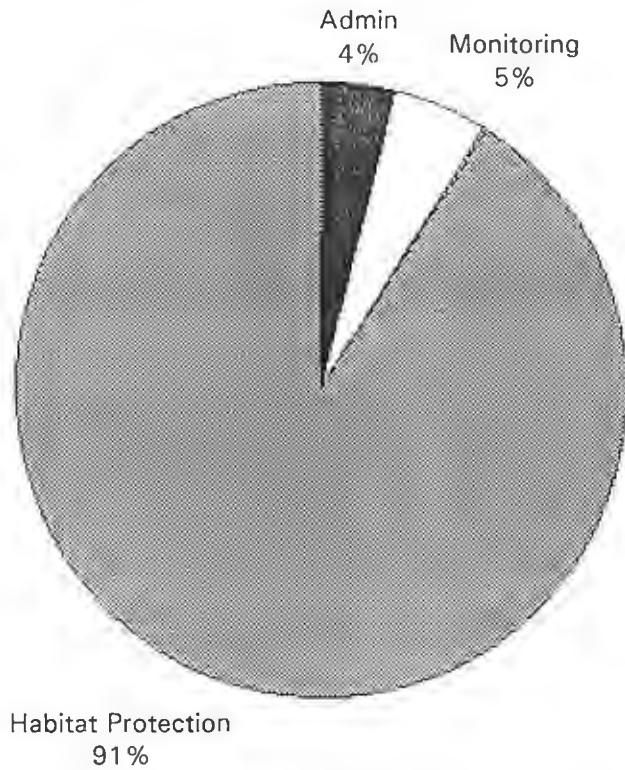
** Options 37 and 40 can potentially benefit all injured resources and services. The table above reflects those resources and services which are the primary targets of the proposed options.

ALTERNATIVE 2: GEOGRAPHIC DISTRIBUTION

RESOURCE OR SERVICE	OPTION NUMBER	OPTION NAME	Prince William Sound			Kenai/Cook Inlet			Alaska Penin.	Kodiak/Afognak		Outside EVOS
			North	East	West	Outer Kenai	Lower Cook In	Central Cook In		Afogn. Shuyak	Kodiak	
MULTI-SPECIES	37.0	Habitat protection and acquisition		x	x	x	x	x	x	x	x	
MULTI-SPECIES	40.0	Land and water management actions	x	x	x	x	x	x	x	x	x	

Allocation of Remainder of Settlement Funds						Total \$	%
Admin						21000.0	4%
Monitoring						26000.0	5%
Habitat Protection						475000.0	91%

Alternative 2 - Allocation



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NB: All costs are expressed in units of \$1,000 (1993 \$). The inflation-adjusted value of the remainder of the settlement is about \$522 million.

Alternative 2 - Protection													
Opt	DESCRIPTION	ResSvc	UNIT	ANNUAL COST			DURATION			TOTAL COST			
				Exp	Low	High	Type	Years			10-Year Maximum		
								E	L	H	Expected	Lower	Higher
37.00	Habitat protection/acquisition	Multiple resources									475000.0	234900.0	475000.0
40.00	Land and water mgmt actions	Multiple resources											
P1.00	Administration	Multiple resources									21000.0	5200.0	36500.0
P2.00	Monitoring	Multiple resources									26000.0	25250.0	52500.0

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NB: All costs are expressed in units of \$1,000 (1993 \$). The inflation-adjusted value of the remainder of the settlement is about \$522 million.

Alternative 3 - Limited Restoration

THEME	Take highly effective actions to protect and restore injured services and resources whose population has declined. Maintain the existing character of the affected area.
VARIABLES	
Injuries Addressed	Injured services and resources whose populations declined.
Status of Resource Recovery	Resources not recovered.
Effectiveness of Restoration Actions	Only highly effective actions.
Strategies for Public Use	Protect existing use.

Monitoring and Information programs are included in all alternatives.

Restoration actions may be undertaken for injured resources, services, or their equivalents in all alternatives.

The goal of this alternative is for the worst-injured resources and services to return to pre-spill conditions as efficiently as possible. This is the only alternative that limits its scope to resources whose populations declined after the spill. Table _____ lists the resources and services addressed in this alternative. None of the resources whose populations declined after the spill has yet recovered. However, as resources recover, settlement funds would no longer be allocated to protecting or restoring them. This alternative includes only the most effective actions for protecting injured resources and restoring them to pre-spill conditions. It also includes only those actions that protect existing human uses that were injured and the resource base on which they depend. For example, a boat ramp in an area already used to launch boats would protect the beach that supports this type of recreational use.

RESOURCES		SERVICES
Population Decline	Other	
*Black oystercatcher Common murre Harbor seal Harlequin duck Intertidal organisms Marbled murrelet Pigeon guillemot Sea otter Sockeye salmon *Subtidal organisms	Archaeology	Commercial fishing Recreation Sport fishing Subsistence Wilderness

* Resources and services for which no restoration action(s) are included in this alternative.

Table _____. Resources and Services Addressed in Alternative 3

DRAFT 2/8/93 Restoration Options for Alternative 3

RESOURCE/SERVICE	RESTORATION OPTION
Black oystercatchers	None identified
Common murre	16.1 Study: Increase productivity with social stimuli 17.2 Temporary predator control
Harbor seals	46.0 Cooperative program with commercial fishermen 47.0 Cooperative program with subsistence users
Harlequin duck	13.1 Study: eliminate oil from mussel beds
	37.0 Habitat protection and acquisition
Intertidal organisms	14.0 Accelerate recovery of upper intertidal zone
Marbled murrelet	9.0 Minimize incidental take
	37.0 Habitat protection and acquisition
	40.0 Land and water management actions
Pigeon guillemots	17.2 Temporary predator control
Sea otters	4.2 Study: Reduce disturbance at marine mammal haul-outs 13.2 Study: eliminate oil from mussel beds 47.0 Cooperative program with subsistence users
Sockeye salmon	2.5 Intensify sockeye management to protect injured stocks 48.0 Improve survival of salmon eggs and fry
Subtidal organisms	None identified
Archaeology	1.1 Site stewardship program 1.2 Site patrol and monitoring 10.0 Preserve archaeological sites and artifacts
Commercial fishing	18.0 Replace salmon harvest opportunities
Recreation	12.1 New backcountry public recreation facilities
	37.0 Habitat protection and acquisition 40.0 Land and water management actions
Sport fishing	18.0 Replace salmon harvest opportunities

Subsistence	30.0 Test subsistence foods for hydrocarbon contamination 49.0 Provide access to traditional subsistence foods
Wilderness and non-use values	37.0 Habitat protection and acquisition 40.0 Land and water management actions
	Included in Alternative 2

ALTERNATIVE 3: GEOGRAPHIC DISTRIBUTION

RESOURCE OR SERVICE	OPT. No.	OPTION NAME	Prince William Sound			Kenai Cook/Inlet			Alaska Penin.	Kodiak/Afognak		Outside EVOS
			North	East	West	Outer Kenai	Lower Ck In	Central Ck In		Afg. Shuyak	Kodiak	
Archaeology	1.0	Archaeological site stewardship program	X	X	X	X	X	X	X	X		
Sockeye salmon	2.5	Intensify sockeye management to protect injured stocks						X				
Harbor seal	4.2	Reduce disturbance at marine mammal haul-outs	X	X	X	X	X	X				
Sea otter	4.2	Reduce disturbance at marine mammal haul-outs	X	X	X							
Marbled murrelet	9.0	Minimize incidental take by commercial fisheries	X	X	X	X	X	X	X	X		
Archaeology	10.0	Preserve archaeological sites and artifacts	X	X	X	X	X	X	X	X		
Sockeye salmon	11.2	Fertilize lakes to improve sockeye rearing success	X									
Recreation	12.1	Construct new backcountry public facilities	X	X	X	X	X	X	X	X		
Harlequin duck	13.1	Study: eliminate oil from mussel beds			X	X	X	X	X	X		
Sea otter	13.2	Study: eliminate oil from mussel beds			X							
MULTI-SPECIES	14.0	Accelerate recovery of upper intertidal zone			X	X	X	X	X	X		
Common murre	16.1	Increase murre productivity through enhanced social stimuli				X		X				
Pigeon guillemot/Common murre (replacement)	17.1	Removal of introduced species in the Aleutians									X	
Common murre	17.2	Temporary predator control				X	X	X	X	X	X	
Pigeon guillemot	17.2	Temporary predator control	X	X	X	X	X	X	X	X		
Subsistence	30.0	Test subsistence foods for hydrocarbon contamination		X	X		X				X	
MULTI-SPECIES	37.0	Habitat protection and acquisition		X	X	X	X	X	X	X		
MULTI-SPECIES	40.0	Land and water management actions	X	X	X	X	X	X	X	X		
Killer Whale - AB pod	45.0	Study: Facilitate changes in black cod fishery gear	X	X	X	X						
Harbor Seal	46.0	Cooperative program w. comm. fishermen to reduce seal bycatch	X	X	X		X			X	X	
Harbor Seal & Sea otter	47.0	Cooperative program with subsistence users to assess harvest levels		X	X		X				X	
Sockeye Salmon	48.0	Improve survival of salmon eggs and fry						X			X	

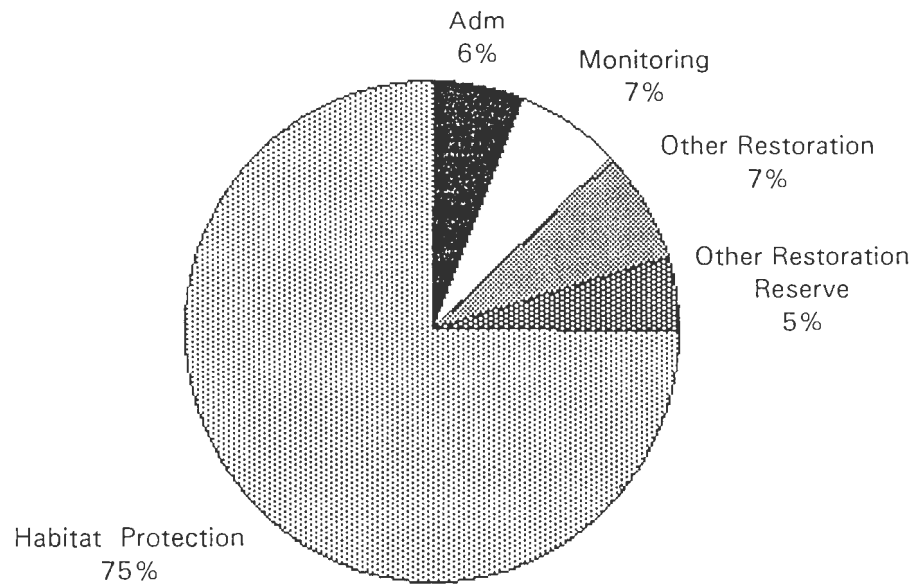
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RESOURCE OR SERVICE	OPT. No.	OPTION NAME	Prince William Sound			Kenai Cook/Inlet			Alaska Penin.	Kodiak/Afognak		Outside EVOS
			North	East	West	Outer Kenai	Lower Ck In	Central Ck In		Afg. Shuyak	Kodiak	
Subsistence	49.0	Provide subsistence users access to traditional subsistence foods			X							
Pink salmon	51.0	Relocate existing hatchery runs	X	X	X							

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Allocation of Remainder of Settlement Funds							Total \$	%
Adm							31500.0	6%
Monitoring							36500.0	7%
Other Restoration							38362.0	7%
Other Restoration Reserve							24138.0	5%
Habitat Protection							391500.0	75%

Alternative 3 - Allocation



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NB: All costs are expressed in units of \$1,000 (1993 \$). The inflation-adjusted value of the remainder of the settlement is about \$522 million.

Alternative 3 - Limited Restoration

Opt	DESCRIPTION	ResSvc	UNIT	ANNUAL COST							TOTAL COST		
				Exp.	Low	High	Type	DURATION			10-Year Maximum		
								E	L	H	Expected	Lower	Higher
1.10	Site stewardship program	Archaeology	Per 3 areas	195.0	195.0	195.0	Ltd	10	10	10	1950.0	1950.0	1950.0
1.20	Site patrol and monitoring	Archaeology		300.0	300.0	300.0	Ltd	4	3	5	1200.0	900.0	1500.0
2.50	Intensify management	Sockeye salmon		3000.0	2000.0	5000.0	Ltd	5	2	5	15000.0	4000.0	25000.0
4.30	Feas Study: Reduce disturb	Sea otter					Ltd				120.0	80.0	640.0
9.00	Minimize incidental take	Marbled murrelet									1625.0	1100.0	2000.0
10.00	Archaeol Res Protection	Archaeology									4072.0	3250.0	7000.0
12.10	New backcountry rec facilities	Recreation									1620.0	480.0	3256.0
13.01	Eliminate oil from mussel beds	Harlequin duck		491.0	340.0	641.0	Ltd	5	4	7	2455.0	1360.0	4487.0
13.02	Study: Elim oil fr mussel beds	Sea otter											
14.01	Accelerate recovery of UIT	Intertidal organisms		150.0	100.0	200.0	UR	5	4	7	750.0	400.0	1400.0
16.10	Feas Study: Social stimuli	Common murre					Ltd				850.0	800.0	5500.0
17.21	Temporary predator control	Common murre		350.0	300.0	400.0	Ltd	5	5	10	1750.0	1500.0	4000.0
17.22	Temporary predator control	Pigeon guillemot		200.0	150.0	250.0	Ltd	4	4	6	800.0	600.0	1500.0
18.01	Replace harvest opportunities	Comm fishing	5 projects	750.0	500.0	1000.0	Ltd	2	1	5	1500.0	500.0	5000.0
18.02	Replace harvest opportunities	Sport fishing	5 projects	750.0	250.0	1000.0	Ltd	2	1	5	1500.0	250.0	5000.0
30.00	Test subsistence foods	Subsistence		330.0	300.0	350.0	Ltd	3	2	5	990.0	600.0	1750.0
37.00	Habitat protection/acquisition	Multiple resources									391500.0	234900.0	475000.0
40.00	Land and water mgmt actions	Multiple resources											
46.00	Coop prgm-fishermen	Harbor seal		50.0	30.0	100.0	Ltd	3	1	5	150.0	30.0	500.0
47.01	Coop prgm-subsistence users	Harbor seal		30.0	30.0	30.0	UR	10	10	10	300.0	300.0	300.0
47.02	Coop prgm-subsistence users	Sea otter					UR						
48.02	Improve survival rates	Sockeye salmon	4 projects	400.0	200.0	600.0	Ltd	3	1	5	1200.0	200.0	3000.0
49.00	Access to traditional foods	Subsistence	Per village	53.0	50.0	60.0	UR	10	5	10	530.0	250.0	600.0
P1.00	Administration	Multiple resources									31500.0	5200.0	36500.0
P2.00	Monitoring	Multiple resources									36500.0	25250.0	52500.0

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NB: All costs are expressed in units of \$1,000 (1993 \$). The inflation-adjusted value of the remainder of the settlement is about \$522 million.

Alternative 4 - Moderate Restoration

THEME	Take the most effective actions to protect and restore all injured resources and services. Increase, to a limited extent, opportunities for human use in the affected area.
VARIABLES	
Injuries Addressed	All injured resources and services.
Status of Resource Recovery	Resources not recovered.
Effectiveness of Restoration Actions	Only highly effective actions.
Strategies for Public Use	Protect or increase existing use.

Monitoring and information programs are included in all alternatives.

Restoration actions may be undertaken for injured resources, services, or their equivalents in all alternatives.

The goal of this alternative is for all injured resources and services to return to pre-spill conditions as efficiently as possible. Table _____ lists the resources and services addressed in this alternative. None of the resources whose populations declined after the spill has yet recovered. However, as resources recover, settlement funds would no longer be allocated to protecting or restoring them. This alternative includes actions that protect existing human uses that were injured and the resource base on which they depend and also those actions that would increase existing use. An example of the latter is a new hatchery run that may increase opportunities in an existing fishery.

RESOURCES			SERVICES
Population Decline	Sublethal/Chronic	Other	
*Black oystercatcher Common murre Harbor seal Harlequin duck Intertidal organisms Marbled murrelet Pigeon guillemot Sea otter Sockeye salmon *Subtidal organisms	Bald eagle Cutthroat trout Dolly Varden Killer whale Pacific herring Pink salmon *River otter Rockfish	Archaeology	Commercial fishing Recreation Sport fishing Subsistence Wilderness

* Resources and services for which no restoration action(s) are included in this alternative.

Table _____. Resources and Services Addressed in Alternative 4.

DRAFT 2/8/93 Restoration Options for Alternative 4

RESOURCE/SERVICE	RESTORATION OPTION
Black oystercatcher	None identified
Common murre	16.1 Study: Increase productivity with enhanced social stimuli
	17.1 Removal of introduced species in the Aleutians
	17.2 Temporary predator control
Harbor seal	46.0 Cooperative program with fishermen 47.0 Cooperative program with subsistence users
Harlequin duck	13.1 Study: eliminate oil from mussel beds 37.0 Habitat protection and acquisition
Intertidal organisms	14.0 Accelerate recovery of upper intertidal zone
Marbled murrelet	9.0 Minimize incidental take 37.0 Habitat protection and acquisition 40.0 Land and water management actions
Pigeon guillemot	17.1 Removal of introduced species in the Aleutians 17.2 Temporary predator control
Sea otter	4.2 Study: Reduce disturbance at marine mammal haul-outs 13.2 Study: Eliminate oil from mussel beds 47.0 Cooperative program with subsistence users
Sockeye salmon	2.5 Intensify sockeye management to protect injured stocks
	11.2 Fertilize lakes to improve sockeye rearing success
	48.0 Improve survival of salmon eggs and fry
Subtidal organisms	None identified
Bald eagle	37.0 Habitat protection and acquisition
Cutthroat trout	2.1 Intensify management to protect injured stocks 37.0 Habitat protection and acquisition

Dolly Varden	2.1 Intensify management to protect injured stocks 37.0 Habitat protection and acquisition
Killer whale	45.0 Study: Changes in black cod fishery gear
Pacific herring	2.2 Intensify herring management to protect injured stocks
Pink salmon	2.3 Intensify salmon management to protect injured stocks 51.0 Relocate existing hatchery runs
River otter	None identified
Rockfish	2.4 Intensify rockfish management to protect injured stocks
Archaeology	1.1 Site stewardship program 1.2 Site patrol and monitoring 10.0 Preserve archaeological sites and artifacts
	35.0 Acquire replacements for artifacts from the spill area
Commercial fishing	18.0 Replace salmon harvest opportunities
Recreation	12.1 New backcountry public recreation facilities 37.0 Habitat protection and acquisition 40.0 Land and water management actions
Sport fishing	18.0 Replace salmon harvest opportunities
Subsistence	30.0 Test subsistence foods for hydrocarbon contamination 49.0 Provide access to traditional subsistence foods
Wilderness and non-use values	37.0 Habitat protection and acquisition 40.0 Land and water management actions
	Included in Alternatives 2 or 3

ALTERNATIVE 4: GEOGRAPHIC DISTRIBUTION

RESOURCE OR SERVICE	OPT. No.	OPTION NAME	Prince William Sound			Kenai/Cook Inlet			Alaska Penin.	Kodiak/Afognak		Outside EVOS
			North	East	West	Outer Kenai	Lower Ck In	Central Ck In		Afg. Shuyak	Kodiak	
Archaeology	1.0	Archaeological site stewardship program	X	X	X	X	X	X	X	X		
Cutthroat trout/ Dolly Varden	2.1	Intensify managment to protect injured stocks	X	X	X							
Herring	2.2	Intensify herring management to protect injured stocks	X	X	X							
Pink salmon	2.3	Intensify pink salmon management to protect injured stocks	X	X	X							
Rockfish	2.4	Intensify rockfish management to protect injured stocks	X	X	X	X	X					
Sockeye salmon	2.5	Intensify sockeye management to protect injured stocks						X				
Harbor seal	4.2	Reduce disturbance at marine mammal haul-outs	X	X	X	X	X	X				
Sea otter	4.2	Reduce disturbance at marine mammal haul-outs	X	X	X							
Marbled murrelet	9.0	Minimize incidental take by commercial fisheries	X	X	X	X	X	X	X	X	X	
Archaeology	10.0	Preserve archaeological sites and artifacts	X	X	X	X	X	X	X	X		
Sockeye salmon	11.2	Fertilize lakes to improve sockeye rearing success	X									
Sockeye salmon	11.3	Improve access to salmon spawning areas with fish passes, etc.								X		
Recreation	12.1	Construct new backcountry public facilities	X	X	X	X	X	X	X	X	X	
Harlequin duck	13.1	Study: eliminate oil from mussel beds			X	X	X	X	X	X		
Sea otter	13.2	Study: eliminate oil from mussel beds			X							
MULTI-SPECIES	14.0	Accelerate recovery of upper intertidal zone			X	X	X	X	X	X		
Common murre	16.1	Increase murre productivity through enhanced social stimuli				X		X				
Pigeon guillemot/Common murre (replacement)	17.1	Removal of introduced species in the Aleutians									X	
Common murre	17.2	Temporary predator control				X	X	X	X	X	X	
Pigeon guillemot	17.2	Temporary predator control	X	X	X	X	X	X	X	X		

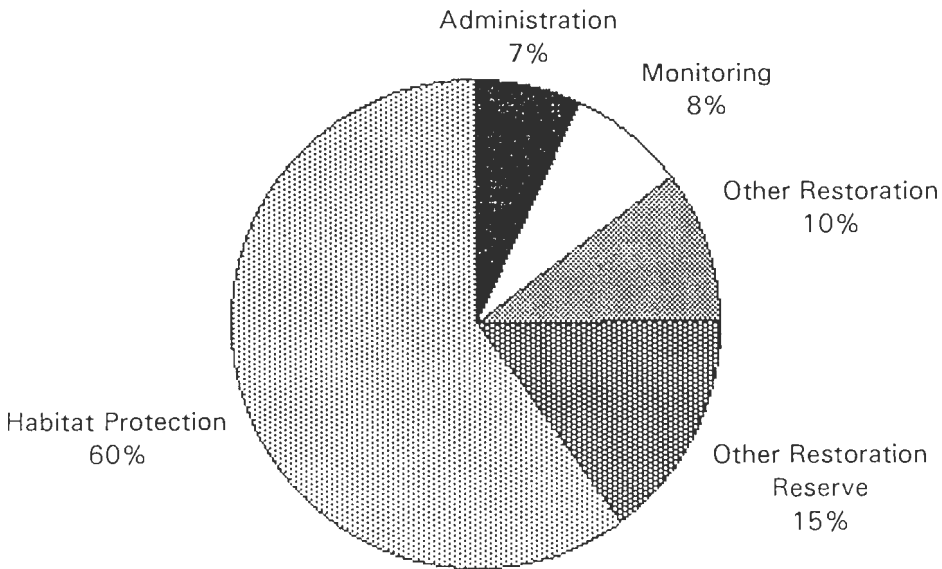
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RESOURCE OR SERVICE	OPT. No.	OPTION NAME	Prince William Sound			Kenai/Cook Inlet			Alaska Penin.	Kodiak/Afognak		Outside EVOS
			North	East	West	Outer Kenai	Lower Ck In	Central Ck In		Afg. Shuyak	Kodiak	
Commercial Fishing	18.0	Replace fisheries harvest opportunities by creating new salmon runs	X	X	X		X	X		X	X	
Sport Fishing	18.0	Replace fisheries harvest opportunities by creating new salmon runs	X	X	X		X	X		X	X	
Subsistence	30.0	Test subsistence foods for hydrocarbon contamination		X	X		X				X	
Archaeology	35.0	Negotiate with museums to acquire replacements for looted artifacts	X	X	X	X	X	X	X	X	X	X
MULTI-SPECIES	37.0	Habitat protection and acquisition		X	X	X	X	X	X	X	X	
MULTI-SPECIES	40.0	Land and water management actions	X	X	X	X	X	X	X	X	X	
Killer Whale - AB pod	45.0	Study: Facilitate changes in black cod fishery gear	X	X	X	X						
Harbor Seal	46.0	Cooperative program with commercial fishermen	X	X	X		X			X	X	
Harbor Seal and Sea Otter	47.0	Cooperative program with subsistence users		X	X		X				X	
Sockeye Salmon	48.0	Improve survival of salmon eggs and fry						X			X	
Subsistence	49.0	Provide subsistence users access to traditional subsistence foods			X							
Pink salmon	51.0	Relocate existing hatchery runs	X	X	X							

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Allocation of Remainder of Settlement Funds							Total \$	%
Administration						36500.0	7%	
Monitoring						41750.0	8%	
Other Restoration						51204.0	10%	
Other Restoration Reserve						79346.0	15%	
Habitat Protection						313200.0	60%	

Alternative 4 - Allocation



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NB: All costs are expressed in units of \$1,000 (1993 \$). The inflation-adjusted value of the remainder of the settlement is about \$522 million.

Alternative 4 - Moderate Restoration													
Opt	DESCRIPTION	ResSvc	UNIT	ANNUAL COST			DURATION			TOTAL COST			
				Exp	Low	High	Type	Years			10-Year Maximum		
								E	L	H	Expected	Lower	Higher
1.10	Site stewardship program	Archaeology	Per 3 areas	195.0	195.0	195.0	Ltd	10	10	10	1950.0	1950.0	1950.0
1.20	Site patrol and monitoring	Archaeology		300.0	300.0	300.0	Ltd	4	3	5	1200.0	900.0	1500.0
2.10	Intensify management	Cutthroat/Dolly		255.0	200.0	300.0	Ltd	2	2	2	510.0	400.0	600.0
2.20	Intensify management	Pacific herring		457.0	440.0	500.0	Ltd	3	2	4	1371.0	880.0	2000.0
2.30	Intensify management	Pink salmon		3000.0	2000.0	5000.0	Ltd	2	2	4	6000.0	4000.0	20000.0
2.40	Intensify management	Rockfish		593.0	550.0	700.0	Ltd	2	1	4	1186.0	550.0	2800.0
2.50	Intensify management	Sockeye salmon		3000.0	2000.0	5000.0	Ltd	5	2	5	15000.0	4000.0	25000.0
4.30	Feas Study: Reduce disturb	Sea otter					Ltd				120.0	80.0	640.0
9.00	Minimize incidental take	Marbled murrelet									1625.0	1100.0	2000.0
10.00	Archaeol Res Protection	Archaeology									4072.0	3250.0	7000.0
11.20	Fertilize lakes	Sockeye salmon	Per lake	190.0	150.0	220.0	Ltd	3	1	5	570.0	150.0	1100.0
12.10	New backcountry rec facilities	Recreation									1620.0	480.0	3256.0
13.01	Eliminate oil from mussel beds	Harlequin duck		491.0	340.0	641.0	Ltd	5	4	7	2455.0	1360.0	4487.0
13.02	Study: Elim oil fr mussel beds	Sea otter											
14.01	Accelerate recovery of UIT	Intertidal organisms		150.0	100.0	200.0	UR	5	4	7	750.0	400.0	1400.0
16.10	Feas Study: Social stimuli	Common murre					Ltd				850.0	800.0	5500.0
17.10	Remove introduced species	Common murre					UR				2500.0	1500.0	3500.0
17.21	Temporary predator control	Common murre		350.0	300.0	400.0	Ltd	5	5	10	1750.0	1500.0	4000.0
17.22	Temporary predator control	Pigeon guillemot		200.0	150.0	250.0	Ltd	4	4	6	800.0	600.0	1500.0
18.01	Replace harvest opportunities	Comm fishing	5 projects	750.0	500.0	1000.0	Ltd	2	1	5	1500.0	500.0	5000.0
18.02	Replace harvest opportunities	Sport fishing	5 projects	750.0	250.0	1000.0	Ltd	2	1	5	1500.0	250.0	5000.0
30.00	Test subsistence foods	Subsistence		330.0	300.0	350.0	Ltd	3	2	5	990.0	600.0	1750.0
35.00	Aquire archaeol. artifacts	Archaeology		225.0	150.0	300.0	Ltd	3	3	3	675.0	450.0	900.0
37.00	Habitat protection/acquisition	Multiple resources									313200.0	234900.0	475000.0
40.00	Land and water mgmt actions	Multiple resources											
45.00	Feas Study: Black cod gear	Killer whale		30.0	30.0	30.0	Ltd	1	1	1	30.0	30.0	30.0
46.00	Coop prgm-fishermen	Harbor seal		50.0	30.0	100.0	Ltd	3	1	5	150.0	30.0	500.0
47.01	Coop prgm-subsistence users	Harbor seal		30.0	30.0	30.0	UR	10	10	10	300.0	300.0	300.0
47.02	Coop prgm-subsistence users	Sea otter					UR						
48.02	Improve survival rates	Sockeye salmon	4 projects	400.0	200.0	600.0	Ltd	3	1	5	1200.0	200.0	3000.0
49.00	Access to traditional foods	Subsistence	Per village	53.0	50.0	60.0	UR	10	5	10	530.0	250.0	600.0
51.00	Relocate existing hatchery runs	Pink salmon	Per project				Ltd						
P1.00	Administration	Multiple resources									36500.0	5200.0	36500.0
P2.00	Monitoring	Multiple resources									41750.0	25250.0	52500.0

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NB: All costs are expressed in units of \$1,000 (1993 \$). The inflation-adjusted value of the remainder of the settlement is about \$522 million.

Alternative 5 - Comprehensive Restoration

THEME	Take all effective actions to protect, restore and enhance all injured resources and services. Increase opportunities for human use in the affected area.
VARIABLES	
Injuries Addressed	All injured resources and services.
Status of Resource Recovery	Resources not recovered and resources recovered.
Effectiveness of Restoration Actions	All effective actions.
Strategies for Public Use	Protect or increase existing use; or encourage appropriate new use.

Monitoring and information programs are included in all alternatives.

Restoration actions may be undertaken for injured resources, services, or their equivalents in all alternatives.

The goal of this alternative is for all injured resources and services to return or exceed prespill levels. Table _____ lists the resources and services addressed in this alternative; they are identical to those addressed in Alternatives 2 and 4. This alternative includes actions that protect existing human uses that were injured and the resource base on which they depend and also those actions that would increase existing use or create new uses. An example of the last item is a new commercial facility on public land that attracts different types of uses than had previously existed there.

RESOURCES			SERVICES
Population Decline	Sublethal/Chronic	Other	
Black oystercatcher Common murre Harbor seal Harlequin duck Intertidal organisms Marbled murrelet Pigeon guillemot Sea otter Sockeye salmon *Subtidal organisms	Bald eagle Cutthroat trout Dolly Varden Killer whale Pacific herring Pink salmon River otter Rockfish	Archaeology	Commercial fishing Recreation Sport fishing Subsistence Wilderness

* Resources and services for which no restoration action(s) are included in this alternative.

Table _____. Resources and Services Addressed in Alternative 5.

DRAFT 2/8/93 Restoration Options for Alternative 5

RESOURCE/SERVICE	RESTORATION OPTION
Black oystercatcher	14.0 Accelerate recovery of upper intertidal zone
	37.0 Habitat protection and acquisition 40.0 Land and water management actions
Common murre	4.1 Reduce disturbance at marine bird colonies
	16.1 Study: Increase productivity with enhanced social stimuli
	16.2 Study: Improve physical characteristics of nest sites
	17.1 Removal of introduced species in Aleutians 17.2 Temporary predator control
Harbor seal	4.2 Reduce disturbance at marine mammal haul-out areas
	46.0 Cooperative program with commercial fishermen
	47.0 Cooperative program with subsistence users
Harlequin duck	8.1 Develop sport harvest guidelines
	13.1 Study: Eliminate oil from mussel beds
	37.0 Habitat protection and acquisition
Intertidal organisms	14.0 Accelerate recovery of upper intertidal zone
Marbled murrelet	9.0 Minimize incidental take
	37.0 Habitat protection and acquisition
	40.0 Land and water management actions
Pigeon guillemot	17.1 Removal of introduced species in the Aleutians
	17.2 Temporary predator control
Sea otter	4.2 Study: Reduce disturbance at marine mammal haul-outs
	13.2 Study: eliminate oil from mussel beds
	47.0 Cooperative program with subsistence users

Sockeye salmon	2.5 Intensify sockeye management to protect injured stocks 11.2 Fertilize lakes to improve sockeye rearing success
	11.3 Improve access to spawning areas with fish passes, etc.
	37.0 Habitat protection and acquisition 48.0 Improve survival of salmon eggs and fry
Subtidal organisms	None identified
Bald eagle	37.0 Habitat protection and acquisition
Cutthroat trout	2.1 Intensify management to protect injured stocks
	19.0 Anadromous stream catalogue
	37.0 Habitat protection and acquisition
Dolly Varden	2.1 Intensify management to protect injured stocks 37.0 Habitat protection and acquisition
Killer whale	45.0 Study: Changes in black cod fishery gear
Pacific herring	2.2 Intensify herring management to protect injured stocks
Pink salmon	2.3 Intensify salmon management to protect injured stocks
	11.1 Construct spawning channels and instream improvements 11.3 Improve access to spawning areas with fish passes, etc. 19.0 Anadromous streams catalogue
	37.0 Habitat protection and acquisition 40.0 Land and water management actions
	48.0 Improve survival of salmon eggs and fry
	51.0 Relocate existing hatchery runs
River otter	8.2 Develop trapping harvest guidelines
Rockfish	2.4 Intensify rockfish management to protect injured stocks

Archaeology	1.1 Site stewardship program 1.2 Site patrol and monitoring
	10.0 Preserve archaeological sites and artifacts 35.0 Acquire replacements for artifacts from the spill area
Commercial fishing	18.0 Replace salmon harvest opportunities
Recreation	12.1 New backcountry public recreation facilities
	12.2 Plan and market public land for commercial recreational facilities
	33.0 Visitor centers 34.0 Marine environmental institute
	37.0 Habitat protection and acquisition 40.0 Land and water management actions
Sport fishing	18.0 Replace salmon harvest opportunities
Subsistence	18.0 Replace salmon harvest opportunities
	30.0 Test subsistence foods for hydrocarbon contamination 49.0 Provide access to traditional subsistence foods
	50.1 Develop subsistence mariculture sites 50.2 Develop bivalve shellfish hatchery and research center
Wilderness and non-use values	37.0 Habitat protection and acquisition 40.0 Land and water management actions
	Included in Alternatives 2, 3 or 4

ALTERNATIVE 5: GEOGRAPHIC DISTRIBUTION

RESOURCE OR SERVICE	OPT. No.	OPTION NAME	Prince William Sound			Kenai/Cook Inlet			Alaska Penin.	Kodiak/Afognak		Outside EVOS
			North	East	West	Outer Kenai	Lower CK In	Central CK In		Afg. Shuyak	Kodiak	
Archaeology	1.0	Archaeological site stewardship program	X	X	X	X	X	X	X	X		
Cutthroat trout/ Dolly Varden	2.1	Intensify managment to protect injured stocks	X	X	X							
Herring	2.2	Intensify herring management to protect injured stocks	X	X	X							
Pink salmon	2.3	Intensify pink salmon management to protect injured stocks	X	X	X							
Rockfish	2.4	Intensify rockfish management to protect injured stocks	X	X	X	X	X					
Sockeye salmon	2.5	Intensify sockeye management to protect injured stocks						X				
Common murre	4.1	Reduce disturbance at marine bird colonies				X	X	X	X			
Harbor seal	4.2	Reduce disturbance at marine mammal haul-outs	X	X	X	X	X	X				
Sea otter	4.2	Reduce disturbance at marine mammal haul-outs	X	X	X							
Harlequin duck	8.1	Develop sport harvest guidelines for injured species	X	X	X	X						
River otter	8.2	Develop trapping guidelines for injured species	X	X	X							
Marbled murrelet	9.0	Minimize incidental take by commercial fisheries	X	X	X	X	X	X	X	X		
Archaeology	10.0	Preserve archaeological sites and artifacts	X	X	X	X	X	X	X	X		
Pink salmon	11.1	Construct salmon spawning channels and instream improvements	X	X	X							
Sockeye salmon	11.2	Fertilize lakes to improve sockeye rearing success	X									
Pink salmon	11.3	Improve access to salmon spawning areas with fish passes, etc.	X	X	X							
Sockeye salmon	11.3	Improve access to salmon spawning areas with fish passes, etc.								X		
Recreation	12.1	Construct new backcountry public facilities	X	X	X	X	X	X	X	X		
Recreation	12.2	Plan and market new public facilities on public land	X	X	X	X	X	X	X	X		

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RESOURCE OR SERVICE	OPT. No.	OPTION NAME	Prince William Sound			Kenai/Cook Inlet			Alaska Penin.	Kodiak/Afognak		Outside EVOS
			North	East	West	Outer Kenai	Lower Ck In	Central Ck In		Afg. Shuyak	Kodiak	
Harlequin duck	13.1	Study: eliminate oil from mussel beds			X	X	X	X	X	X		
Sea otter	13.2	Study: eliminate oil from mussel beds			X							
MULTI-SPECIES	14.0	Accelerate recovery of upper intertidal zone			X	X	X	X	X	X		
Common murre	16.1	Increase murre productivity through enhanced social stimuli				X		X				
Common murre	16.2	Improve physical characteristics of murre nest sites				X		X				
Pigeon guillemot/Common murre (replacement)	17.1	Removal of introduced species in the Aleutians									X	
Common murre	17.2	Temporary predator control				X	X	X	X	X	X	
Pigeon guillemot	17.2	Temporary predator control	X	X	X	X	X	X	X	X	X	
Commercial Fishing	18.0	Replace fisheries harvest opportunities by creating new salmon runs	X	X	X		X	X		X	X	
Sport Fishing	18.0	Replace fisheries harvest opportunities by creating new salmon runs	X	X	X		X	X		X	X	
Subsistence	18.0	Replace fisheries harvest opportunities by creating new salmon runs		X	X		X				X	
Cutthroat Trout	19.0	Anadromous stream catalogue	X	X	X							
Pink salmon	19.0	Anadromous stream catalogue	X	X	X					X	X	
Subsistence	30.0	Test subsistence foods for hydrocarbon contamination		X	X		X				X	
Recreation	33.0	Visitor centers	X	X	X	X	X	X	X		X	
Recreation	34.0	Marine environmental institute	X	X	X	X	X	X		X		
Archaeology	35.0	Negotiate with museums to acquire replacements for looted artifacts	X	X	X	X	X	X	X	X	X	
MULTI-SPECIES	37.0	Habitat protection and acquisition		X	X	X	X	X	X	X	X	
MULTI-SPECIES	40.0	Land and water management actions	X	X	X	X	X	X	X	X	X	
Killer Whale - AB pod	45.0	Study: Facilitate changes in black cod fishery gear	X	X	X	X						
Harbor Seal	46.0	Cooperative program with commercial fishermen	X	X	X		X			X	X	
Harbor Seal and Sea Otter	47.0	Cooperative program with subsistence users		X	X		X				X	
Pink Salmon	48.0	Improve survival of salmon eggs and fry	X	X	X							

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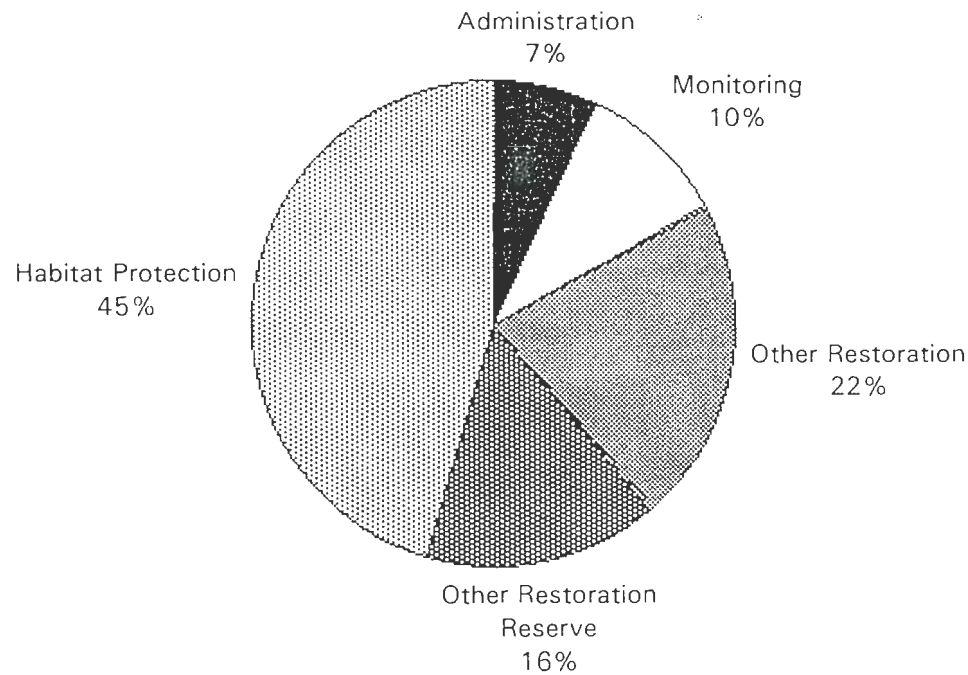
RESOURCE OR SERVICE	OPT. No.	OPTION NAME	Prince William Sound			Kenai/Cook Inlet			Alaska Penin.	Kodiak/Afognak		Outside EVOS
			North	East	West	Outer Kenai	Lower Ck In	Central Ck In		Afg. Shuyak	Kodiak	
Sockeye Salmon	48.0	Improve survival of salmon eggs and fry						X			X	
Subsistence	49.0	Provide subsistence users access to traditional subsistence foods			X							
Subsistence	50.1	Develop subsistence mariculture sites		X	X		X				X	
Subsistence	50.2	Develop bivalve shellfish hatchery and research center					X					
Pink salmon	51.0	Relocate existing hatchery runs	X	X	X							

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Allocation of Remainder of Settlement Funds							Total \$	%
Administration							36500.0	7%
Monitoring							52250.0	10%
Other Restoration							114678.0	22%
Other Restoration Reserve							83672.0	16%
Habitat Protection							234900.0	45%

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Alternative 5 - Allocation



NB: All costs are expressed in units of \$1,000 (1993 \$). The inflation-adjusted value of the remainder of the settlement is about \$522 million.

Alternative 5 - Comprehensive Restoration													
Opt	DESCRIPTION	ResSvc	UNIT	ANNUAL COST			DURATION			TOTAL COST			
				Exp	Low	High	Type	Years			Expected	10-Year Maximum	
								E	L	H		Lower	Higher
1.10	Site stewardship program	Archaeology	Per 3 areas	195.0	195.0	195.0	Ltd	10	10	10	1950.0	1950.0	1950.0
1.20	Site patrol and monitoring	Archaeology		300.0	300.0	300.0	Ltd	4	3	5	1200.0	900.0	1500.0
2.10	Intensify management	Cutthroat/Dolly		255.0	200.0	300.0	Ltd	2	2	2	510.0	400.0	600.0
2.20	Intensify management	Pacific herring		457.0	440.0	500.0	Ltd	3	2	4	1371.0	880.0	2000.0
2.30	Intensify management	Pink salmon		3000.0	2000.0	5000.0	Ltd	2	2	4	6000.0	4000.0	20000.0
2.40	Intensify management	Rockfish		593.0	550.0	700.0	Ltd	2	1	4	1186.0	550.0	2800.0
2.50	Intensify management	Sockeye salmon		3000.0	2000.0	5000.0	Ltd	5	2	5	15000.0	4000.0	25000.0
4.10	Reduce disturbance	Common murre					Ltd				330.0	185.0	640.0
4.20	Reduce disturbance	Harbor seal					Ltd				330.0	185.0	640.0
4.30	Feas Study: Reduce disturb	Sea otter					Ltd				120.0	80.0	640.0
4.40	Reduce disturb public info	Multiple resources		40.0	30.0	50.0	Ltd	1	1	1	40.0	30.0	50.0
4.50	Reduce disturb field presence	Multiple resources		438.0	390.0	486.0	Ltd	10	10	10	4380.0	3900.0	4860.0
8.10	Sport/trap harvest guidelines	Harlequin duck		15.0	10.0	30.0	UR	2	1	2	30.0	10.0	60.0
8.20	Sport/trap harvest guidelines	River otter		15.0	10.0	30.0	UR	2	1	2	30.0	10.0	60.0
9.00	Minimize incidental take	Marbled murrelet									1625.0	1100.0	2000.0
10.00	Archaeol Res Protection	Archaeology									4072.0	3250.0	7000.0
11.10	Salmon spawn channels etc	Pink salmon	9 total	579.0	579.0	579.0	Ltd	6	6	6	3474.0	3474.0	3474.0
11.20	Fertilize lakes	Sockeye salmon	Per lake	190.0	150.0	220.0	Ltd	3	1	5	570.0	150.0	1100.0
11.31	Fish passes and access	Pink salmon	5 passes	250.0	64.0	1900.0	Ltd	6	6	10	1500.0	384.0	19000.0
11.32	Fish passes and access	Sockeye salmon	2 passes	100.0	25.0	800.0	Ltd	6	6	10	600.0	150.0	8000.0
12.10	New backcountry rec facilities	Recreation									1620.0	480.0	3256.0
12.20	Pln/mkt comm rec facilities	Recreation		275.0	200.0	350.0	Ltd	1	1	1	275.0	200.0	350.0
13.01	Eliminate oil from mussel beds	Harlequin duck		491.0	340.0	641.0	Ltd	5	4	7	2455.0	1360.0	4487.0
13.02	Study: Elim oil fr mussel beds	Sea otter											
14.01	Accelerate recovery of UIT	Intertidal organisms		150.0	100.0	200.0	UR	5	4	7	750.0	400.0	1400.0
14.02	Accelerate recovery of UIT	Black oystercatchers											
16.10	Feas Study: Social stimuli	Common murre					Ltd				850.0	800.0	5500.0
16.20	Feas Study: Impr nest sites	Common murre					Ltd				850.0	800.0	5500.0
17.10	Remove introduced species	Common murre					UR				2500.0	1500.0	3500.0
17.21	Temporary predator control	Common murre		350.0	300.0	400.0	Ltd	5	5	10	1750.0	1500.0	4000.0
17.22	Temporary predator control	Pigeon guillemot		200.0	150.0	250.0	Ltd	4	4	6	800.0	600.0	1500.0
18.01	Replace harvest opportunities	Comm fishing	5 projects	750.0	500.0	1000.0	Ltd	2	1	5	1500.0	500.0	5000.0
18.02	Replace harvest opportunities	Sport fishing	5 projects	750.0	250.0	1000.0	Ltd	2	1	5	1500.0	250.0	5000.0
18.03	Replace harvest opportunities	Subsistence	5 projects	750.0	250.0	1000.0	Ltd	4	1	10	3000.0	250.0	10000.0

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NB: All costs are expressed in units of \$1,000 (1993 \$). The inflation-adjusted value of the remainder of the settlement is about \$522 million.

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Opf	DESCRIPTION	ResSvc	UNIT	ANNUAL COST			DURATION				TOTAL COST		
				Exp	Low	High	Type	Years			10-Year Maximum		
								E	L	H	Expected	Lower	Higher
19.01	Anad Stream Catalogue	Cutthroat trout	PWS	335.0	300.0	400.0	Ltd	1	1	1	335.0	300.0	400.0
19.02	Anad Stream Catalogue	Pink salmon	PWS/Afog	650.0	600.0	800.0	Ltd	1	1	1	650.0	600.0	800.0
30.00	Test subsistence foods	Subsistence		330.0	300.0	350.0	Ltd	3	2	5	990.0	600.0	1750.0
33.00	Visitor center	Recreation	Per 5000 sf				Ltd				1000.0	750.0	1750.0
34.00	Marine environmental institute	Recreation					Ltd				42000.0	42000.0	42000.0
35.00	Aquire archaeol. artifacts	Archaeology		225.0	150.0	300.0	Ltd	3	3	3	675.0	450.0	900.0
37.00	Habitat protection/acquisition	Multiple resources									234900.0	234900.0	475000.0
40.00	Land and water mgmt actions	Multiple resources											
45.00	Feas Study: Black cod gear	Killer whale		30.0	30.0	30.0	Ltd	1	1	1	30.0	30.0	30.0
46.00	Coop prgm-fishermen	Harbor seal		50.0	30.0	100.0	Ltd	3	1	5	150.0	30.0	500.0
47.01	Coop prgm-subsistence users	Harbor seal		30.0	30.0	30.0	UR	10	10	10	300.0	300.0	300.0
47.02	Coop prgm-subsistence users	Sea otter					UR						
48.01	Improve survival rates	Pink salmon	4 projects	400.0	200.0	600.0	Ltd	3	1	5			
48.02	Improve survival rates	Sockeye salmon	4 projects	400.0	200.0	600.0	Ltd	3	1	5	1200.0	200.0	3000.0
49.00	Access to traditional foods	Subsistence	Per village	53.0	50.0	60.0	UR	10	5	10	530.0	250.0	600.0
50.10	Subsistence mariculture sites	Subsistence		550.0	180.0	600.0	Ltd	3	2	4	1650.0	360.0	2400.0
50.20	Bivalve shellfish hatchery etc	Subsistence		1000.0	1300.0	2500.0	Ltd	3	2	4	3000.0	2600.0	10000.0
51.00	Relocate existing hatchery runs	Pink salmon	Per project				Ltd						
P1.00	Administration	Multiple resources									36500.0	5200.0	36500.0
P2.00	Monitoring	Multiple resources									52250.0	25250.0	52500.0

NB: All costs are expressed in units of \$1,000 (1993 \$). The inflation-adjusted value of the remainder of the settlement is about \$522 million.

COMPARISON OF ALTERNATIVES

Alternatives:	1	2	3	4	5
Administration	1%	4%	6%	7%	7%
Monitoring	5%	5%	7%	8%	10%
Other Restoration	--	--	7%	10%	22%
Other Restoration Reserve	--	--	5%	15%	16%
Habitat Protection	--	91%	75%	60%	45%
Uncommitted Balance	94%	--	--	--	--


Table ____. Comparison of Alternatives by Allocation of Cost

RESTORATION PLANNING WORKING GROUP
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PHONE: (907) 278-8012 FAX: (907) 276-7178

TO: Ms. Carol Paquette February 19, 1993
Walcoff & Associates
635 Staters Lane, Suite 102
Alexandria, VA 22314

THRU:  Ken Rice
Restoration Team

FROM: Ray Thompson 
Restoration Planning Work Group

SUBJECT: Draft Alternatives for Draft EVOS Restoration Plan and Injury
Table

The enclosed text and tables are the most recent work done by the Restoration Planning Work Group (RPWG). They are **DRAFT** documents which, in revised edition, will be part of the Draft Restoration Plan. The Draft Restoration Plan is evolving quickly, with a proposed release date of June 07, 1993. Changes to the text and tables may be made as RPWG receives and incorporates more information, or as decisions on content are made by the Trustee Council.

The range and theme of the draft alternatives were approved by the Trustee Council, Feb. 16. The policy variables were also tentatively approved as they are described under alternatives 1 through 5, pending the addition of a variable describing the geographic scope.

You should consider these caveats during review of the draft alternatives.

1) The Trustee Council (TC) has asked us to develop a policy variable for geographic scope. The RPWG and Restoration Team (RT) has done this but the TC has not reviewed nor approved the variable language. Therefore, consider the language as subject to change. An enclosed map, reflecting the joint RT and RPWG description of the Exxon Valdez Oil Spill Area, will be useful as you study how geographic scope relates to alternative descriptions. This draft product will go to the RT next week. The RPWG will have their comment by Feb. 26. The map will be approved by the TC before its inclusion in the Draft Restoration Plan.

- 2) The TC has also asked RPWG to develop criteria for integration of the habitat protection/acquisition process (Option 37) into the draft restoration alternatives. This has not been completely analyzed and displayed in the summary of alternatives table. When text and tabular information is completed it will be forwarded to you.
- 3) The RT has requested a solicitor's opinion on the efficacy of including language on oil spill prevention planning in the draft restoration plan. A response is expected by Feb. 26. You will be advised of changes. Should this element be added, changes in the cost allocation by alternative would occur. The magnitude and significance of potential changes, if any, are yet to be decided.
- 4) The use of several endowment types is currently being discussed. Should we conclude that an endowment proposal will be part of the alternative display you will be advised.
- 5) The current explanation of the policy variable for effectiveness of restoration actions by alternative will be strengthened. Please be cautious of using percent improvement expected similarly for all resources. Your questions on changes and the use of effectiveness percentages can be directed to RPWG staff, Karen Klinge.

Also enclosed are TABLE X: Natural Resources Injury Summary, TABLE XX: Services Summary of Injury, and TABLE XXX: Other Natural Resources and Archaeology Summary of Injury. Table X has received peer review and been adjusted accordingly while other tables are in earlier drafts and peer review is pending.

Debate on the details of the cost information continues in the Restoration Team. The spread between alternatives for the elements of habitat protection and restoration may be adjusted. The current range is based upon agreement between the RT and RPWG on Feb. 18.

Since you have recently assumed responsibility for the environmental impact statement (EIS) portion of this process, I want to inform you of a couple events pending for March and April. On March 24 an Information Brochure on the content of the Draft Restoration Plan will be sent to the public. Comments on the Brochure will be requested and due the same date as those for the Draft Restoration Plan and EIS. Public meetings will be held between April 12th and 30th in major state communities and other locations throughout the spill area. Should significant public comment request changes to the draft information, including alternatives, revisions would be made prior to public distribution of the Draft Restoration Plan and EIS. Changes would have to be made quickly since the Trustee Council is adamant about not lengthening the current schedule.

Please contact Ken Rice or me about your concerns and questions. We are available at the above numbers. Ken may also be reached at (907) 271-2751.

Enclosures: 1) Draft Chapter V: Restoration Plan Alternatives
2) Partial Draft Chapter III: Summary Injury Tables

CHAPTER V. RESTORATION PLAN ALTERNATIVES

The chapter presents different ways the to use funds from the civil settlement to restore the injuries to resources and services caused by the spill. Each approach, called an alternative, is a scenario that demonstrates the effect of different policy decisions on restoration. If there were no disagreement on how to restore oil spill injuries, or if there was enough money available to complete everything people wanted to do, there would be no need to illustrate different approaches. However, there are differences of opinion on the best methods of using settlement funds, and alternatives show the implications of different policy decisions on restoration.

INTRODUCTION TO RESTORATION ALTERNATIVES

Each restoration alternative is composed of four components: a theme, policy decisions, restoration options, and approximate budget allocations. Table V-1 on the next page summarizes the themes and policies of the alternatives.

	Alternative 1 Natural Recovery	Alternative 2 Habitat Protection	Alternative 3 Limited Restoration	Alternative 4 Moderate Restoration	Alternative 5 Comprehensive Restoration
THEME	No action other than monitoring and normal agency management.	Protect injured resources and services from further degradation or disturbance.	Take highly effective actions to protect and restore injured services and resources whose population has declined. Maintain the existing character of the affected area.	Take highly effective actions to protect and restore all injured resources and services. Increase, to a limited extent, opportunities for human use in the affected area.	Take all effective actions to protect, restore, and enhance all injured resources and services. Increase opportunities for human use in the affected area.
VARIABLES					
Injuries Addressed	N/A	All injured resources and services.	Injured services and resources whose populations declined.	All injured resources and services.	All injured resources and services.
Status of Resource Recovery	N/A	Resources not recovered and resources recovered.	Resources not recovered.	Resources not recovered.	Resources not recovered and resources recovered.
Effectiveness of Restoration Actions	N/A	All effective habitat protection actions.	Only highly effective actions.	Only highly effective actions.	All effective actions.
Strategies for Public Use	N/A	Protect or increase existing use through habitat protection.	Protect existing use.	Protect or increase existing use.	Protect or increase existing use or encourage appropriate new use.

Monitoring and information programs are included in all alternatives.
Restoration actions may be undertaken for injured resources, services, or their equivalents in all alternatives.

Table _____. Summary of Draft Restoration Plan Alternatives

	Alternative 1 Natural Recovery	Alternative 2 Habitat Protection	Alternative 3 Limited Restoration	Alternative 4 Moderate Restoration	Alternative 5 Comprehensive Restoration
PROPOSED NEW VARIABLE					
Location	N/A	Activities within the spill-area	Activities within the spill-area	Activities within Alaska	Activities within Alaska

Monitoring and information programs are included in all alternatives.

Restoration actions may be undertaken for injured resources, services, or their equivalents in all alternatives.

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Table _____. Summary of Draft Restoration Plan Alternatives

DRAFT FOR RPWG REVIEW

PROPOSED NEW VARIABLE	POLICY ISSUE
Location	Should restoration activities focus on restoring only the injured population and service? Or should some activities include any permissible restoration activity throughout Alaska?

The location policy variable asks the question whether the Trustees should focus their activity on population and species injured by the spill, or target some activities for replacement and equivalent resources and services throughout Alaska.

Most restoration activities proposed in this plan focus on the actual injured population or service. That is, if harlequin ducks are not yet breeding in oiled areas, restoration activities focus on attempting to get that population of harlequins to breed. Similarly, if sport-fishing was injured on the Kenai peninsula, the a restoration option attempts to restore those sport-fishing opportunities.

The civil settlement, however, allows a more expansive view of restoration. It specifies that restoration funds "for purposes of restoring, replacing, enhancing, rehabilitating or acquiring the equivalent of natural resources injured as a result of the Oil Spill and the reduced or last services provided by such services..." Replacement, or acquisition of equivalent resources allows the Trustees to spend money benefit related resources or services besides those that were injured.

For example, one proposal is to eliminate introduced foxes on Aleutian Islands in order to make bird colonies there more productive. These bird colonies are far away from oil spill and were not injured by oil; in fact, most of the benefit would go to species of birds without significant injury by the spill. Many scientists advocate the project to provide replacement birds for spill-affected species. Another example might be to purchase land in near Iliamna to protect sport-fishing there. That would provide "replacement" or "equivalent" sport-fishing opportunities even though Iliamna-area sport-fishing was not injured by the spill.

ALTERNATIVE THEMES. The alternative theme is a description of what the alternative attempts to achieve. It is a general statement of the objectives of the alternative -- a reflection of different answers to four policy questions facing the Trustees.

The theme of Alternative 1, Natural Recovery, is to let the spill-affected area recover on its own, but to monitor recovery and continue normal agency management. In this alternative, the Trustees spend no funds on restoration; they would spend only to monitor recovery. Alternative #1 is a "no-action" alternative required by the U.S. National Environmental Policy Act, Environmental Impact Statement that accompanies the restoration plan. This alternative provides a useful baseline to judge the effects of the other alternatives.

The theme of Alternative 2, Protection, is to protect injured resources and services so they can recover on their own without further disruption. In this alternative, the objective is to fund restoration measures such as land purchases that protect injured resources and services from further stresses, and to let natural processes effect recovery.

Alternatives 3 through 5 represent a progression of restoration actions. These three alternatives progress from a limited to a more expansive view of restoration. The options in Alternative 3, Limited Restoration, address only the most serious resources injuries: those that caused a detectable decline in the population of a resource. The alternative addresses these injuries using only the most effective restoration methods. In addition, in this alternative the Trustees would cease restoration once a population recovered. The alternative also addresses services, but only to the extent of protecting existing uses.

Alternative 4, Moderate Restoration, takes a more expansive approach to injury. It address all injury: population-level, and chronic injuries. It address services by both protecting and enhancing existing use.

Alternative 5, Comprehensive Restoration, takes a further step. In this alternative, the Trustees would fund restoration and protective measures aimed at all resources, and would be willing to aid a species even after it recovered. In this alternative, the Trustees would be willing to fund techniques with a lower level of effectiveness. They would be willing to fund restoration for services that goes past protecting or enhancing existing human use, and encourages appropriate new ones.

POLICY DECISIONS. In deciding what restoration actions to fund, the Trustees are faced with a variety of policy decisions. The alternatives illustrate the implications of different answers to these decisions. They do this through the use of four policy questions, or policy variables, summarized in Table V-2. The first two variables apply to resources only; the last variable applies to services only; the third variable applies to both resources and services. Each variable raises a significant policy issue.

Table V-2. Variables Used to Construct Alternatives

VARIABLE	POLICY ISSUE
Injury	Should restoration actions address ALL injured resources or only those whose populations declined because of the oil spill?
Status of Recovery	Should restoration actions cease when a resource has recovered?
Effectiveness of Restoration Actions	Should the plan include only the most effective restoration actions or all beneficial actions, even those less certain of success or likely to produce only slight improvement in recovery?
Opportunities for Human Use	To what extent should restoration actions be used to increase opportunities for human use?

Policy Variable: Injury. Some people believe that restoration efforts should be focused only on those resources that experienced a population decline after the oil spill. They believe that unless the injury was sufficiently serious to detect a difference in population, the trustees should not fund restoration efforts. Others believe that restoration should focus on all resources, including those that experienced a chronic or sublethal injury that did not result in a detectably lower population.

There are a number of reasons why a sublethal or chronic injury may not result in a lower population. These include: the chronic or sublethal injury may not affect the productivity of the species, or the species may have some natural compensating mechanism for the injury. There also may be enough variability in the natural abundance of the species to mask any effect of the injury, or scientific measurement techniques may not be sensitive enough to measure the effect on the spill-area population.

Table V-3 shows which resources showed a population decline, and which showed chronic or sublethal injury without a detectable change in population. The table shows the injuries that occurred as of 1989, the spill year and does not take into account recovery.

Table V-__ shows which resources showed a population decline, and which showed chronic or sublethal injury without a detectable change in population. The table shows the injuries that occurred as of 1989, the spill year and does not take into account recovery.

Table V-__. Degree of Injury

<u>Resources whose populations declined because of the spill.</u>	<u>Sublethal or Chronic Effects. No Detectable spill-related population decline</u>
Harbor seals	River otters
Sea otters	Bald eagles*
Common murre	Killer Whales*
Marbled murrelet	Pink salmon*
Pigeon Guillemots	Pacific herring
Harlequin ducks	Rockfish
Black oystercatchers	Dolly Varden*
Sockeye salmon smolts	Cutthroat Trout*
Intertidal organisms	
Subtidal organisms	

* For these species, the Trustees' scientists have considerable disagreement over the conclusions to be drawn from the results of the damage assessment studies.

Table V-3. Status of Natural Recovery

<u>Population-level Injuries</u>	<u>Expected Recovery</u>	<u>Comments</u>
Harbor seals	Unknown	In decline before the spill. Population may have stabilized.
Sea otters	< 50 years	Population stable, but not recovering
Killer Whales	< 20 years	Recovering
Common murre	< 120 years	Recovery varies by colony.
Marbled murrelet	Maybe stabilize in < 50 years.	In decline before spill. Maybe still declining; maybe stable.
Pigeon Guillemots	Maybe stabilize in < 50 years.	In decline before spill. Probably still declining.
Harlequin ducks	Maybe < 50 years	Still no reproduction within spill area.
Black oystercatchers	< 30 years	Recovering
Sockeye salmon smolts	< 50 years	In Kenai, not yet recovering.
Intertidal organisms	< 25 years	Recovering in most places.
Subtidal organisms	< 10 years in most	Recovering in most places.
<u>Sublethal or Chronic Injuries</u>	<u>Expected Recovery of Chronic Injury</u>	<u>Comments</u>
River otters	Unknown	
Bald eagles	Recovered	Back to pre-spill population by 1993-1995
Pink salmon	Unknown	
Pacific herring	Recovered	May know if population declined after 1993 spawning season.
Rockfish	Unknown	
Dolly Varden	< 20 years	
Cutthroat Trout	< 20 years	

Policy variable: Effectiveness of Restoration Actions. Most people would agree that all things being equal, the Trustee should fund the most effective techniques available for restoring oil-spill injuries. However, people may disagree at what level of effectiveness a technique is not worth funding. The Effectiveness of Restoration Actions variable gets at this issue.

The effectiveness of an option is classified into two categories, based on how much change they cause in some aspect of the rate or degree of natural recovery.

- **Most Effective options.** These are the options that have a significant effect on recovery, or make it significantly more likely that the population will achieve its predicted natural recovery. "Most effective" options includes those that agency and peer review scientists

estimate could decrease the time to recovery by at least 25%. Options which significantly changed the expected degree of recovery, relative to its prespill condition or its rate of decline were also included in this category.

Many times scientists estimate the time to recovery in a range of years; for example, they might estimate that a population will recovery in, say, 20 to 80 years. Twenty to 80 years forms the confidence interval surrounding recovery. We included options in the "most effective" category, if they decreased the confidence interval by 25%. In this example, that decrease would change the confidence interval to 20-60 years. This is a quantitative way of a scientist saying that the option makes it significantly more likely that an species will achieve its predicted natural recovery.

- **Other Beneficial options.** This category includes options that agency and peer review scientists estimate will have a measurable effect on recovery. It includes those options estimated to cause a 10-24% change in recovery times, including those that change the confidence interval by 10-24%.

Changes less than 10% are unlikely to be measurable. Scientists can rarely measure less than a 10% change in population levels. Options estimated to cause less than a 10% change in recovery (or the confidence interval surrounding recovery) were eliminated from consideration.

In most cases, natural recovery is the most effective mechanism for recovery. Frequently, there is little society can do to help an injured resource or service except wait and protect the injured resources or services from further stress.

The table below shows whether effective options are available to actively aid an injured resource or service recovery, and whether there are options available to protect it from further stress.

Table V-X. Availability of Effective Options

<u>Resources whose populations declined because of the spill.</u>	<u>Active Restoration</u>		<u>Protection</u>	
	<u>Most Eff.</u>	<u>Beneficial</u>	<u>Most Eff.</u>	<u>Beneficial</u>
Harbor seals	No	No	Yes	No
Sea otters	Study*	No	Yes	No
Killer Whales	No	No	Study*	No
Common murre	Yes	Study*	Yes	No
Marbled murrelet	No	No	Yes	No
Pigeon Guillemots	Yes	No	Yes	No
Harlequin ducks	Study*	No	Yes	Yes
Black oystercatchers	No	Study*	No	Yes
Sockeye salmon smolts	Yes	Yes	Yes	Yes
Intertidal organisms	Study*	No	No	No

Subtidal organisms	No	No	No	No
Sublethal or Chronic Effects. No				
<u>Detectable spill-related population decline</u>				
River otters	No	No	No	No
Bald eagles	No	No	No	Yes
Pink salmon	Yes	Yes	No	Yes
Pacific herring	No	No	Yes	No
Rockfish	No	No	Yes	No
Dolly Varden	Yes	No	Yes	No
Cutthroat Trout	Yes	No	Yes	No

* Study refers to options that require feasibility studies to fully evaluate them. They include experimental techniques and further analysis to determine whether they can live up to their potential. They are listed under the column in which they would fall if feasibility or further study finds that they are as effective as they promise.

Policy variable: Opportunities for Human Use. Many of the service options, most notably those for recreation or fishing have the objective of improving or increasing opportunities for human use of the spill area as a way to restore or enhance the spill damages. In interviews with spill-area users, many have expressed concern that too much additional use, especially if located inappropriately, might adversely change the character of the area. This variable addresses that this issue. This variable applies only to restoration options for services.

For this criteria, these options are grouped into four categories.

- *Protect existing uses.* Certain options protect existing opportunities for human use of the spill area. They are not designed to increase use levels or change use patterns, but only to protect what existed before the spill. Examples might be funding to state or federal agencies to construct recreation facilities that protect the environment such as outhouses in over-used areas, or improved trails where hiking is damaging wetlands. Other examples include programs to provide information about the safety of subsistence foods to subsistence users.
- *Protect existing or increase existing uses.* Options in this category provide additional opportunity for human use of the spill area. Examples are funding to increase existing sport- or commercial fishing runs, or funding to construct recreation facilities such as public-use cabins that would also increase opportunities for human use.
- *Protect or increase existing uses; or encourage appropriate new uses.* Options in this category take a further step in increasing opportunities for human use of the spill area. They include funding agencies to add new uses in appropriate locations such as visitor centers, new fishing runs, or commercial facilities.

In all of these categories, options would be funded through existing state and federal agencies. Those agencies are required to comply with existing land-use plans, and agency procedures such as those requiring public notice.

OTHER INFORMATION: COST. Cost for each option is shown in 1993 dollars. Payments from Exxon will be deposited each year through the year 2001. The 1993-value of the remaining settlement (existing balance plus future deposits) is approximate \$522 million. That is an inflation-adjusted amount. The actual amount in current dollars will be _____. Costs are approximate and will change as more is learned about injuries and the options.

Alternative 1 - Natural Recovery

THEME	No action other than monitoring and normal agency management.
VARIABLES	
Injury	N/A
Status of Recovery	N/A
Effectiveness of Restoration Actions	N/A
Opportunities for Human Use	N/A

Monitoring and information programs are included in all alternatives.

Functional equivalents of injured resources and services are included in all alternatives.

What would happen to resources and services within the Exxon Valdez oil spill area if no restoration options were implemented? Normal agency management continues, current trends in human use of the affected area continue, and planned development of private lands continue. These trends influence the environment that injured resources face in order to recover. Ideally, the exact injury would be known, and enough would be known about each resource to develop a population model. Unfortunately, such detailed information is not available for most resources; therefore, estimates are based on discussions with agency experts and peer reviewers, and from experience with similar species in different areas (Note: the literature synthesis information is not yet incorporated into this DRAFT!). Similarly, there is limited information on the injury to services.

The objectives of this alternative are to describe the potential rate and degree of recovery for the injured resources with only normal agency management; identify the missing information that make the recovery estimates uncertain; describe the recovery of services; and to describe the monitoring and public information program that would be funded through the Trustee Council.

I. Monitoring

Monitoring under this alternative is designed to follow the progress of natural (unassisted) recovery of resources and services injured by the oil spill, and to determine when natural recovery has restored injured resources and service to their pre-spill conditions. Implicit in this design is the need to rely as much as possible on normal agency management and monitoring. For example, monitoring the distribution and abundance of harbor seals in Prince William Sound and the Gulf of Alaska, per se, would not be included in the Trustees' monitoring program because the abundance of harbor seals in these waters is already monitored by the National Marine Fisheries Service and the Alaska Department of Fish & Game under provisions of the Marine Mammal Protection Act. However, where designs (goals and objectives) of existing (pre-spill) agency monitoring programs, as in

the case of harbor seal, do not adequately address the impacts and recovery dynamics of harbor seals injured by the oil spill, monitoring harbor seal distribution and abundance on or near oiled segments of their range would be included in the Trustees' Natural Recovery Monitoring Program.

Monitoring under this alternative will be conducted on the in surface waters, on tidelands, and on adjacent uplands including their watersheds in Prince William Sound the Gulf of Alaska. Monitoring will continue dependent upon the severity and duration of injuries resulting from the oil spill and the time necessary to establish a trend for recovery.

Resources to be monitored include but are not limited to affected floral (sea grasses and seaweeds) and faunal assemblages (marine mammals, marine birds including sea ducks, fish and shellfish) as well as impacted intertidal and subtidal substrates upon which they depend. Services arising from injured natural resources also will be monitored inclusive of, but not limited to: recreation, subsistence, commercial fishing, wilderness and intrinsic values. Finally, archaeological resources will be monitored.

Costs for monitoring included in this alternative should be modest and should not exceed \$2.5 million per year, or \$2.0-\$3.0 million per year.

II. Information and Education:

Information and education provide the link between restoration activities and knowledge about the effects of those activities. As restoration, or the lack of direct application of restoration techniques, proceeds and is monitored, the gathering, systematizing, documentation and distribution of information about restoration provides interested persons and communities, scientists, educators, public officials and agencies facts about the effectiveness of techniques and status of recovery for injured resources and services.

Reporting results provides support to education curricula, scientific communities, media, and governmental or private brochures and displays. An Annual Report to the Public (the name only used as an example) would provide in word, graphics and picture information about how much and where money was spent, and what environmental progress, if any, was being made. The information medium would reflect the needs of the various interests. Radio and video shorts, newspaper inserts, books and brochures could all be used. More active methods of information dissemination are meetings and workshops. These media are most effective in rural areas when the information is carried to the people, i.e. town meetings and school workshops.

All methods of information exchange have a means for receiving comment from any interested party. Generally these are clip-out sections of a newspaper, mailers in books and brochures, phone or FAX numbers, and return addresses. For some interested or affected groups such as the Native communities and other subsistence users, visits to their communities, schools and homes for one on one exchanges enhances the credibility of the information and the informer. These intimate interchanges provide both parties a better understanding of interests, needs and reactions to restoration activities.

III. Resources

Natural recovery estimates vary widely for the injured species. For many of the injured species there is not enough information to develop accurate population models that can be used to make predictions. In addition, the recovery of a particular resource is closely dependent on the quality of its habitat and it is difficult to make predictions when future changes to the environment are unknown. Agency scientists and peer reviewers used the best information available to them to predict the potential recovery time. Most gave a range in years that represent possible "best-case" scenarios and "worse-case" scenarios. The wider the span in years, the more uncertainty exists in the expected recovery. For species that were declining prior to the spill even a range in years was impossible. Sometimes it was possible to imagine how long it would take for a population to stabilize, but for most of these species the reason for the decline is unknown and estimates are speculative at best.

A. Marine Mammals

Harbor seals: The harbor seal population in the Gulf of Alaska and Prince William Sound has suffered a severe population decline since the 1970's. The reasons for this decline are unknown, which makes predicting a recovery rate from the effects of the oil spill impossible. The population is expected to continue to decline.

Killer whales - AB pod: As long as there is no additional mortality due to human interactions, the AB pod is expected to fully recover to its pre-spill population level between 10 to 20 years from 1989. The overall whale population is not believed to be injured.

Sea otters: Sea otters are expected to recover 80 - 100% of their pre-spill population. The rate of recovery is dependant on the growth rate of the injured population. Under ideal habitat conditions (abundant high quality food and little competition) sea otters can expand their population at more than 10% per year. Sea otter populations already established in an area probably have a growth rate closer to 2 - 3 % per year. Future habitat conditions and corresponding population growth rates are difficult to predict in the injured area. If the habitat remains degraded the sea otter population may not recover for 35 to 40 years (variation reflects that the population currently may not have a positive growth rate and it may be another 5 years before it begins to grow). If the habitat recovers rapidly to a 'high quality condition', and there are no chronic sublethal effects on the sea otter population, recovery may occur within 7 - 15 years from 1993. (In order to attain this early recovery, the population would have to sustain a

B. Terrestrial Mammals

River otters: River otters are expected to fully recover within 20 years. The injury to river otters is not well understood, therefore it is difficult to make recovery estimates or estimate the effectiveness of different restoration options.

C. Birds

Bald eagles: Bald eagles are expected to be fully recovered to the pre-spill population level between 4 to 6 years after the oil spill (1993 - 1995).

BLACK OYSTERCATCHERS: Natural recovery is expected to occur within the next 30 years. There is a lot of uncertainty regarding the rate of recovery because the actual impact of the injury will not be known until the 1993 breeding season when chicks hatched during 1989 will become sexually mature. It is also unknown how much movement there is between areas so the effect of immigration into the oiled area may greatly accelerate the recovery. The population growth rate for black oystercatchers is unknown; if the growth rate is equal to Eurasian oystercatchers (6.25%) and there are no lingering sublethal effects, the population may recover in 15 years from 1989.

Common murre: The injured common murre populations are expected to return to between 80 to 100% of their pre-spill level. The degree of recovery may vary from pre-spill levels because of natural population fluctuations. The recovery rate for this species is very slow with the predicted recovery time between 50 and 120 years from 1989. These recovery estimates are dependant upon the assumption that commercial fishing doesn't increase near the colonies and that there are no other catastrophic disturbances.

Harlequin ducks are expected to recover to within 80 - 100% (natural variation) of their pre-spill population level. Experts disagreed on the expected recovery time with recovery estimates ranging between 10 and 50 years from 1989.

Marbled murrelets: The marbled murrelet population is not expected to return to pre-spill population levels. The population has been on a long-term decline which is expected to continue. Estimates on when the population may stabilize vary widely between experts. Estimates of further declines range from an additional 20 to 50 % loss with the population stabilizing at that reduced level between 11 and 50 years from now. Because the cause of the pre-spill decline is unknown, it is difficult to estimate stabilization or recovery times.

Pigeon Guillemots: Pigeon guillemots are not expected to return to their pre-spill population levels. The population was declining prior to the spill and the decline is expected to continue. The reasons for the long-term decline are unknown which makes predictions of future population trends extremely difficult. The population is expected to stabilize sometime in the next 50 years, but estimating the population size when it stabilizes is even more uncertain.

D. Fish

Cutthroat trout The injured cutthroat trout population is expected to fully recover to its pre-spill levels in about 13 years (9-19 year range). This is largely due to existing Alaska Department of Fish and Game management which has closed sport-fishing for cutthroat trout in the impacted area.

Dolly Varden trout: The injured dolly varden population is expected to fully recover to its pre-spill levels in about 13 years (9-19 year range). This is largely due to existing Alaska Department of Fish and Game management which has closed sport-fishing in the Prince William Sound impacted area.

Pacific Herring: The complex population dynamics of Pacific herring make it impossible to predict the extent of injury and estimate the natural recovery rate until fish spawned during the oil spill, and subsequent years, return. The effects of the most likely injury scenarios are expected to be recovered within 50 years of 1989, but until the extent of injury is known the uncertainty is extremely wide.

Wild stock Pink salmon: The overall injured population of wild stock pink salmon is expected to recover within 20 years of 1989. While peer reviewers and agency experts expect the population to recover to 100 % of its pre-spill population, it is possible that the wild stocks may be unable to recovery fully. The degree of recovery estimates ranges between 50 and 100%. The lower range estimates represents concern for those streams which are experiencing chronic effects from the oil spill and from the impact of hatchery fish "straying" into wild streams.

Rockfish: There are too many unknowns regarding the injury to rockfish to make predictions around natural recovery. (growth rate higher than 5%/year.)

Sockeye salmon - Kenai river system: Natural recovery of the Kenai river sockeye salmon run is complicated by changes that occurred in the rearing habitat as a result of overescapement. While peer reviewers and agency experts agreed that the population will eventually recover to its pre-spill average, the rate of recovery is more difficult to predict. Recovery rate estimates varied between experts and ranged between 10 to 50 years from 1989 to achieve the 10 year average population size with similar yearly variation. The worst case scenario would occur if two problems developed: the plankton population in the rearing lakes did not recover to the same species composition as before the overescapements; and the salmon population developed a "cyclic abundance" pattern with huge returns some years followed by extremely low runs in other years. The best case scenario could occur if the habitat is recovered by 1993 and there is adequate escapement of spawning adults into the system.

Sockeye Salmon - Kodiak: Natural Recovery of the Kodiak, Red Lake system is expected to be rapid because the overescapement just occurred one year (rather than 1987-1989 for the Kenai system). The injury is expected to produce a one generation effect which means that recovery should occur in 1996, possibly 1997.

E. Coastal Habitat

Coastal Habitat - Upper Intertidal: Natural Recovery of the upper intertidal zone will occur in stages as different species in the community respond to improved environmental conditions. *Fucus* provides food and shelter for many of the invertebrate species that

occupy the upper intertidal zone. These species will return after the *Fucus* has recovered. Full recovery of the upper intertidal zone is expected to occur in 8 - 25 years. The wide range is partially due to the ability of *Fucus* to recolonize injured areas. Recovery estimates for the *Fucus* population range from 6 to 15 years. Once *Fucus* begins to recolonize an area it is expected to take a few more years before other to begin to resemble their pre-spill populations.

IV. Services

Much of what is stated for resources is also applicable to injured services. If no restoration options were implemented for these injured services, what would their fate be? Current levels of use or management would continue. Injuries which occurred as a result of direct oiling, cleanup response, and looting or vandalism, as well as to perceptions of despoiled wilderness character would have to be managed by affected agencies. User groups such as commercial and sport fishers and subsistence users would continue to rely upon information produced from monitoring and presented through information and education options. Management and regulation of subsistence uses would continue under current agency jurisdiction.

Archaeologic Sites and Artifacts: Sites and artifacts will not recover from oil damage and depredation. Managers of lands where these sites occur must prevent further site degradation and loss of artifacts and scientific information under current authority and management priority.

Subsistence: Under the Natural Recovery Alternative, no action (restoration) other than normal agency management and monitoring will be conducted. In the case of native communities, normal agency management of the Alaska Department of Fish and Game Subsistence Division includes regulation of bag limits, seasons and other scientifically routine methods to protect wild and renewable resources. These activities are dependent upon monitoring to determine harvest quantities; levels of participation in subsistence activities; where subsistence hunting, fishing, and gathering occurs; the distribution and exchange of subsistence products; methods and means of harvest; and other demographic and economic data.

This alternative will also address additional monitoring not considered as a normal agency activity prior to the spill. Because of both real and perceived contamination of subsistence foods, there is a need to continue monitoring and chemical analyses of mussels, clams, rockfish, harbor seals and other resources. This monitoring approach is designed to identify traditional subsistence areas still contaminated, measure residual hydrocarbon levels in subsistence foods, as well as restore the confidence of subsistence hunters and fishers in the safety of subsistence resources in the oil spill area.

Recreation and Tourism: Injury to recreation uses occurred throughout the oilspill area. As a result experiences and perceptions changed. Recreation users report less visible oil and a slow, but discernable increase in wildlife sightings. There is also a yearly increase in the number of people using the spill area for recreation activities, although in

1991 activities were still below pre-spill levels. A steady increase in recreation use of the spill area is expected to continue. Annual rates and eventual levels of use by 2001 are unpredictable, as is a date when use will equal or surpass that of 1989.

Wilderness and Intrinsic Values: The uplands of the oil spill area are generally perceived to be of wilderness character. The designated and undesignated Wildernesses have formally recognized this character. Oil found above the mean high tide impacted these areas and perceptibly injured the wilderness character of the land. Cleanup and time have removed most visible oil, but the perception of a degraded wilderness resource remains. But visible oil, evidence of damage assessment, and restoration studies are physical reminders of mans' presence and remains a deterrent to wilderness experiences by visitors. Oil will disappear in time and managers will provide guidance to field workers to be sensitive to the wilderness character thereby reducing evidence of their presence. The perception that the undeveloped portions of the oil spill area offers visitors an "unspoiled" wilderness experience may never return.

Sport and Commercial Fishing: Closure of commercial fisheries during the spill caused injury to those who relied on this resource for a livelihood. Current sport fishing closures for cutthroat trout in Western Prince William Sound has resulted from a decline in that species. The current closure will continue until the species recovers. Perceptions of contaminated fish persist. Sport fishing trips to the spill area remain below the pre spill levels. Overescapement of at least two consecutive years' runs of sockeye into the Kenai River system has reduced the food available for fry. Since the adult return from the low years of outmigration will be low, the adults may not be able to produce enough eggs to rebuild the runs within a single generation. If this is the case, adult runs in 1999 and 2000 may also be low. Fluctuations in the number of spawning adults and outmigrating smolts will continue to be monitored by management agencies and regulatory adjustments made to attempt compensatory takes by commercial and sport fishers.

V. COST

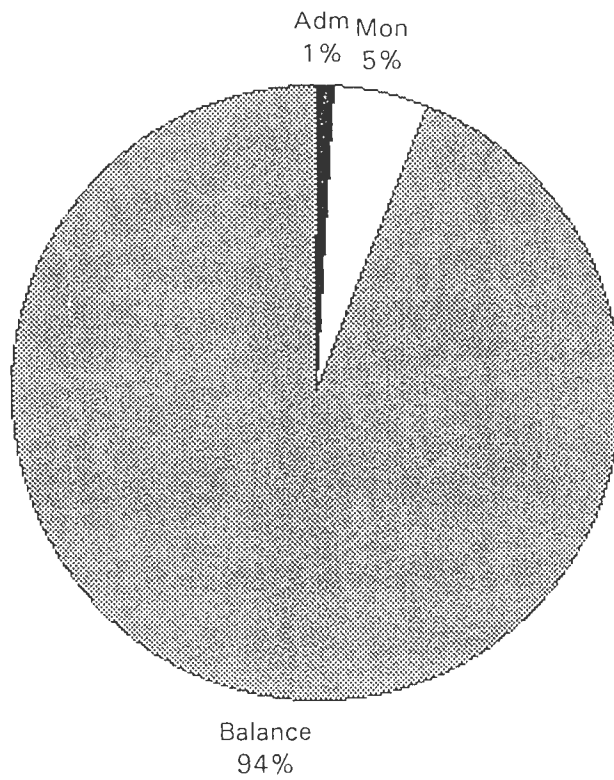
Detailed cost estimates for Alternative 1 are contained in Table ___; the allocation of these costs is shown in Figure ___. Estimates of cost are approximate.

The inflation-adjusted value of the remainder of the settlement fund is about \$522 million. Monitoring would require about 6% of this amount; and Administration/Information 5%.

This scenario would leave 89% of the remaining settlement uncommitted. Uncommitted funds could be held for unanticipated expenses or an endowment. If the entire balance were invested in an endowment, it would yield about \$13 million annually.

Allocation of Remainder of Settlement Funds							Total \$	%
Adm							5200.0	1%
Mon							25250.0	5%
Balance							491550.0	94%

Alternative 1 - Allocation



NB: All costs are expressed in units of \$1,000 (1993 \$). The inflation-adjusted value of the remainder of the settlement is about \$522 million.

Alternative 1 - Natural Recovery													
Opt	DESCRIPTION	ResSvc	UNIT	ANNUAL COST			DURATION			TOTAL COST			
				Exp	Low	High	Type	Years			10-Year Maximum		
								E	L	H	Expected	Lower	Higher
P1.00	Administration	Multiple resources									5200.0	5200.0	36500.0
P2.00	Monitoring	Multiple resources									25250.0	25250.0	52500.0

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NB: All costs are expressed in units of \$1,000 (1993 \$). The inflation-adjusted value of the remainder of the settlement is about \$522 million.

Alternative 2 - Protection

THEME	Protect injured resources and services from further degradation or disturbance.
VARIABLES	
Injury	All injured resources.
Status of Recovery	All stages of recovery.
Effectiveness of Restoration Actions	All beneficial actions.
Opportunities for Human Use	N/A

Monitoring and information programs are included in all alternatives.

Functional equivalents of injured resources and services are included in all alternatives.

The goal of this alternative is for the spill-affected area to return to prespill conditions on its own without further disturbance. This alternative addresses all injured resources and services whether or not they have recovered. Table _____ lists the resources and services addressed in this alternative. As these resources and services recover, protective actions would continue so that they are not subject to additional stress.

RESOURCES		SERVICES
Population Decline	Sublethal/Chronic	
Black oystercatcher Common murre Harbor seal Harlequin duck Intertidal organism Killer whale Marbled murrelet Pigeon guillemot Sea otter Sockeye salmon Subtidal organisms	Bald eagle Cutthroat trout Dolly varden Pacific herring Pink salmon River otter Rockfish	Archaeology Commercial fishing Recreation Sport fishing Subsistence Wilderness

Table _____. Resources and Services Addressed in Alternative 2

Restoration Options. Among the many restoration ideas suggested by scientist, agencies, and the public, only eight meet the criteria for this alternative. There is at least one effective restoration action for each injured resource or service except intertidal organisms, killer whale, pigeon guillemot, sea otter, subtidal organisms, Pacific herring,

river otter, rockfish, commercial and sport fishing, and subsistence. Many of these restoration options apply to several species. Table ___ lists restoration options by resource or service. These options are presented as potential projects which have already been evaluated; they are not proposals. Over time, other options are likely to be proposed which may be superior to those listed here.

The primary protective measure is Habitat protection and acquisition. In this alternative Habitat protection and acquisition applies to the following resources and services:

Harlequin duck	Bald eagle	Recreation
Marbled murrelet	Cutthroat trout	Wilderness
Sockeye salmon	Dolly varden	
	Pink salmon	

MONITORING

Monitoring under this alternative will focus on the need to evaluate the effectiveness of specific protection measures used in restoring injured resources and services. For example, monitoring of injured resources and services would be conducted in conjunction with establishing special designations such as refuges, sanctuaries, parks and critical areas, purchase and protection of private lands, protection to reduce disturbance around marine bird colonies and marine mammal haulouts, and protection of archaeological sites to deter further degradation of sites and artifacts.

This alternative also includes the provision to determine when natural recovery will restore injured resources and services to their pre-spill conditions. It assumes that normal agency management and monitoring will not be duplicated.

Monitoring under this alternative will be conducted on uplands including their watersheds adjacent to coastal habitat and on tidelands and associated waters impacted by the oil spill. Monitoring will continue dependent upon the severity and duration of injuries resulting from the oil spill and the time necessary to establish a trend for recovery.

Resources to be monitored will include those afforded opportunity to recover on protected uplands, tidal habitats and associated waters inclusive of but not limited to affected floral (sea grasses and seaweeds) and faunal assemblages (marine mammals, marine birds including sea ducks, fish and shellfish) as well as impacted intertidal and subtidal substrate upon which they depend. In the case of services, monitoring would focus on documenting recovery of human-use activities (recreation, subsistence, wilderness perception) associated with protected habitats. Archaeological resources present on protected uplands and tidelands also will be monitored.

Costs associated with monitoring are again modest and should not exceed \$2.5 million per year with a range of \$2.0-\$3.0 million per year. Of the \$2.5 million per year figure, \$1.5 million per year is allotted to monitoring effectiveness of restoration, and \$1.0 million is allotted to monitoring natural recovery.

DRAFT 2/8/93 Restoration Options for Alternative 2**

RESOURCE/SERVICE	RESTORATION OPTION
Black oystercatcher	40.0 Land and water management actions
Common murre	None identified
Harbor seal	37.0 Habitat protection and acquisition
Harlequin duck	37.0 Habitat protection and acquisition
Intertidal organisms	None identified
Marbled murrelet	37.0 Habitat protection and acquisition 40.0 Land and water management actions
Pigeon guillemot	None identified
Sea otter	None identified
Sockeye salmon	37.0 Habitat protection and acquisition
Subtidal organisms	None identified
Bald eagle	37.0 Habitat protection and acquisition
Cutthroat trout	37.0 Habitat protection and acquisition
Dolly Varden	37.0 Habitat protection and acquisition
Killer whale	None identified
Pacific herring	None identified
Pink salmon	37.0 Habitat protection and acquisition 40.0 Land and water management actions
River otter	None identified
Rockfish	None identified
Archaeology	None identified
Commercial fishing	None identified
Recreation	37.0 Habitat protection and acquisition 40.0 Land and water management actions
Sport fishing	None identified
Subsistence	None identified
Wilderness and non-use values	37.0 Habitat protection and acquisition 40.0 Land and water management actions

** Options 37 and 40 can potentially benefit all injured resources and services. The table above reflects those resources and services which are the primary targets of the proposed options.

EVALUATION

I. EFFECT ON THE RECOVERY OF RESOURCES

A. MARINE MAMMALS

Harbor seals: Reduce disturbance at marine mammal haulouts (#4) through interagency coordination would help to ensure that harbor seal haulout sites are considered and protected when permitting coastal and marine activities (especially set-net sites) could improve the amount of recovery (if any). Existing disturbance levels within the EVOS area are thought to be minimal but applying this option would provide benefits by preventing additional pup mortality at haulout sites.

Killer whales - AB pod: There are no habitat protection options currently identified that would have notable effects on the AB pod. Although broadly applied protection options such as Special Designations would certainly provide some added protection to the pod.

Sea otters Reduce disturbance at marine mammal haulout and concentration areas (#4.0): There is little information available on how sea otters react to disturbance (such as logging at the head of a highly used bay) so it is difficult to evaluate the ability of this option to prevent habitat degradation. A special study that addresses this problem would provide information on how to implement this option and a land acquisition option to benefit sea otters.

B. TERRESTRIAL MAMMALS

River otters: Habitat protection and acquisition (37.0) provides some protection to the river otter population. No estimates on the amount of habitat that could be protected, or on the tolerance of otters to disturbance are available. Special designations (#40.0): Because we don't know the tolerance of river otters to human activities it is difficult to evaluate this option. Intuitively, we would imagine this option would provide less benefit than acquiring protection on private lands, because there are fewer threats to lands already publicly managed.

C. BIRDS

Bald Eagles: Habitat protection and acquisition (#37) would ensure that the degree of recovery is equal to the pre-spill population level. The bald eagle population in PWS is believed to be at or near the habitat's carrying capacity. Any loss of nesting habitat would likely constitute a corresponding decrease in the population.

BLACK OYSTERCATCHERS: Special designations (#40) that protect areas where black oystercatchers concentrate (usually subadults and failed breeders) or restrict access to injured beaches with several breeding pairs may improve the rate of recovery between 10 to 24 %. Because black oystercatcher habitat is concentrated along the intertidal zone for feeding and breeding little benefit would be added by purchasing

upland habitats. There may be a slight (<10%) improvement in the rate of recovery from habitat protection and acquisition in some site specific situations where shoreline activities disturb the nesting birds.

Common murre: Reduce disturbance at marine bird colonies (#4): This option could have a beneficial effect (10 - 24%) on reducing the amount of time to recovery at colonies where human activities disturb the birds during nesting. This option is most likely to have the greatest benefit at the Barrens Islands or Puale Bay. It is thought that the Chiswell Islands colonies have habituated to the tour boats so there would be limited effectiveness at those colonies. Special designations (#40) would provide the same types of protection but cover a larger area.

Harlequin ducks: Habitat protection and acquisition is the single most effective option for ensuring the population can recover to its pre-spill population at the fastest rate. Studies in the Lower 48 have shown that harlequins are easily disturbed by logging, and other human development, and therefore a proportional loss in breeding birds can be expected.

Marbled murrelets: Habitat protection and Acquisition provides the greatest benefit in ensuring that the population can recover and could prevent an even more rapid decline if current prime habitat were developed. It is conceivable that a large portion of the marbled murrelet population could nest in the prime harvestable timber owned privately, but until more is known about nesting habitat it is impossible to estimate the potential impact from logging or other development.

Special designations that include both upland and marine habitats could provide substantial protection to marbled murrelet habitat. A large designation area that would limit development activities and pollution sources may have a positive effect on the prey base. This added protection would also increase the confidence in a more rapid stabilization period. There is wide disagreement between experts on the benefit these designations may provide.

Pigeon Guillemots: Pigeon guillemots are one of the few alcids that appear to be tolerant of human activity near nesting areas, but it is important to protect the nesting sites from erosion and other degradation. Protecting upland habitat immediately adjacent to the coast would prevent the population decline from accelerating due to lost nesting habitat.

D. FISH

Cutthroat trout Update and expand Alaska anadromous stream catalog (#19) will improve the confidence in the population reaching 100% of its pre-spill levels is increased by 10% because there would be a better understanding of the actual population distribution.

Habitat protection and acquisition (37) could prevent substantial losses to the population and therefore affect the degree of recovery. Because PWS cutthroat trout are at the northern extent of their range it is believed that they are more vulnerable to habitat alterations. Large scale development on private lands which would increase the traffic and fishing pressure on nearby populations could cause local (stream-specific) populations to collapse.

Dolly Varden trout Habitat protection and acquisition (37) could prevent a 10 - 20% loss to the population from reduced quality habitat.

Wild stock Pink salmon Habitat protection and acquisition (#37.0) could provide protection to 10 - 30% of the population. This is especially true for areas outside of Prince William Sound where there are more streams with pinks that spawn above the intertidal zone. The added protection may also allow for the population to increase approximately 10% above pre-spill levels.

Special Designations (#40.0): The effectiveness of this option is similar to acquiring private lands. No changes would be seen in the rate or degree of recovery. Special designations which protect the large intertidal spawning areas, and prevent degradation from mining activities, could benefit 10 - 30% of the population.

Sockeye salmon: Habitat protection and acquisition (37.0): The Kenai river system is already protected from most habitat degrading development. This option could be considered to protect the Quartz Creek area from negative impacts caused by widening the Sterling Highway, but would probably have less than a 10% effect on the overall population. For the Red Lake stock, if this option could be applied to protect the watershed that supports the lake.

E. Coastal Habitat

All options that protect coastal areas would benefit the intertidal zones, however, at this time there are no specific protection options targeted at coastal habitat alone.

EFFECT ON THE RECOVERY OF SERVICES

Archaeology. Restoration of archaeological resources cannot regenerate what has been destroyed, but it can successfully address the prevention of further degradation and loss of both sites and the scientific information they contain. Site stewardship program, Site patrol and monitoring, and Preservation of archaeological sites and artifacts are highly effective techniques to protect archaeological resources in the spill-affected area. The last option entails some physical repair and data recovery.

Recreation. Both of the restoration actions included for recreation serve primarily to

protect existing uses and their resource base. Habitat protection and Special designations are the primary means of protecting recreation.

Wilderness. Habitat protection and acquisition is a highly effective means of preventing additional injury to wilderness; Special designations would provide an increased level of resource protection compatible with preservation of wilderness values.

II. MULTI-SPECIES IMPACTS OF PROPOSED OPTIONS

RESOURCE RESTORATION OPTIONS:

The primary focus of this alternative is to implement options which provide protection for the resources and services while they recover. Implementing these protection options for most injured resources helps improve our confidence that the species will be able to recover to their pre-spill levels at the rate described under Natural Recovery. There are a few exceptions where added protection will prevent a disturbance that is known to affect the reproductive productivity of a species. These are described below.

For black oystercatchers Special designations may be used to protect breeding pairs and improve the rate of recovery by 10 to 24% over natural recovery. There may be some slight, but probably less than 10 % improvement from acquiring adjacent uplands.

For common murrens reducing disturbance from abrupt loud noises (such as gun shots fired by fishermen to kill large halibut) during breeding could increase the productivity of the nesting colony somewhere between 10 to 24% depending on the current level of disturbance.

For marbled murrelets, experts disagree on the effectiveness of Special designations that cover both upland and marine habitats it is possible that they may have a positive effect on the prey species. This added protection and benefit increases the likelihood that the population could stabilize more rapidly.

Because protective measures would be taken for almost all of the injured resources, this alternative has secondary benefits to a wide variety of other non-injured species.

For services, habitat protection and special designations help to maintain the remote, pristine quality of the oil spill area. As described earlier, these options benefit a wide variety of species and therefore benefit the services which depend upon them.

III. GEOGRAPHIC DISTRIBUTION

Table 3 indicates the part of the spill area where the options will most likely be applied. The areas may change as detailed project planning is completed and as more is learned

about injury or recovery.

Options in Alternative #2 focus on protection. Protection is applicable in all parts of the spill area and with some exceptions the options will be applied throughout the spill area. Reducing disturbance at murre colonies will be applied only at the three large colonies in the spill area: Chiswell, Barren Islands, and Paule Bay Colonies. Dolly Varden char and cutthroat trout do not exist in the spill area outside of Prince William Sound. The option locating anadromous streams for those species will be applied only in the Sound.

IV. COST

Detailed cost estimates for Alternative 2 are contained in Table ___; the allocation of these costs is shown in Figure ___. Estimates of cost are approximate. No cost estimates are included for Special designations and Spill prevention and contingency planning because no particular designation is under consideration and spill prevention and contingency planning appears to be well funded at present. However, these situations could change over time. Actual costs will vary as new information about injury becomes available through the monitoring program, new ideas are developed for appropriate restoration options, and project planning proceeds.

The inflation-adjusted value of the remainder of the settlement fund is about \$522 million. Two-thirds (67%) of this amount could be set aside for Habitat Protection. Administration/Information would require 7%; Monitoring 5%; and other restoration projects 2%.

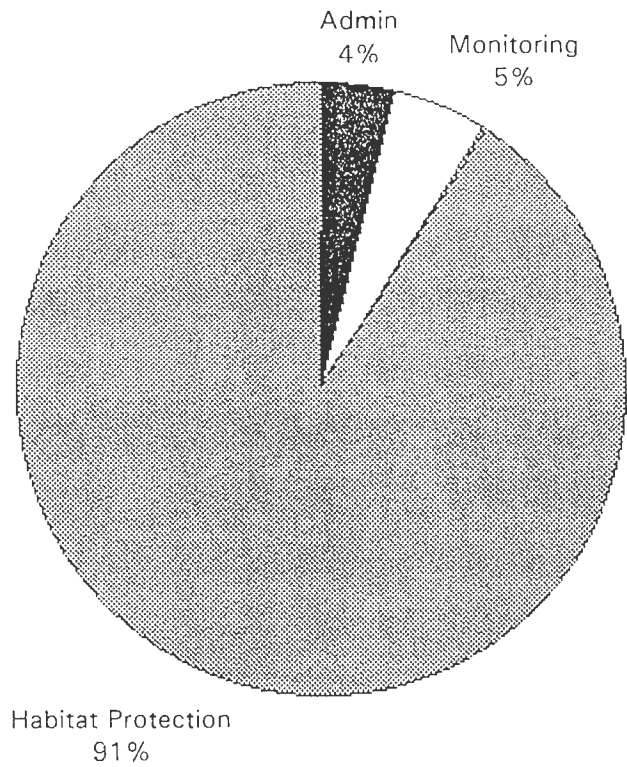
This scenario would leave 19% of the remaining settlement uncommitted. Uncommitted funds could be held for unanticipated expenses, such as injuries identified through the monitoring program, new options, or higher-than-projected costs for those already considered. Another use of the balance could be to fund an endowment for ongoing projects or for a research foundation. If the entire balance were invested in an endowment, it would yield about \$2.8 million annually.

ALTERNATIVE 2: GEOGRAPHIC DISTRIBUTION

RESOURCE OR SERVICE	OPTION NUMBER	OPTION NAME	Prince William Sound			Kenai/Cook Inlet			Alaska Penin.	Kodiak/Afognak		Outside EVOS
			North	East	West	Outer Kenai	Lower Cook In	Central Cook In		Afogn-Shuyak	Kodiak	
MULTI-SPECIES	37.0	Habitat protection and acquisition		x	x	x	x	x	x	x		
MULTI-SPECIES	40.0	Land and water management actions	x	x	x	x	x	x	x	x		

Allocation of Remainder of Settlement Funds							Total \$	%
Admin							21000.0	4%
Monitoring							26000.0	5%
Habitat Protection							475000.0	91%

Alternative 2 - Allocation



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NB: All costs are expressed in units of \$1,000 (1993 \$). The inflation-adjusted value of the remainder of the settlement is about \$522 million.

Alternative 2 - Protection													
Opt	DESCRIPTION	ResSvc	UNIT	ANNUAL COST			DURATION			TOTAL COST			
				Exp	Low	High	Type	Years			10-Year Maximum		
								E	L	H	Expected	Lower	Higher
37.00	Habitat protection/acquisition	Multiple resources									475000.0	234900.0	475000.0
40.00	Land and water mgmt actions	Multiple resources											
P1.00	Administration	Multiple resources									21000.0	5200.0	36500.0
P2.00	Monitoring	Multiple resources									26000.0	25250.0	52500.0

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NB: All costs are expressed in units of \$1,000 (1993 \$). The inflation-adjusted value of the remainder of the settlement is about \$522 million.

Alternative 3 - Limited Restoration

THEME	Take highly effective actions to protect and restore injured services and resources whose population has declined. Maintain the existing character of the affected area.
VARIABLES	
Injuries Addressed	Injured services and resources whose populations declined.
Status of Resource Recovery	Resources not recovered.
Effectiveness of Restoration Actions	Only highly effective actions.
Strategies for Public Use	Protect existing use.

Monitoring and information programs are included in all alternatives.

Restoration actions may be undertaken for injured resources, services, or their equivalents in all alternatives.

The goal of this alternative is for the worst-injured resources and services to return to prespill conditions as efficiently as possible. This is the only alternative that limits its scope to resources whose populations declined after the spill. Table _____ lists the resources and services addressed in this alternative. None of the resources whose populations declined after the spill has yet recovered. However, as resources recover, settlement funds would no longer be allocated to protecting or restoring them. This alternative includes only the most effective actions for protecting injured resources and restoring them to prespill conditions. It also includes only those actions that protect existing human uses that were injured and the resource base on which they depend. For example, a boat ramp in an area already used to launch boats would protect the beach that supports this type of recreational use.

RESOURCES		SERVICES
Population Decline	Other	
*Black oystercatcher Common murre Harbor seal Harlequin duck Intertidal organisms Marbled murrelet Pigeon guillemot Sea otter Sockeye salmon *Subtidal organisms	Archaeology	Commercial fishing Recreation Sport fishing Subsistence Wilderness

* Resources and services for which no restoration action(s) are included in this alternative.

Table _____. Resources and Services Addressed in Alternative 3

Restoration Options. Among the many restoration ideas suggested by scientist, agencies, and the public, twenty one meet the criteria for this alternative. There is at least one effective restoration action for each injured resource or service except black oystercatchers and subtidal organisms. Table ___ lists restoration options by resource or service. These options are presented as potential projects which have already been evaluated; they are not proposals. Over time, other options are likely to be proposed which may be superior to those listed here.

In this alternative, Transplanting hatchery runs for commercial and sport fishing would continue only until the wild stocks of salmon recover to prespill levels. Testing subsistence foods for hydrocarbon contamination and providing Access to traditional foods in areas outside the spill-affected area would be continued only until subsistence resources and use return to prespill levels. New backcountry public recreation facilities would be provided only if they protect existing recreational uses and the resource base on which they depend. Facilities that increase use or create a new use would not be supported with settlement funds. Habitat Protection and Acquisition would apply to only the following resources and services:

Harlequin duck
Marbled murrelet

Recreation
Wilderness

MONITORING

Monitoring under this alternative will focus on the need to evaluate the effectiveness of restoration options used in combination including those designed to manage human use, to directly manipulate injured resources and services, to protect or acquire critical habitat, and to replace or acquire the equivalent of injured resources and services. Monitoring of this type is designed to identify where additional restoration activities may be appropriate, and determine when injury is delayed.

For those resources where little can be done to accelerate recovery, e.g., sea otter, Alternative 3 includes provision to monitor natural recovery. Also, Alternative 3 assumes that normal agency management and monitoring will not be duplicated.

However, monitoring will only be conducted for those resources injured at the population level, and only in conjunction with those restoration measures that are likely to be the most effective when implemented. Monitoring for services will apply only to those options designed to protect and restore existing services injured by the oil spill.

Monitoring will be conducted on and in surface waters, tidelands, and on adjacent uplands including their watersheds in Prince William Sound and the Gulf of Alaska. Monitoring also will be conducted outside the spill affected area to measure the effectiveness of replacement and acquisition of equivalent resources and services options, e.g., eliminate predators from marine bird colonies in the Aleutian Islands, included in this

DRAFT 2/8/93 Restoration Options for Alternative 3

RESOURCE/SERVICE	RESTORATION OPTION
Black oystercatchers	None identified
Common murre	16.1 Study: Increase productivity with social stimuli 17.2 Temporary predator control
Harbor seals	46.0 Cooperative program with commercial fishermen 47.0 Cooperative program with subsistence users
Harlequin duck	13.1 Study: eliminate oil from mussel beds
	37.0 Habitat protection and acquisition
Intertidal organisms	14.0 Accelerate recovery of upper intertidal zone
Marbled murrelet	9.0 Minimize incidental take
	37.0 Habitat protection and acquisition 40.0 Land and water management actions
Pigeon guillemots	17.2 Temporary predator control
Sea otters	4.2 Study: Reduce disturbance at marine mammal haul-outs 13.2 Study: eliminate oil from mussel beds 47.0 Cooperative program with subsistence users
Sockeye salmon	2.5 Intensify sockeye management to protect injured stocks 48.0 Improve survival of salmon eggs and fry
Subtidal organisms	None identified
Archaeology	1.1 Site stewardship program 1.2 Site patrol and monitoring 10.0 Preserve archaeological sites and artifacts
Commercial fishing	18.0 Replace salmon harvest opportunities
Recreation	12.1 New backcountry public recreation facilities
	37.0 Habitat protection and acquisition 40.0 Land and water management actions
Sport fishing	18.0 Replace salmon harvest opportunities

Subsistence	30.0 Test subsistence foods for hydrocarbon contamination 49.0 Provide access to traditional subsistence foods
Wilderness and non-use values	37.0 Habitat protection and acquisition 40.0 Land and water management actions
	Included in Alternative 2

alternative. Monitoring will continue dependent on the severity and duration of effects resulting from the spill and the time necessary to establish a trend for recovery.

Resources to be monitored include but are not restricted to affected floral (sea grasses and seaweeds) and faunal assemblages (marine mammals, marine birds including sea ducks, etc.

Costs of Alternative 3 will be \$4.0 million per year with a range of \$3.5 to \$4.5 million per year. Of the \$4.0 million per year figure, \$3.0 million per year is allotted to monitoring effectiveness of restoration, and \$1.0 million per year is allotted for monitoring natural recovery.

EVALUATION

I. EFFECT ON RECOVERY

All of the restoration actions in this alternative are expected to improve the rate or degree of recovery by 25% to over 50% over natural recovery. However, the objective of this alternative is to protect as well as to restore. Consequently, some restoration actions were included not because they accelerate recovery but because they protect injured resources or services from further degradation or decline.

Restoration actions whose primary purpose is to protect injured resources and services are:

- 1.1 Archaeological site stewardship program
- 1.2 Archaeological site patrol and monitoring
- 10.0 Preserve archaeological sites and artifacts
- 12.1 New backcountry public recreation facilities to protect existing uses or their resource base
- 37.0 Habitat protection/acquisition
- 40.0 Special designations
- 44.0 Spill prevention and contingency planning

The effect these options have on recovery is to prevent further stress to resources and services, thereby allowing natural recovery processes to work more efficiently.

The effect of other restoration actions on recovery are described below by resource or service.

EFFECT ON THE RECOVERY OF RESOURCES

A. MARINE MAMMALS

Harbor seals: The two options which have the greatest potential to benefit harbor seals

are both cooperative programs which will help provide greater management by coordinating the groups that have the most interaction with the harbor seal population. These groups include managers, researchers, subsistence users and commercial fishermen. The two options are: Develop a cooperative program with subsistence users, and Develop a cooperative program with commercial fishermen.

Killer whales - AB pod: The AB pod feeds in the area where the Prince William Sound black cod fishery occurs. In the past there have been conflicts with the killer whales marauding the fishermen's catch. An option to coordinate, and compensate, fishermen to Facilitate gear changes in the black cod fishery from long-lines to pots, would prevent the whales from marauding the catch and eliminate the need for fishermen to defend their harvest.

Sea otters: The option believed to have the greatest ability to effect the overall sea otter population is to Develop a cooperative program with subsistence users. This option would help ensure that the sea otter population fully recovers to its pre-spill level and sustain any changes in harvest levels.

The special study of Eliminating oil from oiled mussel beds could be highly effective (25% to over 50%) in improving the weanling pups survival and recruitment rates. This option has to be considered as a special study because there are too many unknown factors that influence the potential effectiveness of this option. The current level of exposure of young otters to oil from oiled mussel beds is not known, nor is there information on how much oiled food can be eaten before the toxin levels cause an adverse effect. Without this information this option cannot be adequately evaluated.

B. BIRDS

BLACK OYSTERCATCHERS: None of the current options proposed for black oystercatchers are expected to reach the effectiveness level required for this alternative.

Common murre: At this time, there are no proposed options which are certain to reach the effectiveness level required for this alternative. There are two options which have the potential to greatly influence the rate of recovery for common murre; however, preliminary work would need to be completed before the effectiveness can be adequately evaluated. These options are: (#16.1) Enhancing the social stimuli, and (#17.2) Predator control to benefit marine birds.

Enhancing social stimuli may accelerate the rate of recovery by reducing the number of years for the population to return to synchronized and successful breeding. Using social stimuli to encourage synchronization is an experimental technique.

The level of predation, and its impact, on the injured colonies has not been documented. If it is shown to be a significant problem (At some colonies predation has been shown to

destroy 50% of the eggs.), then this option could greatly affect the breeding success of the colonies.

Harlequin ducks: Protecting nesting habitat (#37 Habitat protection and acquisition) for harlequin ducks is the most effective technique currently proposed. While it will not improve the rate or degree of recovery, it can prevent habitat loss which could prevent the population from fully recovering to its prespill level.

Eliminating oil from oiled mussel beds (#13) has the potential to improve the rate of recovery of a localized area by 25 - 50%; however, at this time there are too many unknowns to be certain of its effectiveness, therefore this would be considered as a Special study.

Marbled murrelets: Protecting habitat (options #37 Habitat protection and acquisition and #40 Special designations) would ensure that the marbled murrelet population could recover to its prespill levels once the population decline is reversed. Protecting the coastal waters could also benefit their prey which may help stabilize the population more quickly. In localized areas, option #9 Minimizing incidental take of marine birds could provide additional help to stabilize the population.

Pigeon guillemots: The only option currently proposed that has the potential to produce a substantial impact on stabilizing the population needs to have preliminary work completed before the option can be adequately evaluated. Option #17.2 Predator control to benefit marine birds has the potential to increase productivity by 25-50 % at very site specific locations; however, predation levels at colonies within the injured area have not been documented and this option may not be needed should predation levels be low.

C. FISH

Sockeye salmon (Kenai River): Option 2 Intensify fisheries management to protect injured stocks is the single most effective option for aiding and protecting the Kenai river systems. Its primary benefit is in the ability to prevent future overescapement problems which could greatly exacerbate the current injury level. With this option the risk of overescapements could be reduced from 25% to 10%.

In combination with the above option, and under the right environmental conditions, option #48 (Improve the survival of salmon eggs to fry) could be very effective for the Kenai river system. Improving survival of salmon eggs to fry could stimulate recovery so the injury is confined to one generation and recovery is complete around the year 2000. In order to implement this option monitoring of the plankton population and salmon escapement must occur in 1994/95 in order to supplement fry production in 1995.

D. COASTAL HABITAT

Coastal habitat - subtidal: At this time, no effective options have been identified that could help the recovery of subtidal organisms.

Coastal habitat - upper intertidal: Option 14 - Accelerate the recovery of the upper intertidal zone may prove to greatly increase the recovery time on a very localized basis. Experts have estimated that the option could increase the rate of recovery by 25 to 50%; however, the techniques are experimental and are not likely to be applied on a broad scale.

EFFECT ON THE RECOVERY OF SERVICES

Archaeology. Restoration of archaeological resources cannot regenerate what has been destroyed, but it can successfully address the prevention of further degradation and loss of both sites and the scientific information they contain. Site stewardship program, Site patrol and monitoring, and Preservation of archaeological sites and artifacts are highly effective techniques to protect archaeological resources in the spill-affected area. The last option entails some physical repair and data recovery.

Commercial Fishing. Replacing harvest opportunities by creating new hatchery runs is a highly effective method of replacing commercial fishing opportunities lost due to fishing closures or reduced harvest of species injured by the spill. In this alternative, the newly created runs would continue only until wild stocks recover.

Recreation. All three of the restoration actions included for recreation serve primarily to protect existing uses and their resource base. Habitat protection and Special designations are the primary means of protecting recreation. However, in limited situations New backcountry public recreation facilities could protect both recreation and the resources on which it depends by, for example, providing an outhouse in a heavily used area.

Sport fishing. Replacing harvest opportunities by creating new hatchery runs is a highly effective method of replacing sport fishing opportunities lost due to fishing closures or reduced harvest of species injured by the spill. In this alternative, the newly created runs would continue only until wild stocks recover.

Subsistence. Testing subsistence foods is expected to be an effective way of restoring confidence in the safety of subsistence resources within the spill area. Concern over the safety of subsistence resources is believed to be one of the reasons subsistence harvests have not yet returned to pre-spill levels. Providing Access to traditional foods in areas outside the spill-affected area would be a highly effective way of restoring lost

use. Both projects would be continued until subsistence resources and use have recovered to pre-spill levels.

Wilderness. Habitat protection and acquisition is a highly effective means of preventing additional injury to wilderness; Special designations would provide an increased level of resource protection compatible with preservation of wilderness values.

II. MULTI-SPECIES IMPACTS OF PROPOSED OPTIONS

Ecosystem Effects. Of the twenty-three restoration options included in this alternative, six benefit multiple resources. They are:

- 13.0 Eliminate oil from mussel beds
- 14.0 Accelerate recovery of upper intertidal zone
- 37.0 Habitat protection and acquisition
- 40.0 Special designations
- 44.0 Spill prevention and contingency planning
- 48.2 Improve survival rates of sockeye salmon

The resources these restoration options benefit may include resources injured at a sublethal or chronic level and therefore not directly addressed in this alternative.

The remaining seventeen restoration options focus on individual species. However, even these actions are expected to benefit services such as subsistence and recreation.

RESOURCE RESTORATION OPTIONS:

Of the 14 resource restoration options identified in Alternative 3, 6 of them could potentially have significant multiple-species and habitat benefits.

Habitat protection and acquisition targeted at harlequin ducks would protect the riparian zone and nearby uplands adjacent to anadromous streams. Protection of these areas will have far reaching effects on other resources that depend on the riparian zone and on the anadromous fish. Protection for marbled murrelets would include more upland, non-riparian, habitat and would provide even greater protection for wildlife species that have large home ranges. Some of the other species that would benefit from implementing these options are: Sitka black-tailed deer; brown bears, black bears, river otters, bald eagles, and anadromous fish. Special designations for marbled murrelets would benefit terrestrial species utilizing old growth forests.

For pigeon guillemots and common murrelets it is possible that reducing predators near nesting colonies would be very effective in helping the colonies recover. If it is determined that predation is a serious problem at injured colonies then implementation

of this option could be considered. This option would also benefit other species that are preyed upon by the gulls and weasels. Even though implementing this option for either murrelets or guillemots would not have a long-term effect on the predator population there is obviously a negative ecological cost to the predators. Therefore, the ecological costs and benefits will be carefully weighed to determine if the option should be implemented.

There were no options identified that would have the effectiveness level required in this alternative that would benefit black oystercatchers; however, if habitat protection were extended to the coastline, black oystercatcher and pigeon guillemot habitat would be protected. In addition, two of the special studies could benefit black oystercatchers if implemented in areas which are have, or had, high use.

These special study options include eliminating oil from oiled mussel beds and accelerating the upper intertidal. Both of these options affect lower levels of the food chain which can benefit many species. For instance, accelerating the growth rate of the seaweed *Fucus* would accelerate the colonization of invertebrates such as limpets. Limpets are one of the main prey species for black oystercatchers whose eggs and chicks are preyed upon by gulls, ravens, and some mammalian predators. Limpets and other small invertebrates are consumed by other species which are then taken by birds, river otters, etc. Although both of these special study options have effects on many species, they are not likely to be applied on a broad scale to benefit more than a localized area.

Improving survival rates of juvenile sockeye salmon could benefit marine and terrestrial predators which feed on salmon eggs, juvenile and adults. This includes bald eagles, brown bears, cutthroat trout and Dolly Varden, harlequin ducks, killer whale, harbor seals and river otters. However, the option needs to be carefully implemented so as not to exceed the carrying capacity of the ecosystem by producing large numbers of new fish.

SERVICE RESTORATION OPTIONS

Of the 9 service restoration options proposed for Alternative 3, 5 of them have potential impacts on multiple species and habitats.

Building new backcountry, public recreation facilities has potential negative impacts on all species if facilities are sited so as to increase human use of damaged habitats or other areas supporting recovering species. Alternatively, properly sited facilities could 'harden' use areas and direct uses away from injured areas and promote undisturbed natural recovery of injured resources.

Habitat acquisition and special designations for recreational purposes could benefit injured resources by protecting them from development and disturbances incompatible with recreation. On the other hand, these options could, if not carefully implemented, increase human use of damaged areas and slow natural recovery rates.

Spill prevention and contingency planning could benefit all species by preventing additional spills which would further compound existing injuries.

Replacing harvest opportunities by creating new salmon runs would benefit commercial and sport fishermen. Positive multi-species impacts would result from benefits to the many species which prey on salmon adults, eggs and juveniles. Benefits would be higher in the case of stream stocking programs, since eggs, juveniles and adult would be available to marine and terrestrial predators. This includes bald eagles, brown bears, cutthroat trout and Dolly Varden, harlequin ducks, killer whale, harbor seals and river otters. Terminal hatchery runs would provide fewer species with prey, since only adults and juveniles would be available to marine predators.

Negative impacts include the possibility of increasing mortality of seabirds and marine mammals due to interactions with new commercial fisheries. Also, wild-stock pink salmon could possibly be impacted by fish from new runs straying into wild streams. Lastly, new runs stocked into streams which did not previously support salmon might harm resident fish through competition for food and spawning habitat.

Archaeology. Restoration of archaeological resources cannot regenerate what has been destroyed, but it can successfully address the prevention of further degradation and loss of both sites and the scientific information they contain. Site stewardship program, Site patrol and monitoring, and Preservation of archaeological sites and artifacts are highly effective techniques to protect archaeological resources in the spill-affected area. The last option entails some physical repair and data recovery.

Commercial Fishing. Creating new Terminal hatchery runs is a highly effective method of replacing commercial fishing opportunities lost due to fishing closures or reduced harvest of species injured by the spill. In this alternative, the newly created runs would continue only until wild stocks recover.

Recreation. All three of the restoration actions included for recreation serve primarily to protect existing uses and their resource base. Habitat protection and Special designations are the primary means of protecting recreation. However, in limited situations New backcountry public recreation facilities could protect both recreation and the resources on which it depends by, for example, providing an outhouse in a heavily used area.

Sport fishing. Transplanting hatchery runs is a highly effective method of replacing sport fishing opportunities lost due to fishing closures or reduced harvest of species injured by the spill. In this alternative, the newly created runs would continue only until wild stocks recover.

Subsistence. Testing subsistence foods is expected to be an effective way of restoring

confidence in the safety of subsistence resources within the spill area. Concern over the safety of subsistence resources is believed to be one of the reasons subsistence harvests have not yet returned to pre-spill levels. Providing Access to traditional foods in areas outside the spill-affected area would be a highly effective way of restoring lost use. Both projects would be continued until subsistence resources and use have recovered to pre-spill levels.

Wilderness. Habitat protection and acquisition is a highly effective means of preventing additional injury to wilderness; Special designations would provide an increased level of resource protection compatible with preservation of wilderness values.

III. GEOGRAPHIC DISTRIBUTION

Table 3 indicates the part of the spill area where the options will most likely be applied. The areas may change as detailed project planning is completed and as more is learned about injury or recovery.

Most protective options are applied throughout the spill area. But some research and restoration options are not applicable in all regions. With two exceptions, subsistence options and most commercial fishing options are applied in Prince William Sound and Kodiak. The exceptions are: feasibility study of Black Cod fishing interactions with Killer whales (Prince William Sound, where the interactions are expected to occur); Intensify pink salmon management to protect injured stocks (PWS), and Improve survival rates of salmon and eggs (Red Lake on Kodiak.)

IV. COST

Detailed cost estimates for Alternative 3 are contained in Table ___; the allocation of these costs is shown in Figure ___. Estimates of cost are approximate. No cost estimates are included for Special designations and Spill prevention and contingency planning because no particular designation is under consideration and spill prevention and contingency planning appears to be well funded at present. However, these situations may change over time. Actual costs will vary as new information about injury becomes available through the monitoring program, new ideas are developed for appropriate restoration options, and project planning proceeds.

The inflation-adjusted value of the remainder of the settlement fund is about \$522 million. Sixty-two percent (62%) of this amount could be set aside for Habitat Protection. Monitoring and Administration/Information would require about 8% each. Other Restoration actions would require slightly less than 5%.

This scenario would leave 19% of the remaining settlement uncommitted. Uncommitted funds could be held for unanticipated expenses, such as injuries identified through the monitoring program, new options, or higher-than-projected costs for those already

ALTERNATIVE 3: GEOGRAPHIC DISTRIBUTION

RESOURCE OR SERVICE	OPT. No.	OPTION NAME	Prince William Sound			Kenai-Cook/Inlet			Alaska Penin.	Kodiak/Afognak		Outside EVOS
			North	East	West	Outer Kenai	Lower Ck In	Central Ck In		Afg-Shuyak	Kodiak	
Archaeology	1.0	Archaeological site stewardship program	X	X	X	X	X	X	X	X		
Sockeye salmon	2.5	Intensify sockeye management to protect injured stocks						X				
Harbor seal	4.2	Reduce disturbance at marine mammal haul-outs	X	X	X	X	X	X				
Sea otter	4.2	Reduce disturbance at marine mammal haul-outs	X	X	X							
Marbled murrelet	9.0	Minimize incidental take by commercial fisheries	X	X	X	X	X	X	X	X	X	
Archaeology	10.0	Preserve archaeological sites and artifacts	X	X	X	X	X	X	X	X	X	
Sockeye salmon	11.2	Fertilize lakes to improve sockeye rearing success	X									
Recreation	12.1	Construct new backcountry public facilities	X	X	X	X	X	X	X	X	X	
Harlequin duck	13.1	Study: eliminate oil from mussel beds			X	X	X	X	X	X	X	
Sea otter	13.2	Study: eliminate oil from mussel beds			X							
MULTI-SPECIES	14.0	Accelerate recovery of upper intertidal zone			X	X	X	X	X	X	X	
Common murre	16.1	Increase murre productivity through enhanced social stimuli				X		X				
Pigeon guillemot/Common murre (replacement)	17.1	Removal of introduced species in the Aleutians									X	
Common murre	17.2	Temporary predator control				X	X	X	X	X	X	
Pigeon guillemot	17.2	Temporary predator control	X	X	X	X	X	X	X	X	X	
Subsistence	30.0	Test subsistence foods for hydrocarbon contamination		X	X		X				X	
MULTI-SPECIES	37.0	Habitat protection and acquisition		X	X	X	X	X	X	X	X	
MULTI-SPECIES	40.0	Land and water management actions	X	X	X	X	X	X	X	X	X	
Killer Whale - AB pod	45.0	Study: Facilitate changes in black cod fishery gear	X	X	X	X						
Harbor Seal	46.0	Cooperative program w. comm. fishermen to reduce seal bycatch	X	X	X		X			X	X	
Harbor Seal & Sea otter	47.0	Cooperative program with subsistence users to assess harvest levels		X	X		X				X	
Sockeye Salmon	48.0	Improve survival of salmon eggs and fry						X			X	

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RESOURCE OR SERVICE	OPT. No.	OPTION NAME	Prince William Sound			Kenai Cook/Inlet			Alaska Penin.	Kodiak/Afognak		Outside EVOS
			North	East	West	Outer Kenai	Lower CK In	Central CK In		Afg- Shuyak	Kodiak	
Subsistence	49.0	Provide subsistence users access to traditional subsistence foods			X							
Pink salmon	51.0	Relocate existing hatchery runs	X	X	X							

11/1

Draft January 31, 1993

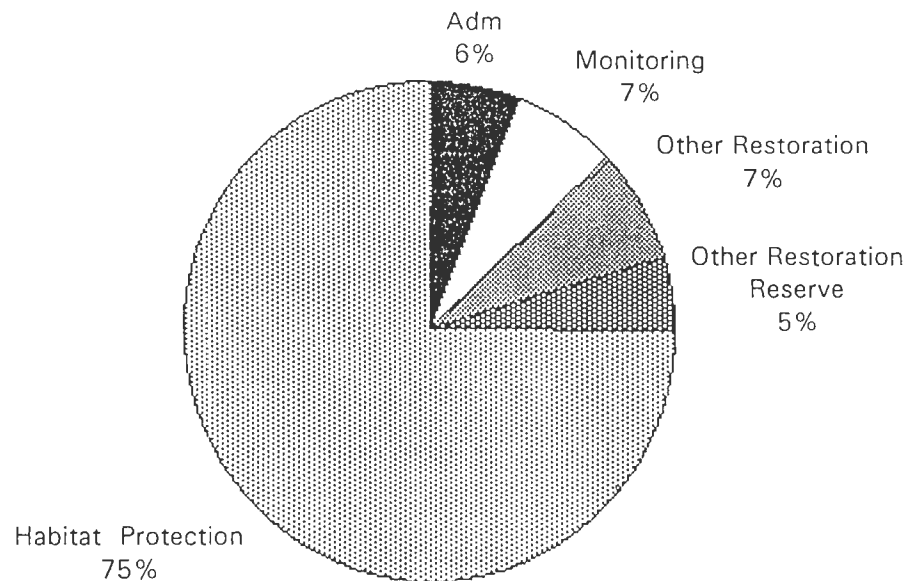
considered. Another use of the balance could be to fund an endowment for ongoing projects or for a research foundation. If the entire balance were invested in an endowment it would yield about \$2.6 million annually.

V. PRIORITY

Because Alternative 3 addresses more severely injured resources, includes the most effective restoration actions, and few restoration options were identified for each resource or service, there is no proposal for setting priorities. However, if environmental conditions on the Kenai river system are adequate to support a supplemental fry program then Option 2.0 and 48.0 must be in place in 1994.

Allocation of Remainder of Settlement Funds						Total \$	%
Adm						31500.0	6%
Monitoring						36500.0	7%
Other Restoration						38362.0	7%
Other Restoration Reserve						24138.0	5%
Habitat Protection						391500.0	75%

Alternative 3 - Allocation



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NB: All costs are expressed in units of \$1,000 (1993 \$). The inflation-adjusted value of the remainder of the settlement is about \$522 million.

Alternative 3 - Limited Restoration													
Opt	DESCRIPTION	ResSvc	UNIT	ANNUAL COST			DURATION				TOTAL COST		
				Exp	Low	High	Type	Years			10-Year Maximum		
								E	L	H	Expected	Lower	Higher
1.10	Site stewardship program	Archaeology	Per 3 areas	195.0	195.0	195.0	Ltd	10	10	10	1950.0	1950.0	1950.0
1.20	Site patrol and monitoring	Archaeology		300.0	300.0	300.0	Ltd	4	3	5	1200.0	900.0	1500.0
2.50	Intensify management	Sockeye salmon		3000.0	2000.0	5000.0	Ltd	5	2	5	15000.0	4000.0	25000.0
4.30	Feas Study: Reduce disturb	Sea otter					Ltd				120.0	80.0	640.0
9.00	Minimize incidental take	Marbled murrelet									1625.0	1100.0	2000.0
10.00	Archaeol Res Protection	Archaeology									4072.0	3250.0	7000.0
12.10	New backcountry rec facilities	Recreation									1620.0	480.0	3256.0
13.01	Eliminate oil from mussel beds	Harlequin duck		491.0	340.0	641.0	Ltd	5	4	7	2455.0	1360.0	4487.0
13.02	Study: Elim oil fr mussel beds	Sea otter											
14.01	Accelerate recovery of UIT	Intertidal organisms		150.0	100.0	200.0	UR	5	4	7	750.0	400.0	1400.0
16.10	Feas Study: Social stimuli	Common murre					Ltd				850.0	800.0	5500.0
17.21	Temporary predator control	Common murre		350.0	300.0	400.0	Ltd	5	5	10	1750.0	1500.0	4000.0
17.22	Temporary predator control	Pigeon guillemot		200.0	150.0	250.0	Ltd	4	4	6	800.0	600.0	1500.0
18.01	Replace harvest opportunities	Comm fishing	5 projects	750.0	500.0	1000.0	Ltd	2	1	5	1500.0	500.0	5000.0
18.02	Replace harvest opportunities	Sport fishing	5 projects	750.0	250.0	1000.0	Ltd	2	1	5	1500.0	250.0	5000.0
30.00	Test subsistence foods	Subsistence		330.0	300.0	350.0	Ltd	3	2	5	990.0	600.0	1750.0
37.00	Habitat protection/acquisition	Multiple resources									391500.0	234900.0	475000.0
40.00	Land and water mgmt actions	Multiple resources											
46.00	Coop prgm-fishermen	Harbor seal		50.0	30.0	100.0	Ltd	3	1	5	150.0	30.0	500.0
47.01	Coop prgm-subsistence users	Harbor seal		30.0	30.0	30.0	UR	10	10	10	300.0	300.0	300.0
47.02	Coop prgm-subsistence users	Sea otter					UR						
48.02	Improve survival rates	Sockeye salmon	4 projects	400.0	200.0	600.0	Ltd	3	1	5	1200.0	200.0	3000.0
49.00	Access to traditional foods	Subsistence	Per village	53.0	50.0	60.0	UR	10	5	10	530.0	250.0	600.0
P1.00	Administration	Multiple resources									31500.0	5200.0	36500.0
P2.00	Monitoring	Multiple resources									36500.0	25250.0	52500.0

NB: All costs are expressed in units of \$1,000 (1993 \$). The inflation-adjusted value of the remainder of the settlement is about \$522 million.

Alternative 4 - Moderate Restoration

THEME	Take the most effective actions to protect and restore all injured resources and services. Increase, to a limited extent, opportunities for human use in the affected area.
VARIABLES	
Injury	All injured resources.
Status of Recovery	Resources not yet recovered.
Effectiveness of Restoration Actions	Most effective actions.
Opportunities for Human Use	Protect or increase existing uses.

Monitoring and information programs are included in all alternatives.

Functional equivalents of injured resources and services are included in all alternatives.

The goal of this alternative is for all injured resources and services to return to prespill conditions as efficiently as possible. Table _____ lists the resources and services addressed in this alternative. None of the resources whose populations declined after the spill has yet recovered. However, as resources recover, settlement funds would no longer be allocated to protecting or restoring them. This alternative includes actions that protect existing human uses that were injured and the resource base on which they depend and also those actions that would increase existing use. An example of the latter is a new hatchery run that may increase fishing opportunities but is compatible with existing use.

RESOURCES			SERVICES
Population Decline	Sublethal/Chronic	Other	
*Black oystercatcher Common murre Harbor seal Harlequin duck Intertidal organisms Marbled murrelet Pigeon guillemot Sea otter Sockeye salmon *Subtidal organisms	Bald eagle Cutthroat trout Dolly Varden Killer whale Pacific herring Pink salmon *River otter Rockfish	Archaeology	Commercial fishing Recreation Sport fishing Subsistence Wilderness

* Resources and services for which no restoration action(s) are included in this alternative.

Table _____. Resources and Services Addressed in Alternative 4.

Restoration Options. Among the many restoration ideas suggested by scientist, agencies, and the public, 28 meet the criteria for this alternative. Of these, 21 are identical to those in Alternative 3. There is at least one effective restoration action for each injured resource or service except black oystercatchers, subtidal organisms and river otter. Table ___ lists restoration options by resource or service. These options are presented as potential projects which have already been evaluated; they are not proposals. Over time, other options are likely to be proposed which may be superior to those listed here.

In this alternative, as for Alternative 3, Transplanting hatchery runs for commercial and sport fishing would continue only until the wild stocks of salmon recover to prespill levels. Testing subsistence foods for hydrocarbon contamination and providing Access to traditional foods in areas outside the spill-affected area would be continued only until subsistence resources and use return to prespill levels. However, in contrast to Alternative 3 New backcountry public recreation facilities would be provided either to protect or increase existing recreational uses. Habitat Protection and Acquisition would apply to only the following resources and services:

Harlequin duck	Bald eagle	Recreation
Marbled murrelet	Cutthroat trout	Wilderness
	Dolly varden	

MONITORING

Monitoring under this alternative will be conducted to evaluate the effectiveness of restoration options used in combination inclusive of managing human use, directly manipulating resources and services, protecting or acquiring critical habitat, and replacing

or acquiring the equivalent of injured resources and services. Monitoring of this type is designed to identify where additional restoration activities may be appropriate, and determine when injury is delayed.

This alternative also includes the provision to monitor the dynamics of other ecological components, e.g., those important in the food chain (web) of injured species. This type of monitoring is useful in detecting residual effects of the oil spill many years removed from the event, and it provides a baseline from which to assess impacts of future spills and other disturbance. It also generates a database that facilitates greater understanding of how our changing environment affects the species that we manage and protect.

For those resources or services where little can be done to accelerate their recovery, e.g., sea otter, Alternative 4 includes provision to determine when natural recovery will restore injured resources and services to their pre-spill conditions. It also is assumed that normal agency management and monitoring will not be duplicated.

Under this alternative, monitoring will be conducted for all injured resources and services, but particularly in conjunction with restoration options that are likely to be the most effective when implemented. Monitoring recovery of injured services will be undertaken in association with restoration measures designed to protect, restore and to increase (enhance) existing human-use activities

Monitoring will be conducted on and in surface waters, on tidelands, and on adjacent uplands including their watersheds in Prince William Sound and the Gulf of Alaska. Monitoring also will be conducted outside the spill affected area to measure the effectiveness of replacement or acquisition of equivalent resources and services options, e.g., eliminate predators of marine birds on Aleutian Islands, included in this alternative. Monitoring will continue dependent upon the severity and duration of effects resulting from the spill and the time necessary to establish a trend for recovery. Some monitoring components, e.g. those designed to document long-term trends in the health of the ecosystem, could continue in perpetuity if supported by an endowment.

Resources to be monitored include but are not restricted to affected floral (sea grasses and sea weeds) and faunal assemblages (marine mammals, marine birds including sea ducks, etc. See Alternative 1 for complete list of injured resources and services to be monitored.

Costs for Alternative 4 are \$5.0 million per year with a range of \$4.0-\$5.0 million per year. Of the \$5.0 million per year figure, \$3.0 million per year is allotted to monitoring effectiveness of restoration; \$1.0 million per year is allotted to monitoring natural recovery; and \$1.0 million per year is allotted for monitoring long-term trends in the health of the ecosystem.

DRAFT 2/8/93 Restoration Options for Alternative 4

RESOURCE/SERVICE	RESTORATION OPTION
Black oystercatcher	None identified
Common murre	16.1 Study: Increase productivity with enhanced social stimuli
	17.1 Removal of introduced species in the Aleutians
	17.2 Temporary predator control
Harbor seal	46.0 Cooperative program with fishermen 47.0 Cooperative program with subsistence users
Harlequin duck	13.1 Study: eliminate oil from mussel beds 37.0 Habitat protection and acquisition
Intertidal organisms	14.0 Accelerate recovery of upper intertidal zone
Marbled murrelet	9.0 Minimize incidental take 37.0 Habitat protection and acquisition 40.0 Land and water management actions
Pigeon guillemot	17.1 Removal of introduced species in the Aleutians 17.2 Temporary predator control
Sea otter	4.2 Study: Reduce disturbance at marine mammal haul-outs 13.2 Study: Eliminate oil from mussel beds 47.0 Cooperative program with subsistence users
Sockeye salmon	2.5 Intensify sockeye management to protect injured stocks
	11.2 Fertilize lakes to improve sockeye rearing success
	48.0 Improve survival of salmon eggs and fry
Subtidal organisms	None identified
Bald eagle	37.0 Habitat protection and acquisition
Cutthroat trout	2.1 Intensify management to protect injured stocks 37.0 Habitat protection and acquisition

Dolly Varden	2.1 Intensify management to protect injured stocks 37.0 Habitat protection and acquisition
Killer whale	45.0 Study: Changes in black cod fishery gear
Pacific herring	2.2 Intensify herring management to protect injured stocks
Pink salmon	2.3 Intensify salmon management to protect injured stocks 51.0 Relocate existing hatchery runs
River otter	None identified
Rockfish	2.4 Intensify rockfish management to protect injured stocks
Archaeology	1.1 Site stewardship program 1.2 Site patrol and monitoring 10.0 Preserve archaeological sites and artifacts
	35.0 Acquire replacements for artifacts from the spill area
Commercial fishing	18.0 Replace salmon harvest opportunities
Recreation	12.1 New backcountry public recreation facilities 37.0 Habitat protection and acquisition 40.0 Land and water management actions
Sport fishing	18.0 Replace salmon harvest opportunities
Subsistence	30.0 Test subsistence foods for hydrocarbon contamination 49.0 Provide access to traditional subsistence foods
Wilderness and non-use values	37.0 Habitat protection and acquisition 40.0 Land and water management actions
	Included in Alternatives 2 or 3

EVALUATION

I. EFFECT ON THE RECOVERY OF RESOURCES

A. Marine mammals

Harbor seals: The two options which have the greatest potential to benefit harbor seals are: Develop a cooperative program with subsistence users, and Develop a cooperative program with commercial fishermen. These programs which will help provide greater management by coordinating managers, researchers, subsistence users and commercial fishermen.

Killer whales - AB pod: An option to determine the feasibility of facilitating gear changes in the black cod fishery from long-lines to pots, would prevent the whales from marauding the catch and eliminate the need for fishermen to defend their harvest.

Sea otters: The option believed to have the greatest ability to effect the overall sea otter population is to Develop a cooperative program with subsistence users. This option would help ensure that the sea other population fully recovers to its pre-spill level and sustain any changes in harvest levels. In addition, the special study of Eliminating oil from oiled mussel beds could be highly effective (25% to over 50%) in improving the weanling pups survival and recruitment rates if oiled mussel beds are determined to be a major reason for the poor weanling survival.

B. Terrestrial mammals

River otters: There are no proposed options that meet the effectiveness level described for this option.

C. Birds

Bald eagles: None of the current options proposed for bald eagles are expected to reach the effectiveness level required for this alternative.

Black oystercatchers: None of the current options proposed for black oystercatchers are expected to reach the effectiveness level required for this alternative.

Common murre: At this time, there are no proposed options which are certain to reach the effectiveness level required for this alternative. There are two options which have the potential to greatly influence the rate of recovery for common murre; however, preliminary work would need to be completed before the effectiveness can be adequately evaluated. These options are: (#16.1) Enhancing the social stimuli, and (#17.2) Predator control to benefit marine birds. (note: greater detail provided in Alternative 3.)

Harlequin ducks: Protecting nesting habitat (#37 Habitat protection and acquisition) for harlequin ducks can prevent habitat loss which could prevent the population from fully recovering to its pre-spill level. In addition, in localized areas the special study Eliminating oil from oiled mussel beds (#13) has the potential to improve the rate of recovery of a localized area by 25 - 50%; however, at this time there are too many unknowns to be certain of its effectiveness.

Marbled murrelets: Protecting habitat (options #37 Habitat protection and acquisition and #40 Special designations) would ensure that the marbled murrelet population could recover to its pre-spill levels once the population decline is reversed. Protecting the coastal waters could also benefit their prey which may help stabilize the population more quickly. In localized areas, option #9 Minimizing incidental take of marine birds could provide additional help to stabilize the population.

Pigeon guillemots: The only option currently proposed that has the potential to produce a substantial impact on stabilizing the population needs to have preliminary work completed before the option can be adequately evaluated. Option #17.2 Predator control to benefit marine birds has the potential to increase productivity by 25-50 % at very site specific locations; however, predation levels at colonies within the injured area have not been documented and this option may not be needed should predation levels be low.

D. Fish

Cutthroat trout: Option 2 Intensify fisheries management to protect injured stocks would benefit both cutthroat trout and its dependent sport fishery. By determining the maximum sustained yield and documenting fishable areas the sport fishery could be opened, or partially opened as early as 1998. It can also be used to enhance the injured stocks an additional 5-10% above the pre-spill population level.

Habitat protection and acquisition is believed to be especially important for cutthroat trout in Prince William Sound because they are at the northern extent of their geographic range and are believed to be more vulnerable to habitat alterations.

Dolly Varden trout: Option 2 Intensify fisheries management to protect injured stocks would benefit the Dolly Varden trout population by determining the maximum sustained yield and documenting the sport fishery the fishery could be managed to protect injured stocks. It can also be used to enhance the injured stocks an additional 5-10% above the pre-spill population level.

Herring: The extent of injury to herring is still unknown. Option 2 Intensify fisheries management to protect injured stocks could improve the rate and degree of recovery by more than 50% if it is necessary. The option would allow for increased precision in stock assessment which would allow for manipulation of the harvest levels to counter all but the most extreme levels of injury.

Pink salmon: The coded-wire tagging and stock separation information that would be gained from an intensified fisheries management program (option 2) would help ensure that the wild stock population fully recover and could accelerate the recovery rate as much as 50% over natural recovery. Relocating existing hatchery runs (option 51) could substantially improve the recovery of wild stocks by reducing interception rates by 25 - 50%. The benefits of this option would be fairly localized.

Sockeye salmon: Option 2 Intensify fisheries management to protect injured stocks is the single most effective option for aiding and protecting the Keani River sockeye. With this option the risk of overescapements on the Kenai River could be reduced from 25% to 10%. In combination with management, and under the right environmental conditions, option #48 (Improve the survival of salmon eggs to fry) could be very effective for the Kenai river system. Improving survival of salmon eggs to fry could stimulate recovery so is complete around the year 2000. Monitoring of the plankton population and salmon escapement must occur in 1994/95 in order to supplement fry production in 1995. Option #11.2, Fertilization of lakes to improve sockeye rearing success could be applied to Coghill Lake to enhance sockeye production.
(effectiveness rating?***)

Rockfish: The only option that would have notable benefits to the rockfish population regardless of the injury level is to intensify the fisheries management. The added information will help direct the harvest to compensate for injury from the oil spill.

E. Coastal habitat

Coastal habitat - subtidal: At this time, no effective options have been identified that could help the recovery of subtidal organisms.

Coastal habitat - upper intertidal: Option 14 - Accelerate the recovery of the upper intertidal zone may prove to greatly increase the recovery time on a very localized basis. Experts have estimated that the option could increase the rate of recovery by 25 to 50%; however, the techniques are experimental and are not likely to be applied on a broad scale.

EFFECT ON THE RECOVERY OF SERVICES

Archaeology. Restoration of archaeological resources cannot regenerate what has been destroyed, but it can successfully address the prevention of further degradation and loss of both sites and the scientific information they contain. Site stewardship program, Site patrol and monitoring, and Preservation of archaeological sites and artifacts are highly effective techniques to protect archaeological resources in the spill-affected area. The last option entails some physical repair and data recovery. Acquiring replacements for artifacts from the spill area would be a moderately effective means of preserving and studying artifacts which were taken from the oil spill area prior to the spill and are currently in the possession of museums and agencies.

Commercial Fishing. Replacing harvest opportunities by creating new salmon runs is a highly effective method of replacing commercial fishing opportunities lost due to fishing closures or reduced harvest of species injured by the spill. In this alternative, the newly created runs would continue only until wild stocks recover.

Recreation. Three of the restoration actions included for recreation serve primarily to protect existing uses and their resource base. Habitat protection and Special designations are the primary means of protecting recreation. However, in limited situations New backcountry public recreation facilities could protect both recreation and the resources on which it depends by, for example, providing an outhouse in a heavily used area. Expanding existing visitor centers is a moderately effective way to disseminate information about spill injuries, recovery, and how the public can modify their uses of the area to maximize recovery.

Sport fishing. Replacing harvest opportunities by creating new salmon runs is a highly effective method of replacing sport fishing opportunities lost due to fishing closures or reduced harvest of species injured by the spill. In this alternative, the newly created runs would continue only until wild stocks recover.

Subsistence. Testing subsistence foods is expected to be an effective way of restoring confidence in the safety of subsistence resources within the spill area. Concern over the safety of subsistence resources is believed to be one of the reasons subsistence harvests have not yet returned to pre-spill levels. Providing Access to traditional foods in areas outside the spill-affected area would be a highly effective way of restoring lost use. Both projects would be continued until subsistence resources and use have recovered to pre-spill levels.

Wilderness. Habitat protection and acquisition is a highly effective means of preventing additional injury to wilderness; Special designations would provide an increased level of resource protection compatible with preservation of wilderness values.

II. MULTI-SPECIES IMPACTS OF PROPOSED OPTIONS

RESOURCE RESTORATION OPTIONS:

Of the 17 resource restoration options identified in Alternative 4, 8 of them could potentially have significant multiple-species and habitat impacts.

Habitat protection and acquisition targeting harlequin ducks, marbled murrelets, bald eagles and cutthroat trout would protect the coastal fringe areas, riparian zones, watersheds and other uplands. Protection of these areas will have far reaching effects on other resources that depend on these habitats and the species which utilize them. Some of the other species that would benefit from implementing these options are: Sitka black-tailed deer; brown bears, black bears, river otters, salmon, and a variety of other fish and birds. Special designations targeting marbled murrelets would benefit terrestrial species using uplands and old growth forests.

For pigeon guillemots and common murres it is possible that reducing predators near nesting colonies would be very effective in helping the colonies recover. If it is determined that predation is a serious problem at injured colonies then implementation of this option could be considered. This option would also benefit other species that are preyed upon by the gulls and weasels. Even though implementing this option for either murres or guillemots would not have a long-term effect on the predator population there is obviously a negative ecological cost to the predators. Therefore, the ecological costs and benefits will be carefully weighed to determine if the option should be implemented.

There were no options identified that would have the effectiveness level required in this alternative that would benefit black oystercatchers; however, if habitat protection were extended to the coastline, black oystercatcher and pigeon guillemot habitat would be protected. In addition, two of the special studies could benefit black oystercatchers if implemented in areas which are have, or had, high use.

These special study options include eliminating oil from oiled mussel beds and accelerating the upper intertidal. Both of these options affect lower levels of the food chain which can benefit many species. For instance, accelerating the growth rate of the seaweed *Fucus* would accelerate the colonization of invertebrates such as limpets. Limpets are one of the main prey species for black oystercatchers whose eggs and chicks are preyed upon by gulls, ravens, and some mammalian predators. Limpets and other small invertebrates are consumed by other species which are then taken by birds, river otters, etc. Although both of these special study options have effects on many species, they are not likely to be applied on a broad scale to benefit more than a localized area.

Improving survival rates of juvenile sockeye salmon and Fertilizing lakes to improve sockeye rearing success could benefit marine and terrestrial predators which feed on salmon eggs, juvenile and adults. This includes bald eagles, brown bears, cutthroat trout

and Dolly Varden, harlequin ducks, killer whale, harbor seals and river otters. However, the option needs to be carefully implemented so as not to exceed the carrying capacity of the ecosystem by producing large numbers of new fish.

Relocating existing hatchery runs to benefit wild pink salmon could have negative impacts on seabirds and marine mammals if fishing pressures are shifted into areas used heavily by these species. These impacts could be avoided by carefully choosing the location and timing of the relocation.

SERVICE RESTORATION OPTIONS

Of the 11 service restoration options proposed for Alternative 4, 5 of them have potential impacts on multiple species and habitats.

Building new backcountry, public recreation facilities has potential negative impacts on all species if facilities are sited so as to increase human use of damaged habitats or other areas supporting recovering species. Alternatively, properly sited facilities could 'harden' use areas and direct uses away from injured areas and promote undisturbed natural recovery of injured resources.

Habitat acquisition and Special designations for recreational purposes could benefit injured resources by protecting them from development and disturbances incompatible with recreation. On the other hand, these options could, if not carefully implemented, increase human use of damaged areas and slow natural recovery rates.

Spill prevention and contingency planning could benefit all species by preventing additional spills which would further compound existing injuries. ***where does this option really go?

Replacing harvest opportunities by creating new salmon runs would benefit commercial and sport fishermen. Positive multi-species impacts would result from benefits to the many species which prey on salmon adults, eggs and juveniles. Benefits would be higher in the case of stream stocking programs, since eggs, juveniles and adult would be available to marine and terrestrial predators. This includes bald eagles, brown bears, cutthroat trout and Dolly Varden, harlequin ducks, killer whale, harbor seals and river otters. Terminal hatchery runs would provide fewer species with prey, since only adults and juveniles would be available to marine predators.

Negative impacts include the possibility of increasing mortality of seabirds and marine mammals due to interactions with new commercial fisheries. Also, wild-stock pink salmon could possibly be impacted by fish from new runs straying into wild streams. Lastly, new runs stocked into streams which did not previously support salmon might harm resident fish through competition for food and spawning habitat.

III. GEOGRAPHIC DISTRIBUTION

Table 3 indicates the part of the spill area where the options will most likely be applied. The areas may change as detailed project planning is completed and as more is learned about injury or recovery.

Most options are applied throughout the spill area. Many of the options involving fish are applicable only in Prince William Sound including management plans for: cutthroat trout and Dolly Varden char, herring, pink salmon, rockfish (also applied to Kenai), and Coghill Lake fertilization. Projects involving sockeye are applied when applicable to Kenai and Red Lake (on Kodiak).

IV. COST

Detailed cost estimates for Alternative 4 are contained in Table ___; the allocation of these costs is shown in Figure ___. Estimates of cost are approximate. No cost estimates are included for Special designations and Spill prevention and contingency planning because no particular designation is under consideration and spill prevention and contingency planning appears to be well funded at present. However, these situations could change over time. Actual costs will vary as new information about injury becomes available through the monitoring program, new ideas are developed for appropriate restoration options, and project planning proceeds.

The inflation-adjusted value of the remainder of the settlement fund is about \$522 million. Over half (57%) of this amount could be set aside for Habitat Protection. Monitoring would require about 10%; Administration/Information 9%; and Other Restoration actions 5%.

This scenario would leave 18% of the remaining settlement uncommitted. Uncommitted funds could be held for unanticipated expenses, such as injuries identified through the monitoring program, new options, or higher-than-projected costs for those already considered. Another use of the balance could be to fund an endowment for ongoing projects or for a research foundation. If the entire balance were invested in an endowment it would yield about \$2.6 million annually.

ALTERNATIVE 4: GEOGRAPHIC DISTRIBUTION

RESOURCE OR SERVICE	OPT. No.	OPTION NAME	Prince William Sound			Kenai/Cook Inlet			Alaska Penin.	Kodiak/Afognak		Outside EVOS
			North	East	West	Outer Kenai	Lower Ck In	Central Ck In		Afg. Shuyak	Kodiak	
Archaeology	1.0	Archaeological site stewardship program	X	X	X	X	X	X	X	X		
Cutthroat trout/ Dolly Varden	2.1	Intensify management to protect injured stocks	X	X	X							
Herring	2.2	Intensify herring management to protect injured stocks	X	X	X							
Pink salmon	2.3	Intensify pink salmon management to protect injured stocks	X	X	X							
Rockfish	2.4	Intensify rockfish management to protect injured stocks	X	X	X	X	X					
Sockeye salmon	2.5	Intensify sockeye management to protect injured stocks						X				
Harbor seal	4.2	Reduce disturbance at marine mammal haul-outs	X	X	X	X	X	X				
Sea otter	4.2	Reduce disturbance at marine mammal haul-outs	X	X	X							
Marbled murrelet	9.0	Minimize incidental take by commercial fisheries	X	X	X	X	X	X	X	X		
Archaeology	10.0	Preserve archaeological sites and artifacts	X	X	X	X	X	X	X	X		
Sockeye salmon	11.2	Fertilize lakes to improve sockeye rearing success	X									
Sockeye salmon	11.3	Improve access to salmon spawning areas with fish passes, etc.								X		
Recreation	12.1	Construct new backcountry public facilities	X	X	X	X	X	X	X	X		
Harlequin duck	13.1	Study: eliminate oil from mussel beds			X	X	X	X	X	X		
Sea otter	13.2	Study: eliminate oil from mussel beds			X							
MULTI-SPECIES	14.0	Accelerate recovery of upper intertidal zone			X	X	X	X	X	X		
Common murre	16.1	Increase murre productivity through enhanced social stimuli				X		X				
Pigeon guillemot/Common murre (replacement)	17.1	Removal of introduced species in the Aleutians									X	
Common murre	17.2	Temporary predator control				X	X	X	X	X		
Pigeon guillemot	17.2	Temporary predator control	X	X	X	X	X	X	X	X		

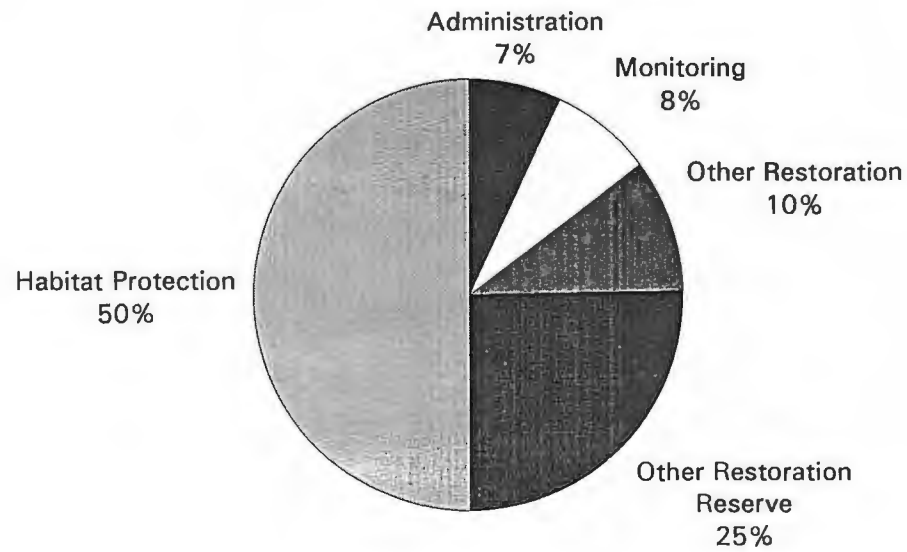
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RESOURCE OR SERVICE	OPT. No.	OPTION NAME	Prince William Sound			Kenai/Cook Inlet			Alaska Penin.	Kodiak/Afognak		Outside EVOS
			North	East	West	Outer Kenai	Lower Ck In	Central Ck In		Afg. Shuyak	Kodiak	
Commercial Fishing	18.0	Replace fisheries harvest opportunities by creating new salmon runs	X	X	X		X	X		X	X	
Sport Fishing	18.0	Replace fisheries harvest opportunities by creating new salmon runs	X	X	X		X	X		X	X	
Subsistence	30.0	Test subsistence foods for hydrocarbon contamination		X	X		X				X	
Archaeology	35.0	Negotiate with museums to acquire replacements for looted artifacts	X	X	X	X	X	X	X	X	X	X
MULTI-SPECIES	37.0	Habitat protection and acquisition		X	X	X	X	X	X	X	X	
MULTI-SPECIES	40.0	Land and water management actions	X	X	X	X	X	X	X	X	X	
Killer Whale - AB pod	45.0	Study: Facilitate changes in black cod fishery gear	X	X	X	X						
Harbor Seal	46.0	Cooperative program with commercial fishermen	X	X	X		X			X	X	
Harbor Seal and Sea Otter	47.0	Cooperative program with subsistence users		X	X		X				X	
Sockeye Salmon	48.0	Improve survival of salmon eggs and fry						X			X	
Subsistence	49.0	Provide subsistence users access to traditional subsistence foods			X							
Pink salmon	51.0	Relocate existing hatchery runs	X	X	X							

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Allocation of Remainder of Settlement Funds										Total \$	%
Administration										36500.0	7%
Monitoring										41750.0	8%
Other Restoration										51204.0	10%
Other Restoration Reserve										131546.0	25%
Habitat Protection										261000.0	50%

Alternative 4 - Allocation



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NB: All costs are expressed in units of \$1,000 (1993 \$). The inflation-adjusted value of the remainder of the settlement is about \$522 million.

Alternative 4 - Moderate Restoration													
Opt	DESCRIPTION	ResSvc	UNIT	ANNUAL COST			DURATION			TOTAL COST			
				Exp	Low	High	Type	Years			10-Year Maximum		
								E	L	H	Expected	Lower	Higher
1.10	Site stewardship program	Archaeology	Per 3 areas	195.0	195.0	195.0	Ltd	10	10	10	1950.0	1950.0	1950.0
1.20	Site patrol and monitoring	Archaeology		300.0	300.0	300.0	Ltd	4	3	5	1200.0	900.0	1500.0
2.10	Intensify management	Cutthroat/Dolly		255.0	200.0	300.0	Ltd	2	2	2	510.0	400.0	600.0
2.20	Intensify management	Pacific herring		457.0	440.0	500.0	Ltd	3	2	4	1371.0	880.0	2000.0
2.30	Intensify management	Pink salmon		3000.0	2000.0	5000.0	Ltd	2	2	4	6000.0	4000.0	20000.0
2.40	Intensify management	Rockfish		593.0	550.0	700.0	Ltd	2	1	4	1186.0	550.0	2800.0
2.50	Intensify management	Sockeye salmon		3000.0	2000.0	5000.0	Ltd	5	2	5	15000.0	4000.0	25000.0
4.30	Feas Study: Reduce disturb	Sea otter					Ltd				120.0	80.0	640.0
9.00	Minimize incidental take	Marbled murrelet									1625.0	1100.0	2000.0
10.00	Archaeol Res Protection	Archaeology									4072.0	3250.0	7000.0
11.20	Fertilize lakes	Sockeye salmon	Per lake	190.0	150.0	220.0	Ltd	3	1	5	570.0	150.0	100.0
12.10	New backcountry rec facilities	Recreation									1620.0	480.0	3256.0
13.01	Eliminate oil from mussel beds	Harlequin duck		491.0	340.0	641.0	Ltd	5	4	7	2455.0	1360.0	4487.0
13.02	Study: Elim oil fr mussel beds	Sea otter											
14.01	Accelerate recovery of UIT	Intertidal organisms		150.0	100.0	200.0	UR	5	4	7	750.0	400.0	400.0
16.10	Feas Study: Social stimuli	Common murre					Ltd				850.0	800.0	5500.0
17.10	Remove introduced species	Common murre					UR				2500.0	1500.0	3500.0
17.21	Temporary predator control	Common murre		350.0	300.0	400.0	Ltd	5	5	10	1750.0	1500.0	4000.0
17.22	Temporary predator control	Pigeon guillemot		200.0	150.0	250.0	Ltd	4	4	6	800.0	600.0	1500.0
18.01	Replace harvest opportunities	Comm fishing	5 projects	750.0	500.0	1000.0	Ltd	2	1	5	1500.0	500.0	5000.0
18.02	Replace harvest opportunities	Sport fishing	5 projects	750.0	250.0	1000.0	Ltd	2	1	5	1500.0	250.0	5000.0
30.00	Test subsistence foods	Subsistence		330.0	300.0	350.0	Ltd	3	2	5	990.0	600.0	1750.0
35.00	Aquire archaeol. artifacts	Archaeology		225.0	150.0	300.0	Ltd	3	3	3	675.0	450.0	900.0
37.00	Habitat protection/acquisition	Multiple resources									313200.0	234900.0	475000.0
40.00	Land and water mgmt actions	Multiple resources											
45.00	Feas Study: Black cod gear	Killer whale		30.0	30.0	30.0	Ltd	1	1	1	30.0	30.0	30.0
46.00	Coop prgm-fishermen	Harbor seal		50.0	30.0	100.0	Ltd	3	1	5	150.0	30.0	500.0
47.01	Coop prgm-subsistence users	Harbor seal		30.0	30.0	30.0	UR	10	10	10	300.0	300.0	300.0
47.02	Coop prgm-subsistence users	Sea otter					UR						
48.02	Improve survival rates	Sockeye salmon	4 projects	400.0	200.0	600.0	Ltd	3	1	5	1200.0	200.0	3000.0
49.00	Access to traditional foods	Subsistence	Per village	53.0	50.0	60.0	UR	10	5	10	530.0	250.0	600.0
51.00	Relocate existing hatchery runs	Pink salmon	Per project				Ltd						
P1.00	Administration	Multiple resources									36500.0	5200.0	36500.0
P2.00	Monitoring	Multiple resources									41750.0	25250.0	52500.0

NB: All costs are expressed in units of \$1,000 (1993 \$). The inflation-adjusted value of the remainder of the settlement is about \$522 million.

Alternative 5 - Comprehensive Restoration

THEME	Take all effective actions to protect, restore and enhance all injured resources and services. Increase opportunities for human use in the affected area.
VARIABLES	
Injuries Addressed	All injured resources and services.
Status of Resource Recovery	Resources not recovered and resources recovered.
Effectiveness of Restoration Actions	All effective actions.
Strategies for Public Use	Protect or increase existing use; or encourage appropriate new use.

Monitoring and information programs are included in all alternatives.

Restoration actions may be undertaken for injured resources, services, or their equivalents in all alternatives.

The goal of this alternative is for all injured resources and services to return or exceed prespill levels. Table _____ lists the resources and services addressed in this alternative; they are identical to those addressed in Alternatives 2 and 4. This alternative includes actions that protect existing human uses that were injured and the resource base on which they depend and also those actions that would increase existing use or create new uses. An example of the last item is a new commercial facility on public land that attracts different types of uses than had previously existed there.

RESOURCES			SERVICES
Population Decline	Sublethal/Chronic	Other	
Black oystercatcher Common murre Harbor seal Harlequin duck Intertidal organisms Marbled murrelet Pigeon guillemot Sea otter Sockeye salmon *Subtidal organisms	Bald eagle Cutthroat trout Dolly Varden Killer whale Pacific herring Pink salmon River otter Rockfish	Archaeology	Commercial fishing Recreation Sport fishing Subsistence Wilderness

* Resources and services for which no restoration action(s) are included in this alternative.

Table _____. Resources and Services Addressed in Alternative 5.

Restoration Options. Among the many restoration ideas suggested by scientist, agencies, and the public, 38 meet the criteria for this alternative. Of these, 21 are identical to those in Alternative 3; and 7 are identical to those in Alternative 4. There is at least one effective restoration action for each injured resource or service except subtidal organisms. Table ___ lists restoration options by resource or service. These options are presented as potential projects which have already been evaluated; they are not proposals. Over time, other options are likely to be proposed which may be superior to those listed here.

In this alternative, Restoring salmon harvest opportunities for commercial and sport fishing could continue after wild stocks of salmon recover to prespill levels. Testing subsistence foods for hydrocarbon contamination and providing Access to traditional foods in areas outside the spill-affected area could be continued only after subsistence resources and use return to prespill levels. In addition, funding for New backcountry public recreation facilities and Planning and marketing of public land for commercial recreation facilities, Visitor centers, and Marine environmental institute would be considered to protect or increase existing recreational uses or encourage new ones. Habitat Protection and Acquisition would apply to only the following resources and services:

Black oystercatcher	Bald eagle	Recreation
Harlequin duck	Cutthroat trout	Wilderness
Marbled murrelet	Dolly varden	
Sockeye salmon	Pink salmon	

Monitoring

Monitoring under this alternative is designed to assess the effectiveness of restoration options used in combination inclusive of managing human uses, directly manipulating resources and services, protecting and acquiring critical habitat, and replacing or acquiring the equivalent of injured resources and services. Monitoring of this type is designed to identify where additional restoration activities may be appropriate, and determine when injury is delayed.

This alternative also includes the provision to monitor the dynamics of other ecological components, e.g., those important in the food chain (web) of injured species. This type of monitoring is useful in detecting residual effects of the oil spill many years removed from the event, and it provides a baseline from which to assess the impacts of future oils spills and other disturbance. It also generates a database that facilitates greater understanding of how our changing environment affects the species that we manage and protect.

For those resources and services where little can be done to accelerate recovery, e.g., sea otters, Alternative 5 also includes provision to determine when natural recovery will restore injured resources and services to their pre-spill conditions. It also is assumed that normal agency management and monitoring will not be duplicated.

Under this alternative, monitoring will be conducted for all injured resources and services, irregardless of the severity of injury or our understanding of the status of recovery. Monitoring will be conducted in conjunction with all restoration measures implemented, even those that we are less certain will produce a beneficial effect. Monitoring recovery of injured services also will be undertaken in association with restoration measures designed to protect, restore, and to increase (enhance) existing (pre-spill) human-use activities.

Monitoring will be conducted on and in surface waters, on tidelands, and on adjacent uplands including their watersheds in Prince William Sound and the Gulf of Alaska. Monitoring also will be conducted outside the spill affected area to measure the effectiveness of replacement and acquisition of equivalent resources and services options, e.g. eliminate predators from marine bird colonies on Aleutian Islands, included in this alternative.

Monitoring will continue dependent upon the severity and duration of injuries resulting from the oil spill and the time necessary to establish a trend for recovery. Some monitoring components, e.g., those designed to document long-term trends in the health of the affected ecosystem, would continue in perpetuity if supported by an endowment.

Resources to be monitored include but are not restricted to affected floral (sea grasses and seaweeds) and faunal (Marine mammals, marine birds including sea ducks), etc. See complete list of resources and services to be monitored in Alternative 1.

Costs of monitoring for this alternative is \$6.0 million per year with a range of \$5.0-\$7.0 million per year. Of the \$6.0 million per year figure, \$4.0 million is allotted to monitoring the effectiveness of restoration; \$1.0 million per year is allotted to monitoring natural recovery; and \$1.0 million per year is allotted to monitoring long-term trends in the health of the ecosystem.

DRAFT 2/8/93 Restoration Options for Alternative 5

RESOURCE/SERVICE	RESTORATION OPTION
Black oystercatcher	14.0 Accelerate recovery of upper intertidal zone
	37.0 Habitat protection and acquisition 40.0 Land and water management actions
Common murre	4.1 Reduce disturbance at marine bird colonies
	16.1 Study: Increase productivity with enhanced social stimuli
	16.2 Study: Improve physical characteristics of nest sites
	17.1 Removal of introduced species in Aleutians 17.2 Temporary predator control
Harbor seal	4.2 Reduce disturbance at marine mammal haul-out areas
	46.0 Cooperative program with commercial fishermen 47.0 Cooperative program with subsistence users
Harlequin duck	8.1 Develop sport harvest guidelines
	13.1 Study: Eliminate oil from mussel beds 37.0 Habitat protection and acquisition
Intertidal organisms	14.0 Accelerate recovery of upper intertidal zone
Marbled murrelet	9.0 Minimize incidental take 37.0 Habitat protection and acquisition 40.0 Land and water management actions
Pigeon guillemot	17.1 Removal of introduced species in the Aleutians 17.2 Temporary predator control
Sea otter	4.2 Study: Reduce disturbance at marine mammal haul-outs 13.2 Study: eliminate oil from mussel beds 47.0 Cooperative program with subsistence users

Sockeye salmon	2.5 Intensify sockeye management to protect injured stocks
	11.2 Fertilize lakes to improve sockeye rearing success
	11.3 Improve access to spawning areas with fish passes, etc.
Subtidal organisms	37.0 Habitat protection and acquisition
	48.0 Improve survival of salmon eggs and fry
Bald eagle	None identified
Cutthroat trout	37.0 Habitat protection and acquisition
	2.1 Intensify management to protect injured stocks
	19.0 Anadromous stream catalogue
Dolly Varden	37.0 Habitat protection and acquisition
	2.1 Intensify management to protect injured stocks
Killer whale	37.0 Habitat protection and acquisition
Pacific herring	45.0 Study: Changes in black cod fishery gear
Pink salmon	2.2 Intensify herring management to protect injured stocks
	2.3 Intensify salmon management to protect injured stocks
	11.1 Construct spawning channels and instream improvements
	11.3 Improve access to spawning areas with fish passes, etc.
	19.0 Anadromous streams catalogue
	37.0 Habitat protection and acquisition
	40.0 Land and water management actions
48.0 Improve survival of salmon eggs and fry	
River otter	51.0 Relocate existing hatchery runs
Rockfish	8.2 Develop trapping harvest guidelines
	2.4 Intensify rockfish management to protect injured stocks

Archaeology	1.1 Site stewardship program 1.2 Site patrol and monitoring 10.0 Preserve archaeological sites and artifacts 35.0 Acquire replacements for artifacts from the spill area
Commercial fishing	18.0 Replace salmon harvest opportunities
Recreation	12.1 New backcountry public recreation facilities
	12.2 Plan and market public land for commercial recreational facilities 33.0 Visitor centers 34.0 Marine environmental institute
	37.0 Habitat protection and acquisition 40.0 Land and water management actions
Sport fishing	18.0 Replace salmon harvest opportunities
Subsistence	18.0 Replace salmon harvest opportunities
	30.0 Test subsistence foods for hydrocarbon contamination 49.0 Provide access to traditional subsistence foods
	50.1 Develop subsistence mariculture sites 50.2 Develop bivalve shellfish hatchery and research center
Wilderness and non-use values	37.0 Habitat protection and acquisition 40.0 Land and water management actions
	Included in Alternatives 2, 3 or 4

Table _____. Restoration Options for Alternative 5.

EVALUATION

I. EFFECT ON THE RECOVERY OF RESOURCES:

A. MARINE MAMMALS

Harbor seals (first priority): At present, disturbance of harbor seals at their haulout sites is not believed to be a significant problem, therefore reducing disturbance at marine

mammal haulout sites (option 4.0) has less effectiveness than the other two options proposed. However, this option would ensure that disturbance remains minimal and protects harbor seals from additional pup mortality that could be caused if disturbance patterns change.

The two options which have the greatest potential to benefit harbor seals are: Develop a cooperative program with subsistence users, and Develop a cooperative program with commercial fishermen. These programs which will help provide greater management by coordinating managers, researchers, subsistence users and commercial fishermen. These options are in the first priority level for Alternative 6.

Killer whales - AB pod (first priority): The most effective option to provide protection for the AB pod is an option to determine the feasibility of facilitating gear changes in the black cod fishery from long-lines to pots. If this option is feasible it would prevent the whales from marauding the catch and eliminate the need for fishermen to defend their harvest.

Sea otters (first priority): The option believed to have the greatest ability to effect the overall sea otter population is to Develop a cooperative program with subsistence users. This option would help ensure that the sea other population fully recovers to its pre-spill level and sustain any changes in harvest levels. In addition, the special study of Eliminating oil from oiled mussel beds could be highly effective (25% to over 50%) in improving the weanling pups survival and recruitment rates if oiled mussel beds are determined to be a major reason for the poor weanling survival.

Very little is known about the effects of disturbance from boat traffic or from harvest and development of coastal lands. A special study which investigates the impact of such activities would determine if Option 4, reducing disturbance at marine mammal haulout sites and concentration areas or Option 37, habitat protection and acquisition should be implement to protect the injured sea otter population.

B. TERRESTRIAL MAMMALS

River otters: If the injury to the river otter population is not chronic from reduced habitat quality, then an option to develop sport and trapping harvest guidelines could be beneficial in restoring the population.

C. BIRDS

Bald eagles: Habitat protection and acquisition is the only option that is likely to provide direct benefit to the bald eagle population. Because there are already mandatory protection for bald eagles, the benefits from this option will be limited.

Black oystercatchers (first priority): Special designations that protect areas where black oystercatchers concentrate (usually subadults and failed breeders), or restrict access to injured beaches with several breeding pairs may improve the rate of recovery

by about 10%. In localized, site-specific areas the rate of recovery may be improved by 10 - 24% by implementing the special study option to accelerate recovery of the upper intertidal zone (#14).

Common murre (first priority): There are two options which have the potential to greatly influence the rate of recovery for common murre; however, preliminary work would need to be completed before the effectiveness can be adequately evaluated. These options are: (#16.1) Enhancing the social stimuli, and (#17.2) Predator control to benefit marine birds. (note: greater detail provided in Alternative 3.) In addition, a feasibility to examine the effectiveness of modifying the characteristics of the nesting ledges may provide another option to improve the recovery rate.

Other options which would provide less direct benefits, but would effect a larger portion of the colonies include reducing disturbance at marine bird colonies, which could reduce the recovery time by 10 -24%; and special designations which would have the same effect but cover an even broader geographic area.

Harlequin ducks (first priority): Protecting nesting habitat (#37 Habitat protection and acquisition) for harlequin ducks can prevent habitat loss which could prevent the population from fully recovering to its prespill level. In addition, in localized areas the special study Eliminating oil from oiled mussel beds (#13) has the potential to improve the rate of recovery of a localized area by 25 - 50%; however, at this time there are too many unknowns to be certain of its effectiveness.

The current early season closure for hunting harlequin ducks is believed to be benefiting the rate of recovery by 10 - 24%. Additional late season closures are expected to provide only minor added benefits.

Marbled murrelets (first priority): Protecting habitat (options #37 Habitat protection and acquisition and #40 Special designations) would ensure that the marbled murrelet population could recover to its prespill levels once the population decline is reversed. Protecting the coastal waters could also benefit their prey which may help stabilize the population more quickly. In localized areas, option #9 Minimizing incidental take of marine birds could provide additional help to stabilize the population.

Pigeon guillemots (first priority): Option #17.2 Predator control to benefit marine birds has the potential to increase productivity by 25-50 % at very site specific locations; however, predation levels at colonies within the injured area have not been documented and this option may not be needed should predation levels be low. Preliminary work must be completed before this option can be adequately evaluated.

Pigeon guillemots are fairly tolerant of human activities, however, it is important to protect nesting habitat from erosion and other degradation. Habitat protection and acquisition of lands immediately adjacent to the coast would prevent the population decline from accelerating due to lost nesting habitat.

D. FISH

Cutthroat trout: Option 2 Intensify fisheries management to protect injured stocks would benefit both cutthroat trout and allow the sport fishery to be opened as early as 1998. It can also be used to enhance the injured stocks an additional 5-10% above the pre-spill population level.

Habitat protection and acquisition is believed to be especially important for cutthroat trout in Prince William Sound because they are at the northern extent of their geographic range and are believed to be more vulnerable to habitat alterations. Likewise, updating the Alaska anadromous stream catalog would help ensure that all injured stocks are identified and protected.

Dolly Varden trout: Option 2 Intensify fisheries management to protect injured stocks would benefit the Dolly Varden trout population by determining the maximum sustained yield and documenting the sport fishery the fishery could be managed to protect injured stocks. It can also be used to enhance the injured stocks an additional 5-10% above the pre-spill population level.

Herring: The extent of injury to herring is still unknown. Option 2 Intensify fisheries management to protect injured stocks could improve the rate and degree of recovery by more than 50% if it is necessary. The option would allow for increased precision in stock assessment which would allow for manipulation of the harvest levels to counter all but the most extreme levels of injury.

Pink salmon: The coded-wire tagging and stock separation information that would be gained from an intensified fisheries management program (option 2) would help ensure that the wild stock population fully recover and could accelerate the recovery rate as much as 50% over natural recovery. Relocating existing hatchery runs (option 51) could substantially improve the recovery of wild stocks by reducing interception rates by 25 - 50%. The benefits of this option would be fairly localized.

Other options that could provide additional benefit to specific streams if implemented in conjunction with option 2 included: Improve survival of salmon eggs to fry, which could also provide short-term enhancement (10 - 24%); improve access to salmon spawning areas by building fish passes or removing barriers, could improve recovery and provide long-term enhancement; construct salmon spawning channels and other instream improvements could increase spawning production by 10 -20 %. Unfortunately there are very few locations that these options can be implemented so the overall effectiveness on the population is limited.

Habitat protection and acquisition could provide protection to habitat for 10 - 30% of the population, especially for stocks found outside of Prince William Sound where more pinks spawn above the intertidal zone. The added protection from this option and from updating the anadromous stream catalog could increase the overall population by 10%.

Rockfish: The only option that would have notable benefits to the rockfish population regardless of the injury level is to intensify the fisheries management. The added information will help direct the harvest to compensate for injury from the oil spill.

Sockeye salmon - Kenai river and Red Lake (first priority): Option 2 Intensify fisheries management to protect injured stocks is the single most effective option for aiding and protecting the two injured systems. With this option the risk of overescapements on the Kenai River could be reduced from 25% to 10%. In combination with management, and under the right environmental conditions, option #48 (Improve the survival of salmon eggs to fry) could be very effective for the Kenai river system. Improving survival of salmon eggs to fry could stimulate recovery so is complete around the year 2000. Monitoring of the plankton population and salmon escapement must occur in 1994/95 in order to supplement fry production in 1995.

Improving access to salmon spawning areas by building fish passes or removing barriers (11.3) can be used to enhance the Red Lake population by 10 - 24%. In addition Habitat protection and acquisition may be used to protect specific areas of the Kenai River drainage or to protect the watershed that feeds into Red Lake.

E. COASTAL HABITAT

Coastal habitat - subtidal: At this time, no effective options have been identified that could help the recovery of subtidal organisms.

Coastal habitat - upper intertidal (first priority): Option 14 - Accelerate the recovery of the upper intertidal zone may prove to greatly increase the recovery time on a very localized basis. Experts have estimated that the option could increase the rate of recovery by 25 to 50%; however, the techniques are experimental and are not likely to be applied on a broad scale.

EFFECT ON THE RECOVERY OF SERVICES

Archaeology. Restoration of archaeological resources cannot regenerate what has been destroyed, but it can successfully address the prevention of further degradation and loss of both sites and the scientific information they contain. Site stewardship program, Site patrol and monitoring, and Preservation of archaeological sites and artifacts are highly effective techniques to protect archaeological resources in the spill-affected area. The last option entails some physical repair and data recovery. Acquiring replacements for artifacts from the spill area would be a moderately effective means of preserving and studying artifacts which were taken from the oil spill area prior to the spill and are currently in the possession of museums and agencies.

Commercial Fishing. Replacing harvest opportunities by creating new salmon runs is a highly effective method of replacing commercial fishing opportunities lost due to fishing closures or reduced harvest of species injured by the spill. In this alternative, the newly

created runs could continue after wild stocks recover.

Recreation. Three of the restoration actions included for recreation serve primarily to protect existing uses and their resource base. Habitat protection and Special designations are the primary means of protecting recreation. However, in limited situations New backcountry public recreation facilities could protect both recreation and the resources on which it depends by, for example, providing an outhouse in a heavily used area.

Planning an marketing new commercial facilities on public land would be an effective way of encouraging new recreational uses of the spill area. Creating new visitor centers or building a Marine environmental institute would encourage new uses of the spill area. These options are also effective ways to disseminate information about spill injuries, recovery, and how the public can modify their uses of the area to maximize recovery.

Sport fishing. Replacing harvest opportunities by creating new salmon runs is a highly effective method of replacing sport fishing opportunities lost due to fishing closures or reduced harvest of species injured by the spill. In this alternative, the newly created runs could continue after wild stocks recover.

Subsistence. Testing subsistence foods is expected to be an effective way of restoring confidence in the safety of subsistence resources within the spill area. Concern over the safety of subsistence resources is believed to be one of the reasons subsistence harvests have not yet returned to pre-spill levels. Providing Access to traditional foods in areas outside the spill-affected area would be a highly effective way of restoring lost use. Both projects would be continued until subsistence resources and use have recovered to pre-spill levels.

Developing subsistence mariculture sites and Funding a shellfish hatchery and technical research center would benefit subsistence users by providing a source of uncontaminated shellfish for their diets. Given that traditional shellfish beaches may remain contaminated for several years, or be perceived to be contaminated, these options create moderate improvements in the rate and degree of recovery.

Replacing harvest opportunities by creating new salmon runs is an effective method of replacing subsistence harvest opportunities lost due to fishing closures or reduced harvest of species injured by the spill. New runs of salmon could replace other sources of food which are perceived as unsafe to eat, such as some shellfish and marine mammals. The option would result in moderate increases in the rate and recovery of subsistence. In this alternative, the newly created runs could continue after wild stocks recover.

Wilderness. Habitat protection and acquisition is a highly effective means of preventing additional injury to wilderness; Special designations would provide an increased level of resource protection compatible with preservation of wilderness values.

II. MULTI-SPECIES IMPACTS OF PROPOSED OPTIONS

RESOURCE RESTORATION OPTIONS:

11 of the resource restoration options identified in Alternative 5 could potentially have significant multiple-species and habitat impacts.

Habitat protection and acquisition targetting harlequin ducks, bald eagles, marbled murrelets, pink and sockeye salmon, cutthroat trout and Dolly Varden would protect coastal fringe areas, riparian zones, watersheds and other uplands. Protection of these areas will have far reaching effects on other resources that depend on these areas and the species which utilize them. Some of the other species that would benefit from implementing these options are: Sitka black-tailed deer; brown bears, black bears, river otters, and several species of fish and birds. Special designations targetting pink salmon, black oystercatchers and marbled murrelets would benefit all other species utilizing anadromous streams, intertidal areas and old growth forests.

For pigeon guillemots and common murrelets it is possible that reducing predators near nesting colonies would be very effective in helping the colonies recover. If it is determined that predation is a serious problem at injured colonies then implementation of this option could be considered. This option would also benefit other species that are preyed upon by the gulls and weasels. Even though implementing this option for either murrelets or guillemots would not have a long-term effect on the predator population there is obviously a negative ecological cost to the predators. Therefore, the ecological costs and benefits will be carefully weighed to determine if the option should be implemented.

There were no options identified that would have the effectiveness level required in this alternative that would benefit black oystercatchers; however, if habitat protection were extended to the coastline, black oystercatcher and pigeon guillemot habitat would be protected. In addition, two of the special studies could benefit black oystercatchers if implemented in areas which are have, or had, high use.

These special study options include eliminating oil from oiled mussel beds and accelerating the upper intertidal. Both of these options affect lower levels of the food chain which can benefit many species. For instance, accelerating the growth rate of the seaweed *Fucus* would accelerate the colonization of invertebrates such as limpets. Limpets are one of the main prey species for black oystercatchers whose eggs and chicks are preyed upon by gulls, ravens, and some mammalian predators. Limpets and other small invertebrates are consumed by other species which are then taken by birds, river otters, etc. Although both of these special study options have effects on many species, they are not likely to be applied on a broad scale to benefit more than a localized area.

Constructing spawning channels, Fertilizing lakes to improve sockeye rearing success, Improving access to spawning areas and Increasing survival of juvenile salmon are all options which could benefit marine and terrestrial predators which feed on salmon eggs,

juvenile and adults. This includes bald eagles, brown bears, cutthroat trout and Dolly Varden, harlequin ducks, killer whale, harbor seals and river otters. However, the options need to be carefully implemented so as not to exceed the carrying capacity of the ecosystem by producing large numbers of new fish. In addition, when these options result in new harvest patterns, care should be taken to minimize impacts on existing fisheries as well as interactions with seabirds and marine mammals.

Updating the anadromous stream catalogue for any one species has the benefit of providing increased regulatory protection for all anadromous species, as well as resident fish. This includes all salmon species, trout and Dolly Varden.

Relocating existing hatchery runs to benefit wild pink salmon could have negative impacts on seabirds and marine mammals if fishing pressures are shifted into areas used heavily by these species. These impacts could be avoided by carefully choosing the location and timing of the relocation.

SERVICE RESTORATION OPTIONS

8 of the service restoration options proposed for Alternative 5 have potential impacts on multiple species and habitats.

Building new backcountry, public recreation facilities has potential negative impacts on all species if facilities are sited so as to increase human use of damaged habitats or other areas supporting recovering species. Alternatively, properly sited facilities could 'harden' use areas and direct uses away from injured areas and promote undisturbed natural recovery of injured resources.

Planning and marketing new commercial facilities on public land could potentially have negative impacts on all injured species. Human use of the area would be substantially increased and would result in disturbance of recovering species. Impacts could be reduced by siting new facilities near population centers or along heavily travelled routes.

Habitat acquisition and Special designations for recreational purposes could benefit injured resources by protecting them from development and disturbances incompatible with recreation. On the other hand, these options could, if not carefully implemented, increase human use of damaged areas and slow natural recovery rates.

Creating new visitor centers or building a Marine environmental institute could benefit all injured resource by increasing public awareness of the nature of injury and recovery, and why it is important not to create additional human disturbances in damaged areas. However, if new visitor centers were sited in areas which would increase human use of recovering habitats, natural recovery would be slowed. This could be avoided by siting centers near existing population centers.

Spill prevention and contingency planning could benefit all species by preventing additional spills which would further compound existing injuries. ***where does this option

really go?

Replacing harvest opportunities by creating new salmon runs would benefit commercial and sport fishermen. Positive multi-species impacts would result from benefits to the many species which prey on salmon adults, eggs and juveniles. Benefits would be higher in the case of stream stocking programs, since eggs, juveniles and adult would be available to marine and terrestrial predators. This includes bald eagles, brown bears, cutthroat trout and Dolly Varden, harlequin ducks, killer whale, harbor seals and river otters. Terminal hatchery runs would provide fewer species with prey, since only adults and juveniles would be available to marine predators.

Negative impacts include the possibility of increasing mortality of seabirds and marine mammals due to interactions with new commercial fisheries. Also, wild-stock pink salmon could possibly be impacted by fish from new runs straying into wild streams. Lastly, new runs stocked into streams which did not previously support salmon might harm resident fish through competition for food and spawning habitat.

III. GEOGRAPHIC DISTRIBUTION

Table 3 indicates the part of the spill area where the options will most likely be applied. The areas may change as detailed project planning is completed and as more is learned about injury or recovery.

Most options are applied throughout the spill area. Protective options are for the most part applied throughout the spill area. Active restoration projects targeting specific biologic conditions apply where the injury occurred. Others involving more wide-spread injuries such as those targeting recreation and education apply over more regions.

IV. COST

Detailed cost estimates for Alternative 5 are contained in Table ___; the allocation of these costs is shown in Figure ___. Estimates of cost are approximate. No cost estimates are included for Special designations and Spill prevention and contingency planning because no particular designation is under consideration and spill prevention and contingency planning appears to be well funded at present. However, these situations could change over time. Actual costs will vary as new information about injury becomes available through the monitoring program, new ideas are developed for appropriate restoration options, and project planning proceeds.

The inflation-adjusted value of the remainder of the settlement fund is about \$522 million. Less than half (42%) of this amount could be set aside for Habitat Protection. Monitoring would require about 12%; Administration/Information 10%; and Other Restoration actions 18%.

This scenario would leave 18% of the remaining settlement uncommitted. The balance

could be held for unanticipated expenses, such as injuries identified through the monitoring program, new options, or higher-than-projected costs for those already considered. Another use of the balance could be to fund an endowment for ongoing projects or for a research foundation. The estimated amount of the balance could yield about \$2.6 million annually through an endowment.

V. PRIORITY

The theme of this alternative includes all beneficial restoration options for all levels of injury from the Exxon-Valdez oil spill. When addresses implementation, first priority is to be placed on restoration options that address species with population level injuries. We have identified these species and the proposed options by highlighting **first priority** after the resource name under the effectiveness in this Evaluation section.

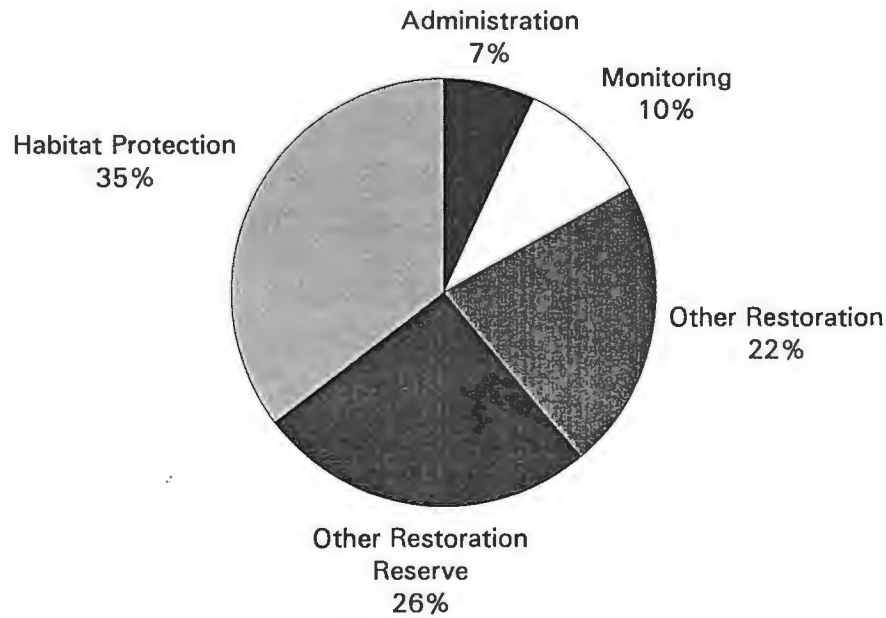
RESOURCE OR SERVICE	OPT. No.	OPTION NAME	Prince William Sound			Kenai/Cook Inlet			Alaska Penin.	Kodiak/Afognak		Outside EVOS
			North	East	West	Outer Kenai	Lower Ck In	Central Ck In		Afg. Shuyak	Kodiak	
Harlequin duck	13.1	Study: eliminate oil from mussel beds			X	X	X	X	X	X		
Sea otter	13.2	Study: eliminate oil from mussel beds			X							
MULTI-SPECIES	14.0	Accelerate recovery of upper intertidal zone			X	X	X	X	X	X		
Common murre	16.1	Increase murre productivity through enhanced social stimuli				X		X				
Common murre	16.2	Improve physical characteristics of murre nest sites				X		X				
Pigeon guillemot/Common murre (replacement)	17.1	Removal of introduced species in the Aleutians									X	
Common murre	17.2	Temporary predator control				X	X	X	X	X	X	
Pigeon guillemot	17.2	Temporary predator control	X	X	X	X	X	X	X	X	X	
Commercial Fishing	18.0	Replace fisheries harvest opportunities by creating new salmon runs	X	X	X		X	X		X	X	
Sport Fishing	18.0	Replace fisheries harvest opportunities by creating new salmon runs	X	X	X		X	X		X	X	
Subsistence	18.0	Replace fisheries harvest opportunities by creating new salmon runs		X	X		X				X	
Cutthroat Trout	19.0	Anadromous stream catalogue	X	X	X							
Pink salmon	19.0	Anadromous stream catalogue	X	X	X					X	X	
Subsistence	30.0	Test subsistence foods for hydrocarbon contamination		X	X		X				X	
Recreation	33.0	Visitor centers	X	X	X	X	X	X			X	
Recreation	34.0	Marine environmental institute	X	X	X	X	X	X		X		
Archaeology	35.0	Negotiate with museums to acquire replacements for looted artifacts	X	X	X	X	X	X		X	X	
MULTI-SPECIES	37.0	Habitat protection and acquisition		X	X	X	X	X		X	X	
MULTI-SPECIES	40.0	Land and water management actions	X	X	X	X	X	X		X	X	
Killer Whale - AB pod	45.0	Study: Facilitate changes in black cod fishery gear	X	X	X	X						
Harbor Seal	46.0	Cooperative program with commercial fishermen	X	X	X		X			X	X	
Harbor Seal and Sea Otter	47.0	Cooperative program with subsistence users		X	X		X				X	
Pink Salmon	48.0	Improve survival of salmon eggs and fry	X	X	X							

RESOURCE OR SERVICE	OPT. No.	OPTION NAME	Prince William Sound			Kenai/Cook Inlet			Alaska Penin.	Kodiak/Afognak		Outside EVOS
			North	East	West	Outer Kenai	Lower Ck In	Central Ck In		Afg. Shuyak	Kodiak	
Sockeye Salmon	48.0	Improve survival of salmon eggs and fry						X			X	
Subsistence	49.0	Provide subsistence users access to traditional subsistence foods			X							
Subsistence	50.1	Develop subsistence mariculture sites		X	X		X				X	
Subsistence	50.2	Develop bivalve shellfish hatchery and research center					X					
Pink salmon	51.0	Relocate existing hatchery runs	X	X	X							

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Allocation of Remainder of Settlement Funds										Total \$	%
Administration										36500.0	7%
Monitoring										52250.0	10%
Other Restoration										114678.0	22%
Other Restoration Reserve										135872.0	26%
Habitat Protection										182700.0	35%

Alternative 5 - Allocation



NB: All costs are expressed in units of \$1,000 (1993 \$). The inflation-adjusted value of the remainder of the settlement is about \$522 million.

Alternative 5 - Comprehensive Restoration													
Opt	DESCRIPTION	ResSvc	UNIT	ANNUAL COST			DURATION			TOTAL COST			
				Exp	Low	High	Type	Years			10-Year Maximum		
								E	L	H	Expected	Lower	Higher
1.10	Site stewardship program	Archaeology	Per 3 areas	195.0	195.0	195.0	Ltd	10	10	10	1950.0	1950.0	1950.0
1.20	Site patrol and monitoring	Archaeology		300.0	300.0	300.0	Ltd	4	3	5	1200.0	900.0	1500.0
2.10	Intensify management	Cutthroat/Dolly		255.0	200.0	300.0	Ltd	2	2	2	510.0	400.0	600.0
2.20	Intensify management	Pacific herring		457.0	440.0	500.0	Ltd	3	2	4	1371.0	880.0	2000.0
2.30	Intensify management	Pink salmon		3000.0	2000.0	5000.0	Ltd	2	2	4	6000.0	4000.0	20000.0
2.40	Intensify management	Rockfish		593.0	550.0	700.0	Ltd	2	1	4	1186.0	550.0	2800.0
2.50	Intensify management	Sockeye salmon		3000.0	2000.0	5000.0	Ltd	5	2	5	15000.0	4000.0	25000.0
4.10	Reduce disturbance	Common murre					Ltd				330.0	185.0	640.0
4.20	Reduce disturbance	Harbor seal					Ltd				330.0	185.0	640.0
4.30	Feas Study: Reduce disturb	Sea otter					Ltd				120.0	80.0	640.0
4.40	Reduce disturb public info	Multiple resources		40.0	30.0	50.0	Ltd	1	1	1	40.0	30.0	50.0
4.50	Reduce disturb field presence	Multiple resources		438.0	390.0	486.0	Ltd	10	10	10	4380.0	3900.0	4860.0
8.10	Sport/trap harvest guidelines	Harlequin duck		15.0	10.0	30.0	UR	2	1	2	30.0	10.0	60.0
8.20	Sport/trap harvest guidelines	River otter		15.0	10.0	30.0	UR	2	1	2	30.0	10.0	60.0
9.00	Minimize incidental take	Marbled murrelet									1625.0	1100.0	2000.0
10.00	Archaeol Res Protection	Archaeology									4072.0	3250.0	7000.0
11.10	Salmon spawn channels etc	Pink salmon	9 total	579.0	579.0	579.0	Ltd	6	6	6	3474.0	3474.0	3474.0
11.20	Fertilize lakes	Sockeye salmon	Per lake	190.0	150.0	220.0	Ltd	3	1	5	570.0	150.0	1100.0
11.31	Fish passes and access	Pink salmon	5 passes	250.0	64.0	1900.0	Ltd	6	6	10	1500.0	384.0	19000.0
11.32	Fish passes and access	Sockeye salmon	2 passes	100.0	25.0	800.0	Ltd	6	6	10	600.0	150.0	8000.0
12.10	New backcountry rec facilities	Recreation									1620.0	480.0	3256.0
12.20	Pln/mkt comm rec facilities	Recreation		275.0	200.0	350.0	Ltd	1	1	1	275.0	200.0	350.0
13.01	Eliminate oil from mussel beds	Harlequin duck		491.0	340.0	641.0	Ltd	5	4	7	2455.0	1360.0	4487.0
13.02	Study: Elim oil fr mussel beds	Sea otter											
14.01	Accelerate recovery of UIT	Intertidal organisms		150.0	100.0	200.0	UR	5	4	7	750.0	400.0	1400.0
14.02	Accelerate recovery of UIT	Black oystercatchers											
16.10	Feas Study: Social stimuli	Common murre					Ltd				850.0	800.0	5500.0
16.20	Feas Study: Impr nest sites	Common murre					Ltd				850.0	800.0	5500.0
17.10	Remove introduced species	Common murre					UR				2500.0	1500.0	3500.0
17.21	Temporary predator control	Common murre		350.0	300.0	400.0	Ltd	5	5	10	1750.0	1500.0	4000.0
17.22	Temporary predator control	Pigeon guillemot		200.0	150.0	250.0	Ltd	4	4	6	800.0	600.0	1500.0
18.01	Replace harvest opportunities	Comm fishing	5 projects	750.0	500.0	1000.0	Ltd	2	1	5	1500.0	500.0	5000.0
18.02	Replace harvest opportunities	Sport fishing	5 projects	750.0	250.0	1000.0	Ltd	2	1	5	1500.0	250.0	5000.0
18.03	Replace harvest opportunities	Subsistence	5 projects	750.0	250.0	1000.0	Ltd	4	1	10	3000.0	250.0	10000.0

NB: All costs are expressed in units of \$1,000 (1993 \$). The inflation-adjusted value of the remainder of the settlement is about \$522 million.

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Opt	DESCRIPTION	ResSvc	UNIT	ANNUAL COST			DURATION			TOTAL COST			
				Exp	Low	High	Type	Years			10-Year Maximum		
								E	L	H	Expected	Lower	Higher
19.01	Anad Stream Catalogue	Cutthroat trout	PWS	335.0	300.0	400.0	Ltd	1	1	1	335.0	300.0	400.0
19.02	Anad Stream Catalogue	Pink salmon	PWS/Afog	650.0	600.0	800.0	Ltd	1	1	1	650.0	600.0	800.0
30.00	Test subsistence foods	Subsistence		330.0	300.0	350.0	Ltd	3	2	5	990.0	600.0	1750.0
33.00	Visitor center	Recreation	Per 5000 sf				Ltd				1000.0	750.0	1750.0
34.00	Marine environmental institute	Recreation					Ltd				42000.0	42000.0	42000.0
35.00	Aquire archaeol. artifacts	Archaeology		225.0	150.0	300.0	Ltd	3	3	3	675.0	450.0	900.0
37.00	Habitat protection/acquisition	Multiple resources									234900.0	234900.0	475000.0
40.00	Land and water mgmt actions	Multiple resources											
45.00	Feas Study: Black cod gear	Killer whale		30.0	30.0	30.0	Ltd	1	1	1	30.0	30.0	30.0
46.00	Coop prgm-fishermen	Harbor seal		50.0	30.0	100.0	Ltd	3	1	5	150.0	30.0	500.0
47.01	Coop prgm-subsistence users	Harbor seal		30.0	30.0	30.0	UR	10	10	10	300.0	300.0	300.0
47.02	Coop prgm-subsistence users	Sea otter					UR						
48.01	Improve survival rates	Pink salmon	4 projects	400.0	200.0	600.0	Ltd	3	1	5			
48.02	Improve survival rates	Sockeye salmon	4 projects	400.0	200.0	600.0	Ltd	3	1	5	1200.0	200.0	3000.0
49.00	Access to traditional foods	Subsistence	Per village	53.0	50.0	60.0	UR	10	5	10	530.0	250.0	600.0
50.10	Subsistence mariculture sites	Subsistence		550.0	180.0	600.0	Ltd	3	2	4	1650.0	360.0	2400.0
50.20	Bivalve shellfish hatchery etc	Subsistence		1000.0	1300.0	2500.0	Ltd	3	2	4	3000.0	2600.0	10000.0
51.00	Relocate existing hatchery runs	Pink salmon	Per project				Ltd						
P1.00	Administration	Multiple resources									36500.0	5200.0	36500.0
P2.00	Monitoring	Multiple resources									52250.0	25250.0	52500.0

NB: All costs are expressed in units of \$1,000 (1993 \$). The inflation-adjusted value of the remainder of the settlement is about \$522 million.

COMPARISON OF ALTERNATIVES

Alternatives:	1	2	3	4	5
Administration	1%	4%	6%	7%	7%
Monitoring	5%	5%	7%	8%	10%
Other Restoration	--	--	7%	10%	22%
Other Restoration Reserve	--	--	5	25%	26%
Habitat Protection	--	91%	75%	50%	35%
Balance	94%	--	--	--	--

Table ____. Comparison of Alternatives by Allocation of Cost

INJURY SUMMARY TABLES
FROM
CHAPTER III

Resources: Summary of Results of Injury Assessment Studies

The next few pages summarize the results of the injury assessment studies for resources completed after the *Exxon Valdez* oil spill. The table has been reviewed by the Restoration Team and the Chief Scientist.

The "Description of Injury," columns focus on injury that took place during 1989. The table shows whether there was initial mortality caused by the spill, whether the spill caused a population-level injury, and whether there is evidence of sublethal or chronic effects on the resource. For some resources, an estimate is available for the total number of animals initially killed by the spill. When available, that estimate is shown in parentheses under the initial mortality column. For many resources, the total number killed will never be known.

The "Status of Recovery" columns show the best estimate of recovery using information current through 1992. These columns show resources' progress toward recovery to the population levels that scientists estimate would have occurred in the absence of the spill. The "Current Population Status" column shows a resource's progress from any "Decline in Population after the Spill." Similarly, the column labeled "Evidence of Continuing Sublethal or Chronic Effects" shows whether a initial chronic or sublethal injury is continuing.

The "Geographic Extent of Injury" column shows whether the injury occurred in the geographic areas shown in Figure X. (Injury may have been more extensive in some regions than others.)

TABLE X Natural Resources: Summary of Results of Injury Assessment Studies Done After the *Exxon Valdez* Oil Spill

Resource	Description of Oil Spill Injury			Status of Recovery in December, 1992		Geographic Extent of Injury (a)				Comments/Discussion
	Initial Oil Spill Mortality (total mortality estimate)(b)	Measured Decline in Population after the spill	Evidence of Sublethal or Chronic Effects (c)	Current Population Status	Evidence of Continuing Sublethal or Chronic Effects	PWS	Kenai	Kodiak	Alaska Penin.	
MARINE MAMMALS										
Harbor Seals (d)	YES (345)	YES	YES	POSSIBLY STABLE, BUT NOT RECOVERING	NO	YES	YES (e)	UNKNOWN	UNKNOWN	Many seals were directly oiled. There was a measurable difference in populations between oiled and unoiled areas in PWS in 1989 and 1990. Population was declining prior to the spill and recovery evident in 1992. Oil residues found in seal bile were 5 to 6 times higher in oiled areas than unoiled areas in 1990.
Humpback Whales	NO	NO	NO	(f)	(f)	(f)	(f)	(f)	(f)	Other than fewer animals being observed in Knight Island Passage in summer 1989, which did not persist in 1990, the oil spill did not have a measurable impact on humpback whales.
Killer Whales	POSSIBLY (g)	POSSIBLY (g)	POSSIBLY (g)	RECOVERING	UNKNOWN	YES	UNKNOWN	UNKNOWN	UNKNOWN	13 whales of the 36 in AB pod are missing and presumed dead. Circumstantial evidence links whale disappearance to oiling. Several adult males have collapsed dorsal fins. Social disruption of family units has been observed. In AB pod, no new births were recorded in 1989 or 1990; one birth was recorded in 1991; and two births were recorded in 1992.

- (a) There may have been an unequal distribution of injury within each region, see map for location of regions;
 (b) Adjusted for carcasses not found, not reported, scavenged, or otherwise lost;
 (c) Evidence of sublethal or chronic effects is defined as an observed physiological or behavioral change in an injured species;
 (d) Population was declining prior to the spill;
 (e) Based on recovery of dead animals from this region of the spill zone;
 (f) If no injury was detected or known, no assessment of recovery could be made.
 (g) "Possibly" was used if there was disagreement over the conclusions to be drawn from the results of the damage assessment studies.

Resource	Description of Oil Spill Injury			Status of Recovery in December, 1992		Geographic Extent of Injury (a)				Comments/Discussion
	Initial Oil Spill Mortality (total mortality estimate)(b)	Measured Decline in Population after the spill	Evidence of Sublethal or Chronic Effects (c)	Current Population Status	Evidence of Continuing Sublethal or Chronic Effects	PWS	Kenai	Kodiak	Alaska Penin.	
Sea Lions (d)	UNKNOWN	UNKNOWN	NO	CONTINUING DECLINE	(f)	(f)	(f)	(f)	(f)	Several sea lions were observed with oiled pelts and oil residues were found in some tissues in 1989. It was not possible to determine population effects or cause of death of carcasses recovered in 1989. Sea lion populations were declining prior to the oil spill.
Sea Otters	YES (3,500 TO 5,000)	YES	YES	STABLE, BUT NOT RECOVERING	YES	YES	YES	YES (e)	YES (e)	Post-spill surveys showed measurable difference in populations and survival between oiled and unoiled areas in 1989, 1990 and 1991. Survey data have not established a significant recovery. Carcasses of prime-age animals were found on beaches in 1989, 1990 and 1991. Proportions of prime-age carcasses found on beaches in 1992 is not significantly different from pre- or post-spill data. Sea otters feed in the lower intertidal and subtidal areas and may still be exposed to hydrocarbons in the environment.

- (a) There may have been an unequal distribution of injury within each region, see map for location of regions;
- (b) Adjusted for carcasses not found, not reported, scavenged, or otherwise lost;
- (c) Evidence of sublethal or chronic effects is defined as an observed physiological or behavioral change in an injured species;
- (d) Population was declining prior to the spill;
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- (g) "Possibly" was used if there was disagreement over the conclusions to be drawn from the results of the damage assessment studies.

Resource	Description of Oil Spill Injury			Status of Recovery in December, 1992		Geographic Extent of Injury (a)				Comments/Discussion
	Initial Oil Spill Mortality (total mortality estimate)(b)	Measured Decline in Population after the spill	Evidence of Sublethal or Chronic Effects (c)	Current Population Status	Evidence of Continuing Sublethal or Chronic Effects	PWS	Kenai	Kodiak	Alaska Penin.	
TERRESTRIAL MAMMALS										
Black Bear	NO	UNKNOWN	UNKNOWN	(f)	(f)	(f)	(f)	(f)	(f)	No field studies were completed.
Brown Bear	NO	NO	NO	(f)	(f)	(f)	(f)	(f)	(f)	Hydrocarbon exposure was documented on Alaska Peninsula in 1989 including high hydrocarbon level in the bile of one dead yearling, although it is unknown if this was the cause of death. Brown bears feed in the intertidal zone and may still be exposed to hydrocarbons in the environment.
River Otters	YES (NUMBER UNKNOWN)	UNKNOWN	YES	UNKNOWN	YES	YES	UNKNOWN	UNKNOWN	UNKNOWN	Exposure to hydrocarbons and sub-lethal effects were determined, but no effects were established on population. Sub-lethal indicators of possible oil exposure remained in 1991. River otters feed in the intertidal and shallow subtidal areas and may be still be exposed to hydrocarbons in the environment.
Sitka Black-tailed Deer	NO	NO	NO	(f)	(f)	(f)	(f)	(f)	(f)	Elevated hydrocarbons were found in tissues in soot deer in 1989 in PWS.

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Resource	Description of Oil Spill Injury			Status of Recovery in December, 1992		Geographic Extent of Injury (a)				Comments/Discussion
	Initial Oil Spill Mortality (total mortality estimate)(b)	Measured Decline in Population after the spill	Evidence of Sublethal or Chronic Effects (c)	Current Population Status	Evidence of Continuing Sublethal or Chronic Effects	PWS	Kenai	Kodiak	Alaska Penin.	
BIRDS										
Bald Eagles	YES (more than 200 to 300)	POSSIBLY	YES	RECOVERED OR RECOVERING	UNKNOWN	YES	YES	YES (e)	YES(e)	Productivity in PWS was disrupted in 1989, but returned to normal in 1990. Exposure to hydrocarbons and some sub-lethal effects were found in 1989 and 1990, but no continuing effects were observed on populations. In 1989, 151 carcasses were recovered from beaches.
Black-legged Kittiwakes	YES (ESTIMATE UNKNOWN)	NO	NO	NO CHANGE	NO	YES	YES (e)	YES (e)	YES (e)	Total reproductive success in oiled and unoiled areas of PWS has declined since 1989. Hydrocarbon contaminated tissues were detected in 1989. Hydrocarbon contaminated stomach contents were detected in 1989 and 1990. This species is known for great natural variation and reproductive failure may be unrelated to the oil spill. In 1989, 1225 carcasses were recovered from beaches.
Black Oystercatchers	YES (ESTIMATE UNKNOWN)	YES	YES	RECOVERING	YES	YES	YES (e)	YES (e)	YES (e)	Differences in egg size between oiled and unoiled areas were found in 1989. Exposure to hydrocarbons and some sublethal effects were determined. Populations declined more in oiled areas than unoiled areas in post-spill surveys in 1989, 1990 and 1991. Black oystercatchers feed in the intertidal areas and may be still be exposed to hydrocarbons in the environment. In 1989, nine carcasses were recovered from beaches.

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Resource	Description of Oil Spill Injury			Status of Recovery in December, 1992		Geographic Extent of Injury (a)				Comments/Discussion
	Initial Oil Spill Mortality (total mortality estimate)(b)	Measured Decline in Population after the spill	Evidence of Sublethal or Chronic Effects (c)	Current Population Status	Evidence of Continuing Sublethal or Chronic Effects	PWS	Kenai	Kodiak	Alaska Penin.	
Common Murres	YES (175,000 to 300,000)	YES	YES	DEGREE OF RECOVERY VARIES BY COLONY	YES	NO	YES	YES	YES	Measurable impacts on populations were recorded 1989, 1990 and 1991. Breeding was still inhibit in some colonies in the Gulf of Alaska in 1992. 1989, 10,428 carcasses were recovered from beach
Glaucon-winged gulls	YES (ESTIMATE UNKNOWN)	NOT DETECTED	NO	NO CHANGE	NO	YES (e)	YES (e)	YES (e)	YES (e)	While 555 dead birds were recovered in 1989, there is no evidence of a population level impact when compared to historic (1972, 1973) population levels.
Harlequin Ducks	YES (423)	YES	YES	STABLE OR CONTINUING DECLINE	YES	YES	YES (e)	YES (e)	YES (e)	Post-spill samples showed hydrocarbon contaminat and poor body conditions in 1989 and 1990. Surv in 1990-1992 indicated population declines and r total reproductive failure. Harlequin ducks fee in the intertidal and shallow subtidal areas and may still be exposed to hydrocarbons in the environment. In 1989, 213 carcasses were recove from beaches.
Marbled Murrelets (d)	YES (8,000 TO 12,000)	YES	UNKNOWN	STABLE OR CONTINUING DECLINE	UNKNOWN	YES	YES (e)	YES (e)	YES (e)	Measurable population effects were recorded in 1989, 1990 and 1991. Marbled murrelet populatic were declining prior to the spill. In 1989, hydrocarbon contamination was found in livers of adult birds. In 1989, 612 carcasses were recove from beaches.

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Resource	Description of Oil Spill Injury			Status of Recovery in December, 1992		Geographic Extent of Injury (a)				Comments/Discussion
	Initial Oil Spill Mortality (total mortality estimate)(b)	Measured Decline in Population after the spill	Evidence of Sublethal or Chronic Effects (c)	Current Population Status	Evidence of Continuing Sublethal or Chronic Effects	PWS	Kenai	Kodiak	Alaska Penin.	
Peale's Peregrine Falcons	UNKNOWN	UNKNOWN	NO	(f)	(f)	(f)	(f)	(f)	(f)	When compared to 1985 surveys a reduction in population and lower than expected productivity was measured in 1989 in the PWS. Cause of these changes are unknown. In 1989, two carcasses were recovered from beaches.
Pigeon Guillemots (d)	YES (1,500 TO 3,000)	YES	NO	STABLE OR CONTINUING DECLINE	UNKNOWN	YES	YES (e)	YES (e)	YES (e)	Pigeon guillemot populations were declining prior to the spill. In 1989, hydrocarbon contamination was found in birds and, externally, on eggs. In 1989, 614 carcasses were recovered from beaches.
Storm Petrels	YES (ESTIMATE UNKNOWN)	NO	UNKNOWN	NO CHANGE	UNKNOWN	YES (e)	YES (e)	YES (e)	YES (e)	Although 363 carcasses were recovered in 1989 and petrels ingested oil and transferred oil to their eggs, reproduction was normal in 1989.
Other Seabirds	YES (ESTIMATE UNKNOWN)	UNKNOWN	UNKNOWN	UNKNOWN	UNKNOWN	YES (e)	YES (e)	YES (e)	YES (e)	Seabird recovery has not been studied. Species collected dead in 1989 include 216 common, 87 yellow-billed, 18 pacific, 5 red-throated loon; red-necked and 277 horned grebe; 426 northern fulmar; 360 sooty and 2,460 short-tailed shearwater; 38 double-crested, 418 pelagic, and red-faced cormorant; 8 herring and 33 mew gull; arctic and 1 Aleutian tern; 67 Kittlitz's and 31 ancient murrelet; 48 Cassin's, 5 least, 31 parakeet, and 141 rhinoceros auklet; and 139 horned and 361 tufted puffin.

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Resource	Description of Oil Spill Injury			Status of Recovery in December, 1992		Geographic Extent of Injury (a)				Comments/Discussion
	Initial Oil Spill Mortality (total mortality estimate)(b)	Measured Decline in Population after the spill	Evidence of Sublethal or Chronic Effects (c)	Current Population Status	Evidence of Continuing Sublethal or Chronic Effects	PWS	Kenai	Kodiak	Alaska Penin.	
Other Sea Ducks	YES (ESTIMATE UNKNOWN)	NO	UNKNOWN	UNKNOWN	UNKNOWN	YES	YES (e)	YES (e)	YES (e)	Species collected dead in 1989 include 4 Stellar's jays, 9 king and 17 common eider; 342 white-winged, 175 surf and 132 black scoter; 185 oldsquaw; 21 bufflehead; 6 common and 33 Barrow's goldeneye; 2 common and 33 red-breasted merganser. Sea ducks tend to feed in the intertidal and shallow subtidal areas which were most heavily impacted by oil.
Other Shorebirds	YES (ESTIMATE UNKNOWN)	UNKNOWN	UNKNOWN	UNKNOWN	UNKNOWN	YES	YES (e)	YES (e)	YES (e)	Species collected dead in 1989 include 1 golden plover; 2 lesser yellowlegs; 1 semipalmated, 5 western, 4 least and 1 Baird's sandpiper; 3 surfbird; 1 short-billed dowitcher; 1 common snipe; 2 red and 7 red-necked phalarope.
Other Birds	YES (ESTIMATE UNKNOWN)	UNKNOWN	UNKNOWN	UNKNOWN	UNKNOWN	YES (e)	YES (e)	YES (e)	YES (e)	Species collected dead in 1989 include 2 emperor and 1 Canada goose; 3 brant; 11 mallard; 4 northern pintail; 5 green-winged teal; 27 greater and 2 lesser scaup; 1 ruddy duck; 1 great blue heron; 1 long-tailed jaeger; 1 willow ptarmigan; 3 great-horned owl; 1 Steller's jay; 7 magpie; 18 common raven; 34 northwestern crow; 2 robin; 1 varied thrush; 1 hermit thrush; 3 yellow warbler; 1 pine grosbeak; 1 savannah and 4 golden-crowned sparrow; 8 white-winged crossbill.

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FISH										
Cutthroat Trout	YES	POSSIBLY (g)	YES	UNKNOWN	UNKNOWN	YES	UNKNOWN	UNKNOWN	UNKNOWN	Differences in survival and growth between anadromous adult populations in the oiled and unoiled areas persisted from 1989 to 1991 despite decrease in exposure indicators. This could be due to continuing injury to the food base.
Dolly Varden	YES	POSSIBLY (g)	YES	UNKNOWN	UNKNOWN	YES	UNKNOWN	UNKNOWN	UNKNOWN	Differences in survival between anadromous adult populations in the oiled and unoiled areas persisted from 1989 to 1991 despite a decrease in exposure indicators. This could be due to continuing injury to the food base.
Pacific Herring	YES, TO EGGS AND LARVAE	UNKNOWN	YES	UNKNOWN	NO	YES	UNKNOWN	UNKNOWN	UNKNOWN	Measurable difference in egg counts between oiled and unoiled areas were found in 1989 and 1990. Lethal and sublethal effects on eggs and larvae were evident in 1989 and to a lesser extent in 1990; in 1991 there were no differences between oiled and unoiled areas. It is possible that the 1989 year class was injured and could result in reduced recruitment to the adult population.

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Pink Salmon (Wild) (d)	YES, TO EGGS	POSSIBLY (g)	YES	UNKNOWN	YES	YES	UNKNOWN	UNKNOWN	UNKNOWN	There was initial egg mortality in 1989. Egg mortality continued to be high in 1990 and 1991. Abnormal fry were observed in 1989. Reduced growth of juveniles was found in the marine environment 1989 and 1991, which correlates with reduced survival.
Rockfish	YES (ESTIMATE UNKNOWN)	UNKNOWN	YES	UNKNOWN	UNKNOWN	YES	YES	UNKNOWN	UNKNOWN	Twenty dead fish were found in 1989, but only a few were in condition to be analyzed. Exposure to hydrocarbons with some sub-lethal effects was determined in those fish, but the effects on the population was unknown. Closures to salmon fisheries increased fishing pressures on rockfish which may be impacting population.
Sockeye Salmon	UNKNOWN	YES	YES	SEE COMMENTS	YES	UNKNOWN	YES	YES	NO	Smolt survival continues to be poor in the Red Lake and Kenai River systems due to overescapements in Red Lake in 1989, and in the Kenai River in 1987, 1988, 1989. As a result, adult returns are expected to be low in 1994 and successive years. Trophic structures of Kenai and Skilak Lakes have been altered by overescapement.

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SHELLFISH										
Clam	YES (ESTIMATE UNKNOWN)	UNKNOWN	UNKNOWN	UNKNOWN	UNKNOWN	YES	YES	YES	YES	Native littleneck and butter clams were impacted both oiling and clean-up, particularly high pressure, hot water washing. Additional data are still being evaluated.
Crab (Dungeness)	UNKNOWN	UNKNOWN	UNKNOWN	(f)	(f)	(f)	(f)	(f)	(f)	Insufficient data to determine injury.
Oyster	UNKNOWN	UNKNOWN	UNKNOWN	(f)	(f)	(f)	(f)	(f)	(f)	Although studies were initiated in 1989, they were not completed because they were determined to be limited value.
Sea Urchin	UNKNOWN	UNKNOWN	UNKNOWN	(f)	(f)	(f)	(f)	(f)	(f)	Studies limited to laboratory toxicity studies.
Shrimp	UNKNOWN	UNKNOWN	NO	(f)	(f)	(f)	(f)	(f)	(f)	No conclusive evidence presented for injury link to oil spill.

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- (d) Population was declining prior to the spill;
- (e) Based on recovery of dead animals from this region of the spill zone;
- (f) If no injury was detected or known, no assessment of recovery could be made.
- (g) "Possibly" was used if there was disagreement over the conclusions to be drawn from the results of the damage assessment studies.

Resource	Description of Oil Spill Injury			Status of Recovery in December, 1992		Geographic Extent of Injury (a)				Comments/Discussion
	Initial Oil Spill Mortality (total mortality estimate)(b)	Measured Decline in Population after the spill	Evidence of Sublethal or Chronic Effects (c)	Current Population Status	Evidence of Continuing Sublethal or Chronic Effects	PWS	Kenai	Kodiak	Alaska Penin.	
INTERTIDAL/SUBTIDAL COMMUNITIES										
Intertidal Organisms/Communities	YES	YES	YES	VARIABLE BY SPECIES	YES	YES	YES	YES	YES	Measurable impacts on populations of plants and animals were determined 1989 to 1992. The lower intertidal and, to some extent, the mid intertidal is recovering. Some species (e.g. Fucus) in the upper intertidal zone have not recovered, and oil persists in and under mussel beds. Intertidal organisms were impacted by both oiling and clean up, particularly high pressure, hot water washing.
Subtidal Communities	YES	YES	YES	VARIABLE BY SPECIES	YES	YES	UNKNOWN	UNKNOWN	UNKNOWN	Measurable impacts on population of plants and animals were determined in 1989. Eel grass and some species of algae appear to be recovering. Amphipods in eel grass beds recovered to pre-spill densities in 1991. Leather stars and helmet crabs show little sign of recovery through 1991.

- (a) There may have been an unequal distribution of injury within each region, see map for location of regions;
- (b) Adjusted for carcasses not found, not reported, scavenged, or otherwise lost;
- (c) Evidence of sublethal or chronic effects is defined as an observed physiological or behavioral change in an injured species;
- (d) Population was declining prior to the spill;
- (e) Based on recovery of dead animals from this region of the spill zone;
- (f) If no injury was detected or known, no assessment of recovery could be made.
- (g) "Possibly" was used if there was disagreement over the conclusions to be drawn from the results of the damage assessment studies.

TABLE XXX Other Natural Resources and Archaeology: Summary of Results of Injury Assessment Studies Done After the Exxon Valdez Oil Spill (b)

RPWG draft 2/8/93

Resource	Description of Injury	Status of Recovery in December, 1992	Geographic Extent of Injury (a)				Comments/Discussion
			PWS	Kenni	Kodiak	Alaska Penin.	
Air	Air quality standards for aromatic hydrocarbons were exceeded at the spill site. Health and safety standards for permissible exposure levels were exceeded up to 400 times.	Recovered	YES	UNKNOWN	UNKNOWN	UNKNOWN	Impacts diminished as oil weathered and lighter fractions evaporated.
h1 Sediments	Oil coated beaches and became buried in beach sediments. Oil laden sediments were transported off beaches and deposited on subtidal marine sediments.	Oil remains intertidally on rocks and beaches and buried beneath the surface at other beach locations. Oil concentrations have increased in subtidal marine sediments and have spread to greater depths (to 720 meters) over time.	YES	YES	YES	YES	Unweathered buried oil will persist for many years in protected low-energy sites in Prince William Sound.
Water	State of Alaska water quality standards were not exceeded in open sea conditions. In small bays and near shore, hydrocarbon concentrations may have exceeded the 10 micrograms per liter standard immediately after the spill. Federal oil discharge standards of no visible sheen were exceeded.	Recovered	YES	UNKNOWN	UNKNOWN	UNKNOWN	Impacts were patchy and transient during the early stages of the spill. Impacts diminished as oil weathered and lighter fractions evaporated.
Archaeologic sites/artifacts	Currently, 24 sites are known to have been adversely affected by oiling, clean-up activities, or looting and vandalism linked to the oil spill. 113 sites are estimated to have been similarly affected. Injuries attributed to looting and vandalism (linked to the oil spill) are still occurring.	Archaeological sites and artifacts cannot recover, they are finite non-renewable resources.	YES	YES	YES	YES	* Injury studies are not yet complete (January 1993).

(a) There may have been an unequal distribution of injury within each region, see map for location of regions;
 (b) This page has not yet been reviewed by the Chief Scientist;

Services: Summary of Results of Injury Assessment Studies

The next few pages summarize information concerning services damaged by the spill. The information in this table has not yet been peer reviewed and is subject to change.

Much of the damage to services, and the information about those damages, is not quantitative. The table reflects the qualitative content of the information. The "Description of Injury" column recounts the situation for each service in the year following the spill. The "Status of Recovery in 1992" shows the 1992 situation for that service.

The information used for this table is taken from injury assessment studies, information from agency managers, and, for recreation, a Key Informant Interview study conducted the Restoration Planning Working Group in December 1992.

TABLE XX Services: Summary of Results of Injury Assessment Studies Done After the Exxon Valdez Oil Spill

RPWG draft 2/8/93

WORKING DRAFT - NOT FOR PUBLIC RELEASE

Service	Description of Injury	Status of Recovery in December, 1992	Geographic Extent of Injury				Comments/Discussion
			PWS	Kenai	Kodiak	Alaska Penin.	
Passive Use Values (Option, existence and non-use values)	In 1991, over 90% of those surveyed (nation-wide) said they were aware of the Exxon Valdez oil spill. Over 50% believed that the spill was the largest environmental accident caused by humans anywhere in the world. The median household willingness to pay for future prevention was \$31. Multiplying thus by the number of U.S. household results in a damage estimate of \$2.8 billion.	Data is not available to determine the status of recovery.	N/A	N/A	N/A	N/A	The study, <u>A Contingency Valuation Study of Lost Passive Use Values Resulting From the Exxon Valdez Oil Spill</u> , was developed between July 1989 and January 1991, at which time it was put into the field. Respondents were comprised of people in the lower 48 states.
91 Recreation and Tourism	The nature and extent of injury varied by user group and by area. About a quarter of key informants interviewed reported no change in their recreation experience, but others reported avoidance of the spill area, reduced wildlife sightings, residual oil, and more people. They also reported changes in their perception of recreation opportunity in terms of increased vulnerability to future oil spills, erosion of wilderness, a sense of permanent change, concern about long-term ecological effects, and, in some, a sense of optimism. Overall, recreation, tourism and sport fishing declined significantly in 1989 and improved markedly in 1990 although there were residual effects. Sport hunting of harlequin duck was affected by restrictions imposed in 1991 in response to damage assessment studies.	Declines in recreation activities reported in 1989 appear to have reversed, although there is no data to support or deny this perception. Harvest restrictions are expected to continue through 1993.	YES	YES	YES	YES	

TABLE XX Services: Summary of Results of Injury Assessment Studies Done After the *Exxon Valdez* Oil Spill

Service	Description of Injury	Status of Recovery in December, 1992	Geographic Extent of Injury				Comments/Discussion
			PWS	Kenai	Kodiak	Alaska Penin.	
17 Sport and Commercial Fishing	<p>During 1989, emergency commercial fishery closures were ordered in PWS, Cook Inlet, Kodiak and the Alaska Peninsula. This affected salmon, herring, crab, shrimp, rockfish and sablefish. The 1989 closures resulted in sockeye over-escapement in the Kenai River and in the Red Lake system (Kodiak Island).</p> <p>In 1990 a portion of PWS was closed to shrimp fishing.</p> <p>Between 1989 and 1990 a decline in sport fishing (number of anglers, fishing trips and fishing day) were recorded for PWS, Cook Inlet and the Kenai Peninsula. In 1992 an emergency order restricting cutthroat trout fishing was issued for western PWS due to low adult returns.</p>	<p>Currently there are no oil spill-related commercial closures in effect. The 1992 sport fishing closure for cutthroat trout is expected to continue at least through 1993.</p> <p>EVOS related sockeye over-escapement in the Kenai River and Red Lake system is anticipated to result in low adult returns in 1994 and 1995. These over-escapements may result in closure or harvest restrictions during these and perhaps in subsequent years.</p>	YES	YES	YES	YES	<p>Injury in the Alaska Peninsula is for Commercial fishing only. Injuries and recovery status of rockfish, shellfish and herring are uncertain. Therefore, future impacts on these fisheries is unknown.</p>

TABLE XX Services: Summary of Results of Injury Assessment Studies Done After the *Exxon Valdez* Oil Spill

Service	Description of Injury	Status of Recovery in December, 1992	Geographic Extent of Injury				Comments/Discussion
			PWS	Kenai	Kodiak	Alaska Penin.	
18 Subsistence	<p>Subsistence harvests of fish and wildlife in 9 of 15 villages surveyed declined from 4 - 78% in 1989 when compared to pre-spill averages. Approximately 7 of the 15 villages show continued declines in use in the period 1990-1991; this decline is particularly noticeable in the Prince William Sound villages of Chenega and Tatitlek.</p> <p>In 1989, chemical analysis indicated that most resources tested, including fish, marine mammals, deer, and ducks, were safe to eat, but that shellfish from oiled beaches should not be used.</p> <p>In addition, village residents believe that subsistence species continue to decline or have not recovered from the oil spill.</p>	Many subsistence users believe that continued contamination to subsistence food sources is dangerous to their health.	YES	YES	YES	NO	For detailed information on village subsistence use see table __, page__.
Wilderness Values	<p>There is a perception of lost values to designated federal and state wilderness areas in parks, refuges and forests. People report that their feeling about the spill area has changed. There is wide-spread feeling that something has been lost. Approximately __ miles of wilderness coastline were affected by oil. Some oil remains embedded in the sediments of these areas.</p>	<p>Some people's feelings of lost values are diminishing (recovery). To others the values remain injured (lack of recovery).</p> <p>Oil has degraded substantially in many areas but remains in others. Until oil is completely removed or degrades naturally, injury to wilderness values will continue.</p>	YES	YES	YES	YES	

9 October 1992

RPWG,

Here are the computer outputs from the alternative sorts we discussed on Tuesday. Bob and I have attached a page for each version which describes the sorts used to select the options. Please review the results for our meeting on Wednesday the 14th. Some things to look for are resources that were missed because they never met the criteria, the inclusion of replacement or equivalent resource options and the differences between the potential alternatives.

Running these sorts have given me some other ideas of potential alternatives. If you also come up with something, write it down and give it to Bob or I and we will try to run the sorts (time permitting) before Wednesday. Otherwise, just bring the descriptions to the meeting.

Karen

RPWG'S FIRST DRAFT OF POSSIBLE ALTERNATIVE 2
(Natural recovery with broad protection)

Part A.

Do all things which provide protection to all injured resources and services. (Fram_alt = PR, Option 4 and 1 where Crit 1a or 1b = M or H)

The entire database was queried (no restrictions based on injury).

Part B.

For any resource which is not recovering and there is no effective protection measure in Part A above, do all highly or moderately effective options (regardless of framework category). 1a = h or m; 5a not equal to L.

Part C.

Add all other measures which provide protection to injured resources and services through management of human uses if 1a or 1b = H or M.

(Add options 2.1, 2.2, 8.1, 8.2, 9, and 30.)

Evaluation of Options, order by RESOURCES/SERVICE: DRAFT for RPWG Review

Option	Resource or Service	Criteria											FrWork Alter- native	Settlement Char			
		1a	1b	2	3	4	5a	5b	6	7	8	DR		Rep	AofE	Enh	
1.0 Archeological site stewardship program	Archaeology	N/A	H	M	M	L	H	H	H	H	Yes	MH	Y	N	N	N	
37.0 Purchase private lands (fee title or less than fee title) 40.0 Special Designations	Bald eagle Bald eagle	M M	H M	H H	M M	L L	H H	M M	H H	M M	No No	PR PR	Y Y	Y Y	Y N	N N	
37.0 Purchase private lands (fee title or less than fee title) 40.0 Special Designations	Black oystercatcher Black oystercatcher	M M	M M	M M	H H	L L	H H	M M	H H	L M	No No	PR PR	Y Y	Y Y	Y N	N N	
37.0 Purchase private lands (fee title or less than fee title)	Brown bear	N/A	H	H	H	L	H	L	H	M	No	PR	Y	Y	Y	N	
4.0 Reduce disturbance at marine bird colonies and mammal haulout 37.0 Purchase private lands (fee title or less than fee title) 40.0 Special Designations	Common murre Common murre Common murre	M M M	M M M	H H H	M M M	L L L	H H H	M H M	H H H	H L H	Yes No No	MH PR PR	Y Y Y	Y Y Y	N Y N	N N Y	
37.0 Purchase private lands (fee title or less than fee title) 40.0 Special Designations	Cutthroat trout Cutthroat trout	N/A N/A	M M	H H	H H	L L	H H	M M	H H	L M	No No	PR PR	Y Y	Y Y	Y N	N N	
37.0 Purchase private lands (fee title or less than fee title) 40.0 Special Designations	Dolly varden trout Dolly varden trout	N/A N/A	M M	H H	H H	L L	H H	M M	H H	L M	No No	PR PR	Y Y	Y Y	Y N	N N	
4.0 Reduce disturbance at marine bird colonies and mammal haulout 40.0 Special Designations	Harbor seal Harbor seal	H H	H H	H H	L H	L L	H H	M M	H H	H H	Yes Yes	MH PR	Y Y	Y Y	N N	N N	
37.0 Purchase private lands (fee title or less than fee title) 40.0 Special Designations	Harlequin duck Harlequin duck	M M	H M	H H	H H	L L	H H	M M	H H	L M	No No	PR PR	Y Y	Y Y	Y N	N N	
40.0 Special Designations	Herring	N/A	Unk	H	H	L	H	L	H	M	No	PR	Y	Y	N	N	
4.0 Reduce disturbance at marine bird colonies and mammal haulout 40.0 Special Designations	Killer whale Killer whale	N/A N/A	M M	M M	M M	L L	H H	M M	H H	M M	No No	MH PR	Y Y	Y Y	N N	N N	
37.0 Purchase private lands (fee title or less than fee title) 40.0 Special Designations	Marbled murrelet Marbled murrelet	M M	M M	H H	H H	L L	H H	L L	H H	L L	No No	PR PR	Y Y	Y Y	Y N	N N	
37.0 Purchase private lands (fee title or less than fee title) 40.0 Special Designations	Recreation: backcountry developed Recreation: backcountry developed	N/A N/A	H H	H H	H H	H L	H H	L L	H H	M M	No No	PR PR	Y Y	Y Y	Y Y	Y Y	
37.0 Purchase private lands (fee title or less than fee title) 40.0 Special Designations	Recreation: undeveloped Recreation: undeveloped	N/A N/A	H H	H H	H H	H L	H H	L L	H H	M M	No No	PR PR	Y Y	Y Y	Y Y	Y Y	
37.0 Purchase private lands (fee title or less than fee title)	River otter	N/A	M	H	H	L	H	M	H	M	No	PR	Y	Y	Y	N	
37.0 Purchase private lands (fee title or less than fee title)	Sockeye salmon	N/A	M	H	H	L	H	M	H	M	No	PR	Y	Y	Y	N	

Criteria Summary. 1a: Potential to improve the rate or degree of recovery. 1b: Potential to prevent further degradation or decline. 2: Technical feasibility
 3: Degree to which proposed action benefits the more than one resource or service. 4: Degree to which proposed action enhances the resc or svc. 5: Potential
 for NO additional injury to: other target or non-target a: resources; b: services. 6. Potential effects of the proposed action on human health & safety.
 7. Relationship of the expected costs of the proposed action to the expected benefits. 8. Will the restoration opportunity be lost if implementation is delayed?
 Legend: MR = Manipulation of Resources; MH = Management of Human Use; PR = Protection;
 H = High; M = Medium; L = Low; N/A = Not applicable; Unk = Unknown; Unp = Unproven.

Evaluation of Options, order by RESOURCES/SERVICE: DRAFT for RPWG Review

Option	Resource or Service	Criteria										FrWork Alter- native	Settlement Char			
		1a	1b	2	3	4	5a	5b	6	7	8		DR	Rep	AofE	Enh
37.0 Purchase private lands (fee title or less than fee title)	Wilderness/intrinsic values	H	H	H	H	N/A	H	L	H	M	No	PR	Y	Y	N	N
40.0 Special Designations	Wilderness/intrinsic values	H	H	H	H	N/A	H	L	H	M	No	PR	Y	Y	N	N

Criteria Summary. 1a: Potential to improve the rate or degree of recovery. 1b: Potential to prevent further degradation or decline. 2: Technical feasibility
 3: Degree to which proposed action benefits the more than one resource or service. 4: Degree to which proposed action enhances the resc or svc. 5: Potential
 for NO additional injury to: other target or non-target a: resources; b: services. 6. Potential effects of the proposed action on human health & safety.
 7. Relationship of the expected costs of the proposed action to the expected benefits. 8. Will the restoration opportunity be lost if implementation is delayed?
 Legend: MR = Manipulation of Resources; MH = Management of Human Use; PR = Protection;
 H = High; M = Medium; L = Low; N/A = Not applicable; Unk = Unknown; Unp = Unproven.

Evaluation of Options, order by RESOURCES/SERVICE: DRAFT for RPWG Review

Option	Resource or Service	Criteria											FrWork Alter- native	Settlement Char			
		1a	1b	2	3	4	5a	5b	6	7	8	DR		Rep	AofE	Enh	
13.0 Eliminate oil from mussel beds	Coastal habitat: intertidal	M	N/A	H	H	L	M	H	H	M	Yes	MR	Y	N	N	N	
14.0 Accelerate recovery of upper intertidal zone	Coastal habitat: intertidal	M	N/A	Unp	H	L	M	H	H	M	No	MR	Y	N	N	N	
17.1 Eliminate introduced foxes (for nesting marine birds)	Pigeon guillemot	H	N/A	H	H	N/A	H	H	H	H	No	MR	N	Y	Y	N	
17.2 Reduce predator access to seabird colonies	Pigeon guillemot	M	M	M	L	M	H	H	H	M	No	MR	Y	N	N	Y	
2.1 Increase fish/shellfish management: species already with plans	Pink salmon	H	H	M	H	L	H	M	H	M	Yes	MH	Y	N	N	Y	
11.0 Improve freshwater wild salmon spawning/rearing habitats	Pink salmon	H	H	H	H	H	H	H	H	M	Yes	MR	Y	Y	Y	Y	
13.0 Eliminate oil from mussel beds	Sea otter	H	H	H	H	L	M	H	H	H	Yes	MR	Y	N	N	N	

Criteria Summary. 1a: Potential to improve the rate or degree of recovery. 1b: Potential to prevent further degradation or decline. 2: Technical feasibility
 3: Degree to which proposed action benefits the more than one resource or service. 4: Degree to which proposed action enhances the resc or svc. 5: Potential
 for NO additional injury to: other target or non-target a: resources; b: services. 6. Potential effects of the proposed action on human health & safety.
 7. Relationship of the expected costs of the proposed action to the expected benefits. 8. Will the restoration opportunity be lost if implementation is delayed?
 Legend: MR = Manipulation of Resources; MH = Management of Human Use; PR = Protection;
 H = High; M = Medium; L = Low; N/A = Not applicable; Unk = Unknown; Unp = Unproven.

7/17/92, Part C

Evaluation of Options, order by RESOURCES/SERVICE: DRAFT for RPWG Review

Option	Resource or Service	Criteria											FrWork Alter- native	Settlement Char			
		1a	1b	2	3	4	5a	5b	6	7	8	DR		Rep	AofE	Enh	
8.1 temporarily restrict/close harvest	Brown bear	L	M	H	L	M	H	M	H	M	No	MH	Y	N	N	Y	
2.1 Incease fish/shellfish management: species already with plans	Cutthroat trout	M	M	H	L	L	H	M	H	M	Yes	MH	Y	N	N	Y	
2.1 Incease fish/shellfish management: species already with plans	Dolly varden trout	M	M	H	L	L	H	M	H	M	Yes	MH	Y	N	N	Y	
8.1 temporarily restrict/close harvest	Harbor seal	H	H	H	M	L	H	L	H	M	No	MH	Y	N	N	Y	
8.2 educate public to voluntarily restrict harvest (sport, subsist.)	Harbor seal	H	H	M	L	L	H	M	H	M	Yes	MH	Y	N	N	Y	
8.1 temporarily restrict/close harvest	Harlequin duck	M	M	H	L	L	H	M	H	M	Yes	MH	Y	N	N	Y	
2.1 Incease fish/shellfish management: species already with plans	Pink salmon	H	H	M	H	L	H	M	H	M	Yes	MH	Y	N	N	Y	
2.1 Incease fish/shellfish management: species already with plans	Sockeye salmon	H	H	M	H	L	H	H	H	H	Yes	MH	Y	N	N	Y	
30.0 Test subsistence foods for hydrocarbon contamination	Subsistence	H	N/A	H	L	L	H	H	H	H	No	MH	Y	N	N	N	

Criteria Summary. 1a: Potential to improve the rate or degree of recovery. 1b: Potential to prevent further degradation or decline. 2: Technical feasibility
 3: Degree to which proposed action benefits the more than one resource or service. 4: Degree to which proposed action enhances the resc or svc. 5: Potential
 for NO additional injury to: other target or non-target a: resources; b: services. 6. Potential effects of the proposed action on human health & safety.
 7. Relationship of the expected costs of the proposed action to the expected benefits. 8. Will the restoration opportunity be lost if implementation is delayed?
 Legend: MR = Manipulation of Resources; MH = Management of Human Use; PR = Protection;
 H = High; M = Medium; L = Low; N/A = Not applicable; Unk = Unknown; Unp = Unproven.

8 October 1992

RPWG'S FIRST DRAFT OF POSSIBLE ALTERNATIVE 3

Part A.

Do all effective things (criteria 1a or 1b = M or H) for resources that we are certain were injured severely (e.g. population level injury - Spies' class 1 or 2) and are not recovering or recovery is unknown.

[Karen's comments: note that the "are not recovering" phrase eliminates Harbor seals from this sort level and bumps it to level C.]

Resources included: sea otter, common murre, marbled murrelet, pigeon guillemot, intertidal, harlequin duck, sockeye salmon(!), Dolly varden, cutthroat trout and archaeology.

Part B.

Do only HIGHLY effective things for resources that we are less certain of the injury (Spies' level 3) at any life history stage and are not recovering or recovery is unknown. 1a or 1b = H, AND 5a or 5b not equal to L.

[I think sockeye may be more appropriate here because not all or the problems are due to the oil spill...?]

Resources included: river otter, black oystercatcher, pink salmon, rockfish.

Part C.

For other species not identified above, do anything that is highly effective, AND benefits more than one resource or service (1a or 1b = h, 3 = m or h, 5a or 5b not equal to l)

The only ones left are: killer whales, bald eagles and harbor seals

Evaluation of Options, order by RESOURCES/SERVICE: DRAFT for RPWG Review

Option	Resource or Service	Criteria										FrWork Alter- native	Settlement Char			
		1a	1b	2	3	4	5a	5b	6	7	8		DR	Rep	AofE	Enh
1.0 Archeological site stewardship program	Archaeology	N/A	H	M	M	L	H	H	H	H	Yes	MH	Y	N	N	N
10.0 Preserve archaeological sites/artifacts	Archaeology	N/A	M	H	L	L	H	H	H	M	Yes	MR	Y	Y	N	N
35.0 Acquire archaeological artifacts from outside the spill area	Archaeology	N/A	N/A	H	L	N/A	M	H	H	L	No	MR	Y	Y	N	N
13.0 Eliminate oil from mussel beds	Coastal habitat: intertidal	M	N/A	H	H	L	M	H	H	M	Yes	MR	Y	N	N	N
14.0 Accelerate recovery of upper intertidal zone	Coastal habitat: intertidal	M	N/A	Unp	H	L	M	H	H	M	No	MR	Y	N	N	N
4.0 Reduce disturbance at marine bird colonies and mammal haulout	Common murre	M	M	H	M	L	H	M	H	H	Yes	MH	Y	Y	N	N
16.1 Enhance social stimuli (Common murre)	Common murre	M	M	M	L	L	M	H	H	H	Yes	MR	Y	N	N	N
16.2 Improve physical characteristics of nest sites (Common murre)	Common murre	M	M	Unp	L	L	M	H	H	M	Yes	MR	Y	N	N	N
17.1 Eliminate introduced foxes (for nesting marine birds)	Common Murre	H	N/A	H	H	N/A	H	H	H	H	No	MR	N	Y	Y	N
37.0 Purchase private lands (fee title or less than fee title)	Common murre	M	M	H	M	L	H	H	H	L	No	PR	Y	Y	Y	N
40.0 Special Designations	Common murre	M	M	H	M	L	H	M	H	H	No	PR	Y	Y	N	Y
2.1 Increase fish/shellfish management: species already with plans	Cutthroat trout	M	M	H	L	L	H	M	H	M	Yes	MH	Y	N	N	Y
11.0 Improve freshwater wild salmon spawning/rearing habitats	Cutthroat trout	M	N/A	H	M	M	H	H	H	M	No	MR	Y	Y	Y	Y
14.0 Accelerate recovery of upper intertidal zone	Cutthroat trout	H	N/A	Unp	H	L	H	H	H	M	No	MR	Y	N	N	N
37.0 Purchase private lands (fee title or less than fee title)	Cutthroat trout	N/A	M	H	H	L	H	M	H	L	No	PR	Y	Y	Y	N
40.0 Special Designations	Cutthroat trout	N/A	M	H	H	L	H	M	H	M	No	PR	Y	Y	N	N
2.1 Increase fish/shellfish management: species already with plans	Dolly varden trout	M	M	H	L	L	H	M	H	M	Yes	MH	Y	N	N	Y
11.0 Improve freshwater wild salmon spawning/rearing habitats	Dolly varden trout	M	N/A	H	M	M	H	H	H	M	No	MR	Y	Y	Y	Y
14.0 Accelerate recovery of upper intertidal zone	Dolly varden trout	H	N/A	Unp	H	L	H	H	H	M	No	MR	Y	N	N	N
19.0 Update and expand Alaska's Anadromous Fish Stream Catalog	Dolly varden trout	L	M	H	H	L	H	H	H	M	No	PR	Y	N	N	N
37.0 Purchase private lands (fee title or less than fee title)	Dolly varden trout	N/A	M	H	H	L	H	M	H	L	No	PR	Y	Y	Y	N
40.0 Special Designations	Dolly varden trout	N/A	M	H	H	L	H	M	H	M	No	PR	Y	Y	N	N
8.1 temporarily restrict/close harvest	Harlequin duck	M	M	H	L	L	H	M	H	M	Yes	MH	Y	N	N	Y
13.0 Eliminate oil from mussel beds	Harlequin duck	H	H	H	H	L	M	H	H	M	Yes	MR	Y	N	N	N
37.0 Purchase private lands (fee title or less than fee title)	Harlequin duck	M	H	H	H	L	H	M	H	L	No	PR	Y	Y	Y	N
40.0 Special Designations	Harlequin duck	M	M	H	H	L	H	M	H	M	No	PR	Y	Y	N	N
17.1 Eliminate introduced foxes (for nesting marine birds)	Marbled murrelet	H	N/A	H	H	N/A	H	H	H	H	No	MR	N	Y	Y	N
37.0 Purchase private lands (fee title or less than fee title)	Marbled murrelet	M	M	H	H	L	H	L	H	L	No	PR	Y	Y	Y	N
40.0 Special Designations	Marbled murrelet	M	M	H	H	L	H	L	H	L	No	PR	Y	Y	N	N
17.1 Eliminate introduced foxes (for nesting marine birds)	Pigeon guillemot	H	N/A	H	H	N/A	H	H	H	H	No	MR	N	Y	Y	N
17.2 Reduce predator access to seabird colonies	Pigeon guillemot	M	M	M	L	M	H	H	H	M	No	MR	Y	N	N	Y
37.0 Purchase private lands (fee title or less than fee title)	Pigeon guillemot	L	M	M	H	L	H	M	H	L	No	PR	Y	Y	Y	N
40.0 Special Designations	Pigeon guillemot	L	M	M	H	L	H	M	H	M	No	PR	Y	Y	N	N
13.0 Eliminate oil from mussel beds	Sea otter	H	H	H	H	L	M	H	H	H	Yes	MR	Y	N	N	N
2.1 Increase fish/shellfish management: species already with plans	Sockeye salmon	H	H	M	H	L	H	H	H	H	Yes	MH	Y	N	N	Y

Criteria Summary. 1a: Potential to improve the rate or degree of recovery. 1b: Potential to prevent further degradation or decline. 2: Technical feasibility
 3: Degree to which proposed action benefits the more than one resource or service. 4: Degree to which proposed action enhances the resc or svc. 5: Potential
 for NO additional injury to: other target or non-target a: resources; b: services. 6. Potential effects of the proposed action on human health & safety.
 7. Relationship of the expected costs of the proposed action to the expected benefits. 8. Will the restoration opportunity be lost if implementation is delayed?
 Legend: MR = Manipulation of Resources; MH = Management of Human Use; PR = Protection;
 H = High; M = Medium; L = Low; N/A = Not applicable; Unk = Unknown; Unp = Unproven.

Part A

Evaluation of Options, order by RESOURCES/SERVICE: DRAFT for RPWG Review

Option	Resource or Service	Criteria										FrWork Alter- native	Settlement Char			
		1a	1b	2	3	4	5a	5b	6	7	8		DR	Rep	AofE	Enh
11.0 Improve freshwater wild salmon spawning/rearing habitats	Sockeye salmon	H	H	H	H	M	H	H	H	H	Yes	MR	Y	Y	Y	Y
18.1 Establish additional hatchery (salmon) runs	Sockeye salmon	M	M	H	H	M	M	H	H	M	No	MR	Y	Y	N	Y
18.2 Transplant (salmon) hatchery-reared fish to depleted areas	Sockeye salmon	H	L	H	H	L	H	H	H	M	Yes	MR	Y	Y	N	Y
18.3 Wild egg take to establish new runs (salmon)	Sockeye salmon	M	M	H	H	M	M	H	H	M	No	MR	Y	Y	N	Y
19.0 Update and expand Alaska's Anadromous Fish Stream Catalog	Sockeye salmon	L	M	H	H	L	H	H	H	M	No	PR	Y	N	N	N
37.0 Purchase private lands (fee title or less than fee title)	Sockeye salmon	N/A	M	H	H	L	H	M	H	M	No	PR	Y	Y	Y	N
40.0 Special Designations	Sockeye salmon	N/A	L	H	H	L	H	M	H	M	No	PR	Y	Y	N	N

Criteria Summary. 1a: Potential to improve the rate or degree of recovery. 1b: Potential to prevent further degradation or decline. 2: Technical feasibility
 3: Degree to which proposed action benefits the more than one resource or service. 4: Degree to which proposed action enhances the resc or svc. 5: Potential
 for NO additional injury to: other target or non-target a: resources; b: services. 6. Potential effects of the proposed action on human health & safety.
 7. Relationship of the expected costs of the proposed action to the expected benefits. 8. Will the restoration opportunity be lost if implementation is delayed?
 Legend: MR = Manipulation of Resources; MH = Management of Human Use; PR = Protection;
 H = High; M = Medium; L = Low; N/A = Not applicable; Unk = Unknown; Unp = Unproven.

Evaluation of Options, order by RESOURCES/SERVICE: DRAFT for RPWG Review

Option	Resource or Service	Criteria										FrWork Alter- native	Settlement Char			
		1a	1b	2	3	4	5a	5b	6	7	8		DR	Rep	AofE	Enh
1.0 Archeological site stewardship program	Archaeology	N/A	H	M	M	L	H	H	H	H	Yes	MH	Y	N	N	N
10.0 Preserve archaeological sites/artifacts	Archaeology	N/A	M	H	L	L	H	H	H	M	Yes	MR	Y	Y	N	N
35.0 Acquire archaeological artifacts from outside the spill area	Archaeology	N/A	N/A	H	L	N/A	M	H	H	L	No	MR	N	Y	N	N
13.0 Eliminate oil from mussel beds	Coastal habitat: intertidal	M	N/A	H	H	L	M	H	H	M	Yes	MR	Y	N	N	N
14.0 Accelerate recovery of upper intertidal zone	Coastal habitat: intertidal	M	N/A	Unp	H	L	M	H	H	M	No	MR	Y	N	N	N
4.0 Reduce disturbance at marine bird colonies and mammal haulout	Common murre	M	M	H	M	L	H	M	H	H	Yes	MH	Y	Y	N	N
16.1 Enhance social stimuli (Common murre)	Common murre	M	M	M	L	L	M	H	H	H	Yes	MR	Y	N	N	N
16.2 Improve physical characteristics of nest sites (Common murre)	Common murre	M	M	Unp	L	L	M	H	H	M	Yes	MR	Y	N	N	N
17.1 Eliminate introduced foxes (for nesting marine birds)	Common Murre	H	N/A	H	H	N/A	H	H	H	H	No	MR	N	Y	Y	N
37.0 Purchase private lands (fee title or less than fee title)	Common murre	M	M	H	M	L	H	H	H	L	No	PR	Y	Y	Y	N
40.0 Special Designations	Common murre	M	M	H	M	L	H	M	H	H	No	PR	Y	Y	N	Y
2.1 Increase fish/shellfish management: species already with plans	Cutthroat trout	M	M	H	L	L	H	M	H	M	Yes	MH	Y	N	N	Y
11.0 Improve freshwater wild salmon spawning/rearing habitats	Cutthroat trout	M	N/A	H	M	M	H	H	H	M	No	MR	Y	Y	Y	Y
14.0 Accelerate recovery of upper intertidal zone	Cutthroat trout	H	N/A	Unp	H	L	H	H	H	M	No	MR	Y	N	N	N
37.0 Purchase private lands (fee title or less than fee title)	Cutthroat trout	N/A	M	H	H	L	H	M	H	L	No	PR	Y	Y	Y	N
40.0 Special Designations	Cutthroat trout	N/A	M	H	H	L	H	M	H	M	No	PR	Y	Y	N	N
2.1 Increase fish/shellfish management: species already with plans	Dolly varden trout	M	M	H	L	L	H	M	H	M	Yes	MH	Y	N	N	Y
11.0 Improve freshwater wild salmon spawning/rearing habitats	Dolly varden trout	M	N/A	H	M	M	H	H	H	M	No	MR	Y	Y	Y	Y
14.0 Accelerate recovery of upper intertidal zone	Dolly varden trout	H	N/A	Unp	H	L	H	H	H	M	No	MR	Y	N	N	N
19.0 Update and expand Alaska's Anadromous Fish Stream Catalog	Dolly varden trout	L	M	H	H	L	H	H	H	M	No	PR	Y	N	N	N
37.0 Purchase private lands (fee title or less than fee title)	Dolly varden trout	N/A	M	H	H	L	H	M	H	L	No	PR	Y	Y	Y	N
40.0 Special Designations	Dolly varden trout	N/A	M	H	H	L	H	M	H	M	No	PR	Y	Y	N	N
8.1 temporarily restrict/close harvest	Harlequin duck	M	M	H	L	L	H	M	H	M	Yes	MH	Y	N	N	Y
13.0 Eliminate oil from mussel beds	Harlequin duck	H	H	H	H	L	M	H	H	M	Yes	MR	Y	N	N	N
37.0 Purchase private lands (fee title or less than fee title)	Harlequin duck	M	H	H	H	L	H	M	H	L	No	PR	Y	Y	Y	N
40.0 Special Designations	Harlequin duck	M	M	H	H	L	H	M	H	M	No	PR	Y	Y	N	N
17.1 Eliminate introduced foxes (for nesting marine birds)	Marbled murrelet	H	N/A	H	H	N/A	H	H	H	H	No	MR	N	Y	Y	N
37.0 Purchase private lands (fee title or less than fee title)	Marbled murrelet	M	M	H	H	L	H	L	H	L	No	PR	Y	Y	Y	N
40.0 Special Designations	Marbled murrelet	M	M	H	H	L	H	L	H	L	No	PR	Y	Y	N	N
17.1 Eliminate introduced foxes (for nesting marine birds)	Pigeon guillemot	H	N/A	H	H	N/A	H	H	H	H	No	MR	N	Y	Y	N
17.2 Reduce predator access to seabird colonies	Pigeon guillemot	M	M	M	L	M	H	H	H	M	No	MR	Y	N	N	Y
37.0 Purchase private lands (fee title or less than fee title)	Pigeon guillemot	L	M	M	H	L	H	M	H	L	No	PR	Y	Y	Y	N
40.0 Special Designations	Pigeon guillemot	L	M	M	H	L	H	M	H	M	No	PR	Y	Y	N	N
2.1 Increase fish/shellfish management: species already with plans	Pink salmon	H	H	M	H	L	H	M	H	M	Yes	MH	Y	N	N	Y
11.0 Improve freshwater wild salmon spawning/rearing habitats	Pink salmon	H	H	H	H	H	H	H	H	M	Yes	MR	Y	Y	Y	Y

Criteria Summary. 1a: Potential to improve the rate or degree of recovery. 1b: Potential to prevent further degradation or decline. 2: Technical feasibility
 3: Degree to which proposed action benefits the more than one resource or service. 4: Degree to which proposed action enhances the resc or svc. 5: Potential
 for NO additional injury to: other target or non-target a: resources; b: services. 6. Potential effects of the proposed action on human health & safety.
 7. Relationship of the expected costs of the proposed action to the expected benefits. 8. Will the restoration opportunity be lost if implementation is delayed?
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part B

Evaluation of Options, order by RESOURCES/SERVICE: DRAFT for RPWG Review

Option	Resource or Service	Criteria										FrWork Alter-native	Settlement Char			
		1a	1b	2	3	4	5a	5b	6	7	8		DR	Rep	AofE	Enh
13.0 Eliminate oil from mussel beds	River otter	H	H	H	H	L	M	H	H	M	Yes	MR	Y	N	N	N
37.0 Purchase private lands (fee title or less than fee title)	River otter	N/A	M	H	H	L	H	M	H	M	No	PR	Y	Y	Y	N
40.0 Special Designations	River otter	N/A	L	H	H	L	H	M	H	M	No	PR	Y	Y	N	N
13.0 Eliminate oil from mussel beds	Sea otter	H	H	H	H	L	M	H	H	H	Yes	MR	Y	N	N	N
2.1 Incease fish/shellfish management: species already with plans	Sockeye salmon	H	H	M	H	L	H	H	H	H	Yes	MH	Y	N	N	Y
11.0 Improve freshwater wild salmon spawning/rearing habitats	Sockeye salmon	H	H	H	H	M	H	H	H	H	Yes	MR	Y	Y	Y	Y
18.1 Establish additional hatchery (salmon) runs	Sockeye salmon	M	M	H	H	M	M	H	H	M	No	MR	Y	Y	N	Y
18.2 Transplant (salmon) hatchery-reared fish to depleted areas	Sockeye salmon	H	L	H	H	L	H	H	H	M	Yes	MR	Y	Y	N	Y
18.3 Wild egg take to establish new runs (salmon)	Sockeye salmon	M	M	H	H	M	M	H	H	M	No	MR	Y	Y	N	Y
19.0 Update and expand Alaska's Anadromous Fish Stream Catalog	Sockeye salmon	L	M	H	H	L	H	H	H	M	No	PR	Y	N	N	N
37.0 Purchase private lands (fee title or less than fee title)	Sockeye salmon	N/A	M	H	H	L	H	M	H	M	No	PR	Y	Y	Y	N
40.0 Special Designations	Sockeye salmon	N/A	L	H	H	L	H	M	H	M	No	PR	Y	Y	N	N

Criteria Summary. 1a: Potential to improve the rate or degree of recovery. 1b: Potential to prevent further degradation or decline. 2: Technical feasibility
 3: Degree to which proposed action benefits the more than one resource or service. 4: Degree to which proposed action enhances the resc or svc. 5: Potential for NO additional injury to: other target or non-target a: resources; b: services. 6. Potential effects of the proposed action on human health & safety.
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Evaluation of Options, order by RESOURCES/SERVICE: DRAFT for RPWG Review

Option	Resource or Service	Criteria										FrWork Alter- native	Settlement Char			
		1a	1b	2	3	4	5a	5b	6	7	8		DR	Rep	AofE	Enh
1.0 Archeological site stewardship program	Archaeology	N/A	H	M	M	L	H	H	H	H	Yes	MH	Y	N	N	N
10.0 Preserve archaeological sites/artifacts	Archaeology	N/A	M	H	L	L	H	H	H	M	Yes	MR	Y	Y	N	N
35.0 Acquire archaeological artifacts from outside the spill area	Archaeology	N/A	N/A	H	L	N/A	M	H	H	L	No	MR	N	Y	N	N
37.0 Purchase private lands (fee title or less than fee title)	Bald eagle	M	H	H	M	L	H	M	H	M	No	PR	Y	Y	Y	N
13.0 Eliminate oil from mussel beds	Coastal habitat: intertidal	M	N/A	H	H	L	M	H	H	M	Yes	MR	Y	N	N	N
14.0 Accelerate recovery of upper intertidal zone	Coastal habitat: intertidal	M	N/A	Unp	H	L	M	H	H	M	No	MR	Y	N	N	N
4.0 Reduce disturbance at marine bird colonies and mammal haulout	Common murre	M	M	H	M	L	H	M	H	H	Yes	MH	Y	Y	N	N
16.1 Enhance social stimuli (Common murre)	Common murre	M	M	M	L	L	M	H	H	H	Yes	MR	Y	N	N	N
16.2 Improve physical characteristics of nest sites (Common murre)	Common murre	M	M	Unp	L	L	M	H	H	M	Yes	MR	Y	N	N	N
17.1 Eliminate introduced foxes (for nesting marine birds)	Common Murre	H	N/A	H	H	N/A	H	H	H	H	No	MR	N	Y	Y	N
37.0 Purchase private lands (fee title or less than fee title)	Common murre	M	M	H	M	L	H	H	H	L	No	PR	Y	Y	Y	N
40.0 Special Designations	Common murre	M	M	H	M	L	H	M	H	H	No	PR	Y	Y	N	Y
2.1 Increase fish/shellfish management: species already with plans	Cutthroat trout	M	M	H	L	L	H	M	H	M	Yes	MH	Y	N	N	Y
11.0 Improve freshwater wild salmon spawning/rearing habitats	Cutthroat trout	M	N/A	H	M	M	H	H	H	M	No	MR	Y	Y	Y	Y
14.0 Accelerate recovery of upper intertidal zone	Cutthroat trout	H	N/A	Unp	H	L	H	H	H	M	No	MR	Y	N	N	N
37.0 Purchase private lands (fee title or less than fee title)	Cutthroat trout	N/A	M	H	H	L	H	M	H	L	No	PR	Y	Y	Y	N
40.0 Special Designations	Cutthroat trout	N/A	M	H	H	L	H	M	H	M	No	PR	Y	Y	N	N
2.1 Increase fish/shellfish management: species already with plans	Dolly varden trout	M	M	H	L	L	H	M	H	M	Yes	MH	Y	N	N	Y
11.0 Improve freshwater wild salmon spawning/rearing habitats	Dolly varden trout	M	N/A	H	M	M	H	H	H	M	No	MR	Y	Y	Y	Y
14.0 Accelerate recovery of upper intertidal zone	Dolly varden trout	H	N/A	Unp	H	L	H	H	H	M	No	MR	Y	N	N	N
19.0 Update and expand Alaska's Anadromous Fish Stream Catalog	Dolly varden trout	L	M	H	H	L	H	H	H	M	No	PR	Y	N	N	N
37.0 Purchase private lands (fee title or less than fee title)	Dolly varden trout	N/A	M	H	H	L	H	M	H	L	No	PR	Y	Y	Y	N
40.0 Special Designations	Dolly varden trout	N/A	M	H	H	L	H	M	H	M	No	PR	Y	Y	N	N
40.0 Special Designations	Harbor seal	H	H	H	H	L	H	M	H	H	Yes	PR	Y	Y	N	N
8.1 temporarily restrict/close harvest	Harlequin duck	M	M	H	L	L	H	M	H	M	Yes	MH	Y	N	N	Y
13.0 Eliminate oil from mussel beds	Harlequin duck	H	H	H	H	L	M	H	H	M	Yes	MR	Y	N	N	N
37.0 Purchase private lands (fee title or less than fee title)	Harlequin duck	M	H	H	H	L	H	M	H	L	No	PR	Y	Y	Y	N
40.0 Special Designations	Harlequin duck	M	M	H	H	L	H	M	H	M	No	PR	Y	Y	N	N
17.1 Eliminate introduced foxes (for nesting marine birds)	Marbled murrelet	H	N/A	H	H	N/A	H	H	H	H	No	MR	N	Y	Y	N
37.0 Purchase private lands (fee title or less than fee title)	Marbled murrelet	M	M	H	H	L	H	L	H	L	No	PR	Y	Y	Y	N
40.0 Special Designations	Marbled murrelet	M	M	H	H	L	H	L	H	L	No	PR	Y	Y	N	N
17.1 Eliminate introduced foxes (for nesting marine birds)	Pigeon guillemot	H	N/A	H	H	N/A	H	H	H	H	No	MR	N	Y	Y	N
17.2 Reduce predator access to seabird colonies	Pigeon guillemot	L	M	M	L	M	H	H	H	M	No	MR	Y	N	N	Y
37.0 Purchase private lands (fee title or less than fee title)	Pigeon guillemot	L	M	M	H	L	H	M	H	L	No	PR	Y	Y	Y	N
40.0 Special Designations	Pigeon guillemot	L	M	M	H	L	H	M	H	M	No	PR	Y	Y	N	N

Criteria Summary. 1a: Potential to improve the rate or degree of recovery. 1b: Potential to prevent further degradation or decline. 2: Technical feasibility
 3: Degree to which proposed action benefits the more than one resource or service. 4: Degree to which proposed action enhances the resc or svc. 5: Potential
 for NO additional injury to; other target or non-target a: resources; b: services. 6. Potential effects of the proposed action on human health & safety.
 7. Relationship of the expected costs of the proposed action to the expected benefits. 8. Will the restoration opportunity be lost if implementation is delayed?

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Part C

Evaluation of Options, order by RESOURCES/SERVICE: DRAFT for RPWG Review

Option	Resource or Service	Criteria										FrWork Alter- native	Settlement Char			
		1a	1b	2	3	4	5a	5b	6	7	8		DR	Rep	AofE	Enh
2.1 Incease fish/shellfish management: species already with plans	Pink salmon	H	H	M	H	L	H	M	H	M	Yes	MH	Y	N	N	Y
11.0 Improve freshwater wild salmon spawning/rearing habitats	Pink salmon	H	H	H	H	H	H	H	H	M	Yes	MR	Y	Y	Y	Y
13.0 Eliminate oil from mussel beds	River otter	H	H	H	H	L	M	H	H	M	Yes	MR	Y	N	N	N
37.0 Purchase private lands (fee title or less than fee title)	River otter	N/A	M	H	H	L	H	M	H	M	No	PR	Y	Y	Y	N
40.0 Special Designations	River otter	N/A	L	H	H	L	H	M	H	M	No	PR	Y	Y	N	N
13.0 Eliminate oil from mussel beds	Sea otter	H	H	H	H	L	M	H	H	H	Yes	MR	Y	N	N	N
2.1 Incease fish/shellfish management: species already with plans	Sockeye salmon	H	H	M	H	L	H	H	H	H	Yes	MH	Y	N	N	Y
11.0 Improve freshwater wild salmon spawning/rearing habitats	Sockeye salmon	H	H	H	H	M	H	H	H	H	Yes	MR	Y	Y	Y	Y
18.1 Establish additional hatchery (salmon) runs	Sockeye salmon	M	M	H	H	M	M	H	H	M	No	MR	Y	Y	N	Y
18.2 Transplant (salmon) hatchery-reared fish to depleted areas	Sockeye salmon	H	L	H	H	L	H	H	H	M	Yes	MR	Y	Y	N	Y
18.3 Wild egg take to establish new runs (salmon)	Sockeye salmon	M	M	H	H	M	M	H	H	M	No	MR	Y	Y	N	Y
19.0 Update and expand Alaska's Anadromous Fish Stream Catalog	Sockeye salmon	L	M	H	H	L	H	H	H	M	No	PR	Y	N	N	N
37.0 Purchase private lands (fee title or less than fee title)	Sockeye salmon	N/A	M	H	H	L	H	M	H	M	No	PR	Y	Y	Y	N
40.0 Special Designations	Sockeye salmon	N/A	L	H	H	L	H	M	H	M	No	PR	Y	Y	N	N

Criteria Summary. 1a: Potential to improve the rate or degree of recovery. 1b: Potential to prevent further degradation or decline. 2: Technical feasibility
 3: Degree to which proposed action benefits the more than one resource or service. 4: Degree to which proposed action enhances the resc or svc. 5: Potential
 for NO additional injury to: other target or non-target a: resources; b: services. 6. Potential effects of the proposed action on human health & safety.
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October 8, 1992

RPWG'S FIRST DRAFT OF POSSIBLE ALTERNATIVE 4

Part A.

Do all effective things (criteria 1a or 1b = M or H) for resources that we are certain were injured severely (i.e., population level injury - Spies' class 1 or 2) and are not recovering or recovery is uncertain at a population level for adults.

Resources included: Archaeology, Common Murres, Coastal Habitat: intertidal, Cutthroat trout, Dolly Varden trout, Harlequin duck, Marbled murrelet, Pigeon guillemots, Sea otter, Sockeye salmon,

Do all effective things for services: (criteria 1a or 1b = M or H) and (5b not equal L)

Services included: Subsistence, Recreation (the other services are included below)

Do all effective things for Resources that Services depend on:
(1a or 1b = H or M) and (5b not equal L)

Resources included: Pink salmon, Herring, Rockfish, Harbor seals, River otter, Brown Bear.

Part B.

For all resources not addressed in A above, do only highly effective things (1a or 1b = H), and 5b = H.

The only resources not in Part A are Bald Eagle, Black Oystercatcher, and Killer whale. For these resources, there are no options that meet the test in Part B.

Part C.

Include things that are highly effective at enhancing resources or services listed in A above.
Sort = Resources in A, and criteria 4 = H.

Resources included: See A above.

Evaluation of Options, order by RESOURCES/SERVICE: DRAFT for RPWG Review

Option	Resource or Service	Criteria										FrWork Alter- native	Settlement Char			
		1a	1b	2	3	4	5a	5b	6	7	8		DR	Rep	AofE	Enh
1.0 Archeological site stewardship program	Archaeology	N/A	H	M	M	L	H	H	H	H	Yes	MH	Y	N	N	N
10.0 Preserve archaeological sites/artifacts	Archaeology	N/A	M	H	L	L	H	H	H	M	Yes	MR	Y	Y	N	N
13.0 Eliminate oil from mussel beds	Coastal habitat: intertidal	M	N/A	H	H	L	M	H	H	M	Yes	MR	Y	N	N	N
14.0 Accelerate recovery of upper intertidal zone	Coastal habitat: intertidal	M	N/A	Unp	H	L	M	H	H	M	No	MR	Y	N	N	N
4.0 Reduce disturbance at marine bird colonies and mammal haulout	Common murre	M	M	H	M	L	H	M	H	H	Yes	MH	Y	Y	N	N
16.1 Enhance social stimuli (Common murre)	Common murre	M	M	M	L	L	M	H	H	H	Yes	MR	Y	N	N	N
16.2 Improve physical characteristics of nest sites (Common murre)	Common murre	M	M	Unp	L	L	M	H	H	M	Yes	MR	Y	N	N	N
17.1 Eliminate introduced foxes (for nesting marine birds)	Common Murre	H	N/A	H	H	N/A	H	H	H	H	No	MR	N	Y	Y	N
37.0 Purchase private lands (fee title or less than fee title)	Common murre	M	M	H	M	L	H	H	L	L	No	PR	Y	Y	Y	N
40.0 Special Designations	Common murre	M	M	H	M	L	H	M	H	H	No	PR	Y	Y	N	Y
2.1 Increase fish/shellfish management: species already with plans	Cutthroat trout	M	M	H	L	L	H	M	H	M	Yes	MH	Y	N	N	Y
11.0 Improve freshwater wild salmon spawning/rearing habitats	Cutthroat trout	M	N/A	H	M	M	H	H	H	M	No	MR	Y	Y	Y	Y
14.0 Accelerate recovery of upper intertidal zone	Cutthroat trout	H	N/A	Unp	H	L	H	H	H	M	No	MR	Y	N	N	N
19.0 Update and expand Alaska's Anadromous Fish Stream Catalog	Cutthroat trout	L	M	H	H	L	H	H	H	M	No	PR	Y	N	N	N
37.0 Purchase private lands (fee title or less than fee title)	Cutthroat trout	N/A	M	H	H	L	H	M	H	L	No	PR	Y	Y	Y	N
40.0 Special Designations	Cutthroat trout	N/A	M	H	H	L	H	M	H	M	No	PR	Y	Y	N	N
2.1 Increase fish/shellfish management: species already with plans	Dolly varden trout	M	M	H	L	L	H	M	H	M	Yes	MH	Y	N	N	Y
11.0 Improve freshwater wild salmon spawning/rearing habitats	Dolly varden trout	M	N/A	H	M	M	H	H	H	M	No	MR	Y	Y	Y	Y
14.0 Accelerate recovery of upper intertidal zone	Dolly varden trout	H	N/A	Unp	H	L	H	H	H	M	No	MR	Y	N	N	N
19.0 Update and expand Alaska's Anadromous Fish Stream Catalog	Dolly varden trout	L	M	H	H	L	H	H	H	M	No	PR	Y	N	N	N
37.0 Purchase private lands (fee title or less than fee title)	Dolly varden trout	N/A	M	H	H	L	H	M	H	L	No	PR	Y	Y	Y	N
40.0 Special Designations	Dolly varden trout	N/A	M	H	H	L	H	M	H	M	No	PR	Y	Y	N	N
8.1 temporarily restrict/close harvest	Harlequin duck	M	M	H	L	L	H	M	H	M	Yes	MH	Y	N	N	Y
13.0 Eliminate oil from mussel beds	Harlequin duck	H	H	H	H	L	M	H	H	M	Yes	MR	Y	N	N	N
37.0 Purchase private lands (fee title or less than fee title)	Harlequin duck	M	H	H	H	L	H	M	H	L	No	PR	Y	Y	Y	N
40.0 Special Designations	Harlequin duck	M	M	H	H	L	H	M	H	M	No	PR	Y	Y	N	N
17.1 Eliminate introduced foxes (for nesting marine birds)	Marbled murrelet	H	N/A	H	H	N/A	H	H	H	H	No	MR	N	Y	Y	N
37.0 Purchase private lands (fee title or less than fee title)	Marbled murrelet	M	M	H	H	L	H	L	H	L	No	PR	Y	Y	Y	N
40.0 Special Designations	Marbled murrelet	M	M	H	H	L	H	L	H	L	No	PR	Y	Y	N	N
17.1 Eliminate introduced foxes (for nesting marine birds)	Pigeon guillemot	H	N/A	H	H	N/A	H	H	H	H	No	MR	N	Y	Y	N
17.2 Reduce predator access to seabird colonies	Pigeon guillemot	M	M	M	L	M	H	H	H	M	No	MR	Y	N	N	Y
37.0 Purchase private lands (fee title or less than fee title)	Pigeon guillemot	L	M	M	H	L	H	M	H	L	No	PR	Y	Y	Y	N
40.0 Special Designations	Pigeon guillemot	L	M	M	H	L	H	M	H	M	No	PR	Y	Y	N	N
13.0 Eliminate oil from mussel beds	Sea otter	H	H	H	H	L	M	H	H	H	Yes	MR	Y	N	N	N
2.1 Increase fish/shellfish management: species already with plans	Sockeye salmon	H	H	M	H	L	H	H	H	H	Yes	MH	Y	N	N	Y

Criteria Summary. 1a: Potential to improve the rate or degree of recovery. 1b: Potential to prevent further degradation or decline. 2: Technical feasibility
 3: Degree to which proposed action benefits the more than one resource or service. 4: Degree to which proposed action enhances the resc or svc. 5: Potential
 for NO additional injury to: other target or non-target a: resources; b: services. 6. Potential effects of the proposed action on human health & safety.
 7. Relationship of the expected costs of the proposed action to the expected benefits. 8. Will the restoration opportunity be lost if implementation is delayed?
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Evaluation of Options, order by RESOURCES/SERVICE: DRAFT for RPWG Review

Option	Resource or Service	Criteria											FrWork Alter- native	Settlement Char			
		1a	1b	2	3	4	5a	5b	6	7	8	DR		Rep	AofE	Enh	
11.0 Improve freshwater wild salmon spawning/rearing habitats	Sockeye salmon	H	H	H	H	M	H	H	H	H	Yes	MR	Y	Y	Y	Y	
18.1 Establish additional hatchery (salmon) runs	Sockeye salmon	M	M	H	H	M	M	H	H	M	No	MR	Y	Y	N	Y	
18.2 Transplant (salmon) hatchery-reared fish to depleted areas	Sockeye salmon	H	L	H	H	L	H	H	H	M	Yes	MR	Y	Y	N	Y	
18.3 Wild egg take to establish new runs (salmon)	Sockeye salmon	M	M	H	H	M	M	H	H	M	No	MR	Y	Y	N	Y	
19.0 Update and expand Alaska's Anadromous Fish Stream Catalog	Sockeye salmon	L	M	H	H	L	H	H	H	M	No	PR	Y	N	N	N	
37.0 Purchase private lands (fee title or less than fee title)	Sockeye salmon	N/A	M	H	H	L	H	M	H	M	No	PR	Y	Y	Y	N	

Criteria Summary. 1a: Potential to improve the rate or degree of recovery. 1b: Potential to prevent further degradation or decline. 2: Technical feasibility
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Option	Resource or Service	Criteria											FrWork Alter- native	Settlement Char			
		1a	1b	2	3	4	5a	5b	6	7	8	DR		Rep	AofE	Enh	
8.1 temporarily restrict/close harvest	Brown bear	L	M	H	L	M	H	M	H	M	No	MH	Y	N	N	Y	
4.0 Reduce disturbance at marine bird colonies and mammal haulout	Harbor seal	H	H	H	L	L	H	M	H	H	Yes	MH	Y	Y	N	N	
8.2 educate public to voluntarily restrict harvest (sport, subsist.)	Harbor seal	H	H	M	L	L	H	M	H	M	Yes	MH	Y	N	N	Y	
40.0 Special Designations	Harbor seal	H	H	H	H	L	H	M	H	H	Yes	PR	Y	Y	N	N	
2.1 Increase fish/shellfish management: species already with plans	Pink salmon	H	H	M	H	L	H	M	H	M	Yes	MH	Y	N	N	Y	
11.0 Improve freshwater wild salmon spawning/rearing habitats	Pink salmon	H	H	H	H	H	H	H	H	M	Yes	MR	Y	Y	Y	Y	
18.3 Wild egg take to establish new runs (salmon)	Pink salmon	M	M	H	H	H	L	H	H	M	No	MR	Y	Y	N	Y	
19.0 Update and expand Alaska's Anadromous Fish Stream Catalog	Pink salmon	L	M	H	H	L	H	H	H	M	No	PR	Y	N	N	N	
37.0 Purchase private lands (fee title or less than fee title)	Pink salmon	L	M	H	H	L	H	M	H	M	No	PR	Y	Y	Y	N	
28.0 Acquire access for sport-fishing and recreation	Recreation: backcountry developed	M	H	H	M	M	M	H	H	M	No	MH	N	Y	Y	Y	
13.0 Eliminate oil from mussel beds	River otter	H	H	H	H	L	M	H	H	M	Yes	MR	Y	N	N	N	
37.0 Purchase private lands (fee title or less than fee title)	River otter	N/A	M	H	H	L	H	M	H	M	No	PR	Y	Y	Y	N	
30.0 Test subsistence foods for hydrocarbon contamination	Subsistence	H	N/A	H	L	L	H	H	H	H	No	MH	Y	N	N	N	

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July 1992

Evaluation of Options, order by RESOURCES/SERVICE: DRAFT for RPWG Review

Option	Resource or Service	Criteria										FrWork Alter- native	Settlement Char				
		1a	1b	2	3	4	5a	5b	6	7	8		DR	Rep	AofE	Enh	
11.0 Improve freshwater wild salmon spawning/rearing habitats	Pink salmon	H	H	H	H	H	H	H	H	H	M	Yes	MR	Y	Y	Y	Y
18.1 Establish additional hatchery (salmon) runs	Pink salmon	L	L	H	H	H	L	L	H	L	No	MR	Y	Y	N	Y	
18.2 Transplant (salmon) hatchery-reared fish to depleted areas	Pink salmon	L	L	H	H	H	L	L	H	L	No	MR	Y	Y	N	Y	
18.3 Wild egg take to establish new runs (salmon)	Pink salmon	M	M	H	H	H	L	H	H	M	No	MR	Y	Y	N	Y	
12.2 New commercial, (lodge, fuel facilities) recreation facilities	Recreation: backcountry developed	N/A	N/A	H	M	H	L	H	H	M	No	MH	N	N	Y	Y	
37.0 Purchase private lands (fee title or less than fee title)	Recreation: backcountry developed	N/A	H	H	H	H	H	L	H	M	No	PR	Y	Y	Y	Y	
37.0 Purchase private lands (fee title or less than fee title)	Recreation: undeveloped	N/A	H	H	H	H	H	L	H	M	No	PR	Y	Y	Y	Y	

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**RESTORATION PLANNING WORK GROUP
EXXON VALDEZ OIL SPILL OFFICE**
**645 "G" STREET
ANCHORAGE, ALASKA 99501**

TO: Restoration Team

DATE: February 24, 1993

FROM: Bob Loeffler, Co-Chair
John Strand, Co-Chair
Restoration Planning Work Group

SUBJECT: Alternatives Information Package (Brochure) Schedule

Attached for your review and comment is RPWG's draft schedule for final production and publication of the subject brochure. This schedule assumes that the text will be submitted to the Trustee Council for their review and approval. It also assumes a quick turnaround from the RT early the first week in March, and it significantly decreases the 10-day review window previously requested by the Trustee Council. Given that we received general Trustee Council approval of the alternatives at the February 16th Meeting, are we necessarily required to go back to the Council for an additional round of review and approval before publishing the brochure? If not, the RT could undertake a more thorough review of the document and play a more active role in its revision, if necessary. Please note that we also have scheduled a peer review of our draft product.

Attachment

cc: RPWG

DRAFT

ALTERNATIVES INFORMATION PACKAGE (BROCHURE)

SCHEDULE FOR COMPLETION

<u>Date</u>	<u>Activity</u>
02/26/93	Complete draft of brochure; submit text to Editor
03/01/93	Edited text reviewed by RPWG
03/02/93	Submit text for RT and outside peer review
03/04/93	Review comments from RT and peer reviewers; begin revision
03/05/93	Revision completed; submit text for Trustee Council review and approval
03/10/93	Review comments from Trustee Council; begin revision
03/12/93	Revision completed; submit Trustee Council changes to Editor
03/15/93	Edited text reviewed by RPWG; begin preparation of camera-ready copy
03/24/93	Camera-ready copy completed and forwarded to printer
03/31/93	Brochure released to the public