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Department of the Interior
OFFICE OF THE SECRETARY
Office of Environmental Affairs - Alaska

NOTE

March 25, 1993

TO: Exxon Valdez Oil Spill Public Advisory Group

FROM: Doug Mutter, Designated Federal Officer

RE: Nominations for Alternate Members

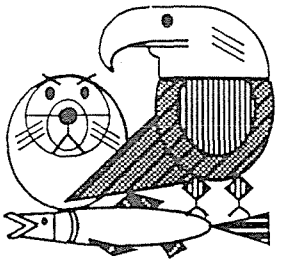
The Trustee Council approved the appointment of alternates to Public Advisory Group (PAG) members, pending amendment of the PAG Charter. The Charter amendment process has been initiated and will be completed when the Secretary of the Interior has signed and filed the amended Charter. Until that process is completed, alternates will not have voting rights.

To obtain Trustee Council approval of an alternate (which then goes to the Trustees and the Secretary of the Interior for official appointment), a PAG member must submit a packet of information about the nominated alternate. Some PAG members have already submitted some of this information (see attached status list, noting what information we already have). If any PAG member wishes to designate an alternate who will have full responsibilities at a meeting when the PAG member is absent, they must have the nominated alternate complete the information packet and answer the conflict of interest questions, as identified in the attached procedures. This should be submitted to Doug Mutter (at Department of the Interior, 1689 C Street Room 119, Anchorage, AK 99501) by Friday, April 23, 1993, in order to be incorporated into a package for consideration by the Trustee Council at their next meeting.

Please include the alternate's name, address, telephone number and social security number (for use only by the Designated Federal Officer in approving travel).

Exxon Valdez Oil Spill Trustee Council

Restoration Office
645 "G" Street, Anchorage, AK 99501
Phone: (907) 278-8012 Fax: (907) 276-7178



Exxon Valdez Oil Spill
Public Advisory Group

Procedure for Designation of an Alternate

Public Advisory Group members may recommend an alternate for their position. All alternates must be approved by the Trustee Council. The information described below should be submitted to the Trustee Council. From these nominations, the Trustee Council may select a designated alternate for each member or the Trustee Council may request additional nominations. The Trustee Council will forward their recommendations to the Trustees. Following approval by the Trustees, the Secretary of the Interior will officially appoint those alternates approved by the Trustees. When appointed, alternates may substitute for the official Public Advisory Group member at a particular meeting and will have all the responsibilities of the member they represent.

The information requested below shall be prepared by the nominee for alternate and submitted by the Public Advisory Group member to the Interim Administrative Director at the address above. Questions should be directed to Dave Gibbons, Interim Administrative Director, at 907/278-8012; or to Doug Mutter, Public Advisory Group Designated Federal Officer, at 907/271-5011.

Information Packet

Nominees for an alternate to a Public Advisory Group member should provide the following information:

- A biographical sketch (education, experience, address, telephone);
- Information about the nominee's knowledge of the region, peoples or principal economic and social activities of the area affected by the *Exxon Valdez* oil spill, or expertise in public lands and resource management;
- Information about the nominee's relationship/involvement with the principal interest to be represented;
- A statement explaining any unique contributions the nominee will make to the Public Advisory Group and why the nominee should be appointed to serve as an alternate; and
- Any additional relevant information that would assist the Trustee Council in making a recommendation.

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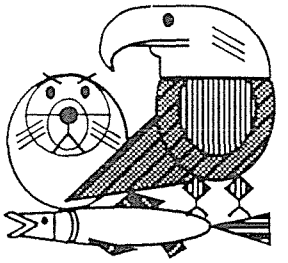

Conflict of Interest

Public Advisory Group members and their alternates are chosen to represent a broad range of interests. It is possible that action could be taken by the Public Advisory Group when one or more of the members have a direct personal conflict of interest which would prejudice and call into question the entire public process. To avoid this eventuality and to enable the Trustee Council to choose appropriate individuals as alternates to Public Advisory Group members, it is necessary that each nominee for alternate provide the following information with their information packet. If the answer to any of these questions is yes, please provide a brief explanation of your answer. A yes will not necessarily preclude any nominee from being appointed to serve as an alternate to a member of the Public Advisory Group.

- Do you, your spouse, children, any relative with whom you live or your employer have, or are you defending, a claim filed before any court or administrative tribunal based upon damages caused by the *Exxon Valdez* oil spill?

- Do you, your spouse, children, any relative with whom you live or your employer own any property or interest in property which has been, or is likely to be, proposed for acquisition by the Trustee Council?

- Have you, your spouse, children, any relative with whom you live or your employer submitted, or likely will submit, a proposal for funding by the Trustee Council?

- Do you know of any other potential actions of the Trustee Council or the Public Advisory Group to have a direct bearing on the financial condition of yourself, your spouse, children, other relative with whom you live or your employer?

Exxon Valdez Oil Spill

Public Advisory Group Designated Alternates

Status of Information as of March 24, 1993

Member	Alternate	Bio or Resume	EVOS knowledge	Relation to interest	Why select	Conflict answers
Rupert Andrews						
Pamela Brodie						
James Cloud						
James Diehl						
Richard Eliason						
Donna Fischer	Dave Beck (Valdez)	have	have	---	---	---
John French	Brenda Norcross (Fairbanks)	---	have	---	---	---
Paul V. Gavora	Donald McCumby (Fairbanks)	have	---	---	---	---
James King	David Cline (Anchorage)	---	---	---	---	---
Richard Knecht						
Vern C. McCorkle						
Gerald McCune	Mary McBurney (Cordova)	---	---	---	---	---
John McMullen	Dan Warren (Anchorage)	---	---	have	---	---
Brad Phillips	Bill Elander (Anchorage)	have	---	have	---	---
John Sturgeon	Kimberley Benton (Anchorage)	---	have	have	---	---
Charles Totemoff	Gail Evanoff (Chenega)	have	have	have	---	---
Lew Williams Jr.	Sharon Gagnon (Anchorage)	have	---	---	---	---

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

MEMORANDUM

TO: RPWG Members **DATE:** November 30, 1992

THROUGH: John Strand, Chairman

FROM: Veronica Gilbert
Mark Fraker

SUBJECT: Cost

In this memo we describe a methodology for developing cost estimates for the options evaluation process. At the end of the memo we ask for your help in refining the proposed methodology and the cost estimates themselves. We need your contribution no later that noon, Friday, December 4 because the EIS contractors require this information as soon as possible.

Our best estimates of the cost of restoration options are contained in the attached spreadsheet. The source of these estimates is the compendium of options summaries published on the network. We have taken pains to retrace the genesis of these options from their first drafts early last summer to the latest combinations.

The spreadsheet includes 40 options and suboptions. Each option or suboption is assigned an annual cost and duration in years. These attributes are expressed as the expected value (or mean), lower range, and upper range. Total cost is computed by multiplying annual cost by duration.

We would like to discuss in some detail our methodology for presenting options and suboptions, estimates of annual cost, and estimates of duration; and mention a note on units of measurement. Then we specify the information we need from you, indicating the RPWG member responsible for writing the option summary. Finally, we describe the next steps and schedule for completing this task.

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I. Options and Suboptions

A. The spreadsheet addresses 40 options and suboptions.

B. Thirty-four (34) of the options are those RPWG has been considering for months.

C. Option 28 (Acquisition of access) has been incorporated into option 37 (Purchase private land) and renamed "Habitat Protection and Acquisition" at the request of the Habitat Protection Work Group.

D. Two new options for subsistence have been included at ADFG's request. We have assigned them numbers 41.0 and 42.0.

41.0	Subsistence mariculture
42.0	Access to new subsistence resources

E. On the last page of the spreadsheet we have listed four programmatic options, which probably won't vary across alternatives. However, because they represent substantial amounts of money and there appears to be substantial interest in them, their costs should be estimated.

P1.	Administration
P2.	Monitoring
P3.	Education/public information
P4.	Agency management

F. Because Options 40.0 (Special designations), P3 (Education/Public Information), and P4 (Agency Management) now consist of a combination of many older options for which cost had been estimated, we retained the detail of earlier components so the reviewers could determine which of the earlier estimates are still valid. However, this level of detail need not be retained in the final report.

II. Annual Cost

A. Expected value of annual cost = mean of lower and upper cost estimates. However, in some cases it is derived from multi-year estimates, e.g. $120,000 over 3 years = $40,000/year.) In actuality most of the money may be needed in the first year and less in subsequent years. This level of refinement will be tackled in the annual work plans.

B. We have separated initial costs from continuation costs and addressed each on a separate line underneath the name of the option or suboption. For example, construction is separated from maintenance [see option 12.1], planning and designation from implementation [see option 40.0], and start-up from continuation [see options 16.1 and 16.2]. In this way we can easily differentiate the duration and total cost of the initial part of a project from the duration and cost of its continuation.

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III. Duration

A. Some of the options summaries specify a limited duration, e.g., 5 years. Others imply ongoing activities, e.g., 1.1 (Archaeological site stewardship program) and P4 (Agency management). Still others state that the project will continue until the resource recovers.

B. Unless the option summary indicates a specific number of years we have set the expected value of the duration of the option at "1 year." Please specify otherwise if you have better information. The lower- and upper-range columns are to be used to express uncertainty.

C. For those projects whose duration depends on recovery of species we intend to use the figures Karen Klinge is gathering for each option through her telephone surveys of peer reviewers.

IV. Units of Measurement

A. Costs

1. All costs are expressed in units of $1,000.

2. For simplicity, all costs are expressed in 1993 dollars with a note that the present value of the settlement is about $600 million. The alternative is to estimate a start date of each project and project future costs using an average rate of inflation of about 4%. We thought the simpler method we have recommended is sufficient provided everyone thinks in terms of $600 million instead of $1 billion.

3. We had discussed the possibility of expressing costs in broad categories, e.g., up to $250.0, $250.0-$500.0, $500.0-$1,000.0, etc. However, of the 40 options and suboptions being considered, we have at least partial estimates for 30. Some of these estimates appear to be expressed as an order of magnitude, e.g., $250.0-$300.0; others are quite precise, e.g., $143.8. Through its inclusion of lower and upper ranges for both annual costs and duration, the spreadsheet gives ample latitude to express cost as a broad category. We do not propose to standardize the cost categories that could be selected.

4. Cost estimates for only two of the options are expressed per unit, specifically, 17.1 (COST PER ISLAND) and 40.0 (Modify management plans and policies - COST PER PLAN). This convention is used only because the options summary estimated cost per unit. However, this measure of cost can only be used if the peer reviewers assess the effectiveness of the options using the same unit of measurement.

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B. Duration

1. Duration is in years. If partial years are specified the figure is rounded up to the nearest whole number.

2. The options summaries expressed no estimates for lower and upper ranges of duration. However, for ease of computation we copied the expected value of duration into cells for lower and upper ranges whenever lower and upper ranges of annual cost were expressed. The expected value of total cost could then be computed as the expected value of annual cost times expected value of duration; lower range of total cost could be computed as the lower value of annual cost times the lower value of duration; etc. As we refine this spreadsheet with more informed estimates of both cost and duration we expect the values for lower and upper ranges to become more meaningful.

Requests of RPWG Members

We need the following contributions from RPWG members:

1. Please review the proposed methodology and submit comments to Veronica.

2. Please fill in the blanks and, if necessary, modify old information for each of the options summaries for which you were responsible. To jog your memory, we have noted on the far right of the attached spreadsheet the name of the staff primarily responsible for each options summary. Because no one had been closely associated with P1 (Administration) it has been assigned to Veronica.

Unfortunately, we need your contributions by noon Friday, December 4 because the EIS contractors need this information by then.

Next Steps

During the week of December 7 we plan to submit this methodology to peer review. During the week of December 14 we plan to make final changes in the cost element and submit it to us all for use in the options evaluation process. We will then depart for the holidays with a clear conscience.

Thank you.

Attachment

Option	Description	Annual Cost			Duration (Yrs.)			Total Cost			
		Exp	Lower	Upper	Exp	Lower	Upper	Exp	Lower	Upper	
1.1	Archaeological site stewardship program	135.0			1			135.0			Sandy
2.0	Fish management plans - pink salmon	4,043.0			4			16172.0			Mark/Chris
2.0	Fish management plans - sockeye salmon	813.0			5			4065.0			
2.0	Fish management plans - dolly varden/cutthroat trout	236.0			4			944.0			
2.0	Fish management plans - pacific herring	456.6			4			1826.4			
2.0	Fish management plans - rockfish	593.0			4			2372.0			
4.3	Reduce disturbance at marine bird bolonies, marine mammal haul-out sites and rubbing beaches.										Karen
8.1	Temporarily restrict or close harvests of injured species.				1						Carol
8.2	Educate public to encourage voluntary reductions of subsistence harvest levels.	143.8			1			143.8			Karen
8.3	Educate public to encourage voluntary reductions of sport harvest and trapping levels.										Chris
9.0	Minimize incidental take of marine birds by commercial fisheries.	275.0	250.0	300.0	1	1	1	275.0	250.0	300.0	Mark
10.0	Preservation of archaeological sites and artifacts.	300.0			3			900.0			Sandy
11.1	Supplement fry production using such methods as egg boxes and net pens for fry rearing.	579.0			6			3474.0			Mark/Chris
11.2	Improve access to spawning areas (e.g., fish passes, remove barriers).	481.0			3			1443.0			
11.3	Improve spawning and rearing habitat (e.g., create spawning channels, add woody debris, improve substrate, lake fertilization).	800.0			6			4800.0			
12.1	Construct new public recreation facilities.										Ray
	1) Construction										
	2) Maintenance										
12.2	Planning for and marketing public land for new commercial facilities.										Ray
13.0	Eliminate sources of persistent contamination from mussel beds.	344.8			2			689.6			John/Art
14.0	Accelerate recovery of upper intertidal zone.	156.2			2			312.4			John/Art
15.0	Supplement intertidal substrates for spawning herring.	256.0			5			1280.0			Mark/Chris

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NB: All costs are expressed in units of $1,000 (1993 $). The present value of the settlement is about $600 million.

Option	Description	Annual Cost			Duration (Yrs.)			Total Cost			
		Exp	Lower	Upper	Exp	Lower	Upper	Exp	Lower	Upper	
16.1	Restore murre productivity through enhancing social stimuli.										
	1) Initial year	250.0			1			250.0			Karen
	2) Continuation	150.0									
16.2	Restore murre productivity through improving physical characteristics										
	1) Initial year	250.0			1			250.0			Karen
	2) Continuation	150.0									
17.1	Eliminate introduced foxes from islands important to nesting birds. COST PER ISLAND	140.0			5			700.0			Carol
17.2	Reduce predator access to seabird colonies.										
	1) Initial year	350.0			1			350.0			Karen
	2) Continuation	150.0									
18.1	Establish additional hatchery runs.	784.0			1			784.0			Mark/Chris
18.2	Transplant hatchery-reared fish to depleted areas.	472.0			2			944.0			
18.3	Use wild egg takes from noninjured streams.	615.0			1			615.0			
19.0	Update and expand the state's Anadromous Stream Catalogue.	259.0			1			259.0			
30.0	Test subsistence foods for hydrocarbon contamination.	100.0			1			100.0			
33.2	Visitor center										Sandy
34.0	Marine environmental institute										Art
35.0	Identify institutions and individuals with artifacts from the spill area and offer to purchase specific pieces for the public.	225.0	150.0	300.0	3	3	3	675.0	450.0	900.0	Sandy
37.0	Habitat protection and acquisition										Art

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Option	Description	Annual Cost			Duration (Yrs.)			Total Cost		
		Exp	Lower	Upper	Exp	Lower	Upper	Exp	Lower	Upper
40.0	Special designations									
	1) Designate the Nellie Juan-College Fjord Wilderness area as				1					
	2) Designate a portion of the Chugach National Forest as a National Recreation Area				1					
	3) Designate new Alaska State Parks	22.3	8.0	36.7	3	3	3	67.0	24.0	110.0
	Implement park management plan and enforce regulations	60.0								
	4) Designate new ADFG special areas	35.0			2			70.0		
	Implement special area management plan and enforce regulations	12.0								
	5) Designate National Marine Sanctuary	166.7			3			500.1		
	6) Designate National Estuarine Reserves									
	7) Modify management plans and policies COST PER PLAN	125.0	50.0	200.0	2	2	2	250.0	100.0	400.0
	8) Designate National Estuarine Research Reserve Sites	33.3			2			66.7		
	Subtotal	454.4								
41.0	Subsistence mariculture	589.0			4			2356.0		
42.0	Access to new subsistence resources	53.0			3			159.0		
P1	Administration									
P2	Monitoring									
	1) Design	250.0			1			250.0		
	2) Implement									
P3	Education /public information									
	1) Archaeology resource protection - expand public education efforts	150.0	100.0	200.0	1			150.0		
	2) Educate tour- and charter-boat operators about the need for, and ways to decrease disturbance near sensitive marine bird and mammal use	40.0	30.0	50.0	1	1	1	40.0	30.0	50.0
	3) Use public education to encourage conservation for sport-fishing	20.0	15.0	25.0	2	2	2	40.0	30.0	50.0
	4) Educate public about minimizing their impacts on recovering	25.0			2			50.0		
	5) Develop program to provide and distribute updated information and educational products	100.0			1			100.0		
	Subtotal	335.0								

Chris/Sandy

Mark/Chris ↓ Veronica

John

Sandy

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Option	Description	Annual Cost			Duration (Yrs.)			Total Cost		
		Exp	Lower	Upper	Exp	Lower	Upper	Exp	Lower	Upper
P4	Agency management									
	1) Archaeology resource protection	390.0			1			390.0		
	2) Increase field presence of trustee agencies to enforce federal and state laws designed to reduce distubance at marine bird colonies, marine mammal haul-out areas, and rubbing beaches .	438.0	390.0	486.0	1			438.0		
	3) Increase field presence of management agencies within the affected	438.0	390.0	486.0	1			438.0		
	Subtotal	1,266.0								

Karen

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

TO: Ken Rice, Restoration Team **DATE:** December 7, 1992

FROM: John Strand, Chairman, RPWG J.S. for V.G.
Veronica Gilbert, RPWG/DNR V.G.

SUBJECT: Restoration Options - Preliminary Cost Estimates

With this memo we are transmitting to you preliminary cost estimates for some Restoration Options and universal program elements. We are sending them to you at your request so you may transmit them to Walcoff Associates for preparation of the EIS on the Restoration Plan. Please be mindful that we have been cautioned against transmitting to the EIS team any information that has not been cleared through the Restoration Team. The attached information has not yet been peer reviewed or cleared through the Restoration Team.

The Restoration Team is certain to have ideas on how to approach administrative costs and many of the other entries. For example, we have included construction and operations costs for most projects, but not all. The Marine Environmental Institute is an exception. We should develop a policy on the extent to which the settlement will fund operation/maintenance costs for projects it initiates. Eventually we will develop recommendations about which of these projects are well-suited to funding through an endowment.

Once the Options Evaluation Database has been revised we will be able to relate restoration options and their costs to alternatives. We will begin that task this week and complete it no later than early January. Meanwhile we hope the attached information is helpful to the EIS team.

Attachment

cc: Restoration Planning Work Group

EXXON VALDEZ OIL SPILL RESTORATION OPTIONS - PRELIMINARY COST ESTIMATES

DRAFT - 12/8/92

Option	Description	Annual Cost			Duration (Yrs.)			Total Cost		
		Exp	Lower	Upper	Exp	Lower	Upper	Exp	Lower	Upper
1.1	Archaeological site stewardship program	195.0			10	10	10	1950.0	1950.0	1950.0
2.0	Fish management plans - pink salmon	4043.0			4	4	4	16172.0	16172.0	16172.0
2.0	Fish management plans - sockeye salmon	813.0			5	5	5	4065.0	4065.0	4065.0
2.0	Fish management plans - dolly varden/cutthroat trout	236.0			4	4	4	944.0	944.0	944.0
2.0	Fish management plans - pacific herring	457.0			4	4	4	1826.4	1826.4	1826.4
2.0	Fish management plans - rockfish	593.0			4	4	4	2372.0	2372.0	2372.0
4.3	Reduce disturbance at marine bird colonies, marine mammal haul-out sites and rubbing beaches.									
	Initial year	60.0	50.0	100.0	1	1	1	60.0	50.0	100.0
	Continuation	30.0	15.0	60.0	2	2	9	60.0	30.0	540.0
8.1	Temporarily restrict or close harvests of injured species.	15.0	10.0	30.0	5	2	10	75.0	20.0	300.0
8.2	Implement a cooperative program for developing voluntary subsistence harvest levels.	144.0			1	1	1	143.8	143.8	143.8
9.0	Minimize incidental take of marine birds by commercial fisheries.	275.0	250.0	300.0	1	1	1	275.0	250.0	300.0
10.0	Preservation of archaeological sites and artifacts.	300.0			3	3	3	900.0	900.0	900.0
11.1	Supplement fry production using such methods as egg boxes and net pens for fry rearing.	579.0			6	6	6	3474.0	3474.0	3474.0
11.2	Improve access to spawning areas (e.g., fish passes, remove barriers).	481.0			3	3	3	1443.0	1443.0	1443.0
11.3	Improve spawning and rearing habitat (e.g., create spawning channels, add woody debris, improve substrate, lake fertilization).	800.0			6	6	6	4800.0	4800.0	4800.0
12.1	Construct new public recreation facilities.									
	Construction	294.0	218.0	370.0	5	2	8	1470.0	436.0	2960.0
	Maintenance	30.0	22.0	37.0	5	2	8	150.0	44.0	296.0
12.2	Planning for and marketing public land for new commercial facilities.	275.0	200.0	350.0	1	1	1	275.0	200.0	350.0
13.0	Eliminate sources of persistent contamination from mussel beds.	491.0	340.0	641.0	5	4	7	2455.0	1360.0	4487.0
14.0	Accelerate recovery of upper intertidal zone.	150.0	100.0	200.0	5	4	7	750.0	400.0	1400.0
15.0	Supplement intertidal substrates for spawning herring.	256.0			5	5	5	1280.0	1280.0	1280.0

NB: All costs are expressed in units of $1,000 (1993 $). The present value of the settlement is about $600 million.

EXXON VALDEZ OIL SPILL RESTORATION OPTIONS - PRELIMINARY COST ESTIMATES

DRAFT - 12/8/92

Option	Description	Annual Cost			Duration (Yrs.)			Total Cost		
		Exp	Lower	Upper	Exp	Lower	Upper	Exp	Lower	Upper
16.1	Restore murre productivity through enhancing social stimuli.									
	Initial year	250.0	200.0	500.0	1	1	1	250.0	200.0	500.0
	Continuation	150.0	150.0	500.0	4	4	10	600.0	600.0	5000.0
16.2	Restore murre productivity through improving physical characteristics									
	Initial year	250.0	200.0	500.0	1	1	1	250.0	200.0	500.0
	Continuation	150.0	150.0	500.0	4	4	10	600.0	600.0	5000.0
17.1	Eliminate introduced foxes from islands important to nesting birds. COST PER ISLAND	140.0	100.0	250.0	5	5	10	700.0	500.0	2500.0
17.2	Reduce predator access to seabird colonies.									
	Initial year	350.0			1	1	1	350.0	350.0	350.0
	Continuation	150.0								
18.1	Establish additional hatchery runs.	784.0			1	1	1	784.0	784.0	784.0
18.2	Transplant hatchery-reared fish to depleted areas.	472.0			2	2	2	944.0	944.0	944.0
18.3	Use wild egg takes from noninjured streams.	615.0			1	1	1	615.0	615.0	615.0
19.0	Update and expand the state's Anadromous Stream Catalogue.	259.0			1	1	1	259.0	259.0	259.0
30.0	Test subsistence foods for hydrocarbon contamination.	100.0			1	1	1	100.0	100.0	100.0
33.2	Visitor center									
34.0	Marine environmental institute									
	Establishment							42000.0	42000.0	42000.0
	Continuation									
35.0	Identify institutions and individuals with artifacts from the spill area and offer to purchase specific pieces for the public.	225.0	150.0	300.0	3	3	3	675.0	450.0	900.0
37.0	Habitat protection and acquisition	20000.0	10000.0	30000.0	10	10	10	200000.0	100000.0	300000.0
40.1	Federal wilderness areas COST PER WILDERNESS AREA.	165.0			3	3	3	495.0	495.0	495.0
40.2	Alaska State Parks COST PER 6-7 PARKS									
	Designation	22.0	8.0	37.0	3	3	3	66.9	24.0	110.1
	Implement park management plan and enforce regulations	60.0			10	10	10	600.0	600.0	600.0
40.3	ADFG special areas									
	Designation	35.0			2	2	2	70.0	70.0	70.0
	Implement special area management plan and enforce regulations	12.0			10	10	10	120.0	120.0	120.0
40.4	National Marine Sanctuary	167.0			3	3	3	500.1	500.1	500.1

NB: All costs are expressed in units of $1,000 (1993 $). The present value of the settlement is about $600 million.

EXXON VALDEZ OIL SPILL RESTORATION OPTIONS - PRELIMINARY COST ESTIMATES

Option	Description	Annual Cost			Duration (Yrs.)			Total Cost		
		Exp	Lower	Upper	Exp	Lower	Upper	Exp	Lower	Upper
40.5	Modify coastal management policies/create plan. COST PER PLAN	125.0	50.0	200.0	2	2	2	250.0	100.0	400.0
41.0	Subsistence mariculture	589.0			4	4	4	2356.0	2356.0	2356.0
42.0	Access to new subsistence resources	53.0			3	3	3	159.0	159.0	159.0
43.1	National Estuarine Research Reserve Sites									
	Designation							200.0		
	Land Acquisition and Construction							250.0		
	Operation	150.0			10	10	10			
43.2	Designate Research Natural Areas in Chugach National Forest.	200.0			10	10	10	2000.0	2000.0	2000.0
P1	Administration	3300.0	3000.0	3600.0	10	10	10	33000.0	30000.0	36000.0
P2	Monitoring									
	Design - Phase 2 (Detailed Technical Protocols)	250.0			1	1	1	250.0	250.0	250.0
	Implement	5000.0	4000.0	6000.0	10	10	10	50000.0	40000.0	60000.0
P3	Education /public information									
	1) Archaeology resource protection - expand public education efforts	317.0			1	1	1	317.0	317.0	317.0
	2) Educate tour- and charter-boat operators about the need for, and ways to decrease disturbance near sensitive marine bird and mammal use	40.0	30.0	50.0	1	1	1	40.0	30.0	50.0
	3) Use public education to encourage conservation for sport-fishing	20.0	15.0	25.0	2	2	2	40.0	30.0	50.0
	4) Educate public about minimizing their impacts on recovering	25.0			2	2	2	50.0	50.0	50.0
	5) Develop program to provide and distribute updated information and educational products	100.0			1	1	1	100.0	100.0	100.0
P4	Agency management									
	1) Archaeology site patrol and monitoring.	300.0			4	3	5	1200.0	900.0	1500.0
	2) Increase field presence of trustee agencies to enforce federal and state laws designed to reduce distubance at marine bird colonies, marine mammal haul-out areas, and rubbing beaches .	438.0	390.0	486.0	10	10	10	4380.0	3900.0	4860.0
	3) Increase field presence of management agencies within the affected	438.0	390.0	486.0	10	10	10	4380.0	3900.0	4860.0
	TOTAL							393891.2	275663.3	524402.4

NB: All costs are expressed in units of $1,000 (1993 $). The present value of the settlement is about $600 million.

EXXON VALDEZ OIL SPILL RESTORATION OPTIONS - PRELIMINARY COST ESTIMATES

DRAFT - 12/8/92

Option	Description	Annual Cost			Duration (Yrs.)			Total Cost		
		Exp	Lower	Upper	Exp	Lower	Upper	Exp	Lower	Upper
NOTES										
13.0	First two years directed to testing feasibility; latter three years for implementation. It is furthermore assumed that this approach will be used sparingly, e.g., at 15-25 most severely impacted, slowest recovering, and most biologically valuable areas.									
14.0	First two years directed to testing feasibility; latter three years are for implementation. It is furthermore assumed that approach will be used sparingly, e.g., 3-5 most severely damaged areas, slowest recovering, and most biologically valuable areas .									
34.0	The cost estimate includes design and construction for the facility but does not include post-construction staffing or maintenance.									
37.0	These are average figures. In any one year the amount spent would vary widely depending on such factors as the status of negotiations.									
P1	Upper range assumes deletion of funding for the Restoration Planning Working Group and reductions of $100.0-150.0 for Peer Review, work plan, and environmental compliance. Lower range assumes the additional deletion of funding for the Restoration Team.									
P2	Assumes 8-year program with first implementation in 1994. Program could be extended beyond life of settlement by establishing an endowment. Intensity of program would then depend on size of endowment and available annual support.									

NB: All costs are expressed in units of $1,000 (1993 $). The present value of the settlement is about $600 million.

EVOS RESTORATION OPTIONS - COST METHODOLOGY

I. Options and Suboptions

A. The spreadsheet addresses 40 options and suboptions.

B. Thirty-four (34) of the options are those RPWG has been considering for months.

C. Option 28 (Acquisition of access) has been incorporated into option 37 (Purchase private land) and renamed "Habitat Protection and Acquisition" at the request of the Habitat Protection Work Group.

D. Two new options for subsistence have been included at ADFG's request. We have assigned them numbers 41.0 and 42.0.

41.0	Subsistence mariculture
42.0	Access to new subsistence resources

E. A third new option has been carved out of Option 40.0, Special Designations. The new Option 43.0 addresses special designations for monitoring and research sites.

F. On the last page of the spreadsheet we have listed four programmatic options, which probably won't vary across alternatives. However, because they represent substantial amounts of money and there appears to be substantial interest in them, their costs should be estimated.

P1.	Administration
P2.	Monitoring
P3.	Education/public information
P4.	Agency management

G. Because Options 40.0 (Special designations), P3 (Education/Public Information), and P4 (Agency Management) now consist of a combination of many older options for which cost had been estimated, we retained the detail of earlier components so the reviewers could determine which of the earlier estimates are still valid. However, this level of detail need not be retained in the final report.

II. Annual Cost

A. Expected value of annual cost = mean of lower and upper cost estimates. However, in some cases it is derived from multi-year estimates, e.g. $120,000 over 3 years = $40,000/year.) In actuality most of the money may be needed in the first year and less in subsequent years. This level of refinement will be tackled in the annual work plans.

B. We have separated initial costs from continuation costs and addressed each on a separate line underneath the name of the option or suboption. For example, construction is separated from maintenance [see option 12.1], planning and designation from implementation [see option 40.0], and start-up from continuation [see options 16.1 and 16.2]. In this way we can easily differentiate the duration and total cost of the initial part of a project from the duration and cost of its continuation.

III. Duration

A. Some of the options summaries specify a limited duration, e.g., 5 years. Others imply ongoing activities, e.g., 1.1 (Archaeological site stewardship program) and P4 (Agency management). Still others state that the project will continue until the resource recovers.

B. Unless the option summary indicates a specific number of years we have set the expected value of the duration of the option at "1 year." Please specify otherwise if you have better information. The lower- and upper-range columns are to be used to express uncertainty.

C. For those projects whose duration depends on recovery of species we intend to use the figures Karen Klinge is gathering for each option through her telephone surveys of peer reviewers.

IV. Units of Measurement

A. Costs

1. All costs are expressed in units of $1,000.

2. For simplicity, all costs are expressed in 1993 dollars with a note that the present value of the settlement is about $600 million. The alternative is to estimate a start date of each project and project

future costs using an average rate of inflation of about 4%. We thought the simpler method we have recommended is sufficient provided everyone thinks in terms of $600 million instead of $1 billion.

3. We had discussed the possibility of expressing costs in broad categories, e.g., up to $250.0, $250.0-$500.0, $500.0-$1,000.0, etc. However, of the 40 options and suboptions being considered, we have at least partial estimates for 30. Some of these estimates appear to be expressed as an order of magnitude, e.g., $250.0-$300.0; others are quite precise, e.g., $143.8. Through its inclusion of lower and upper ranges for both annual costs and duration, the spreadsheet gives ample latitude to express cost as a broad category. We do not propose to standardize the cost categories that could be selected.

4. Cost estimates for only two of the options are expressed per unit, specifically, 17.1 (COST PER ISLAND) and 40.0 (Modify management plans and policies - COST PER PLAN). This convention is used only because the options summary estimated cost per unit. However, this measure of cost can only be used if the peer reviewers assess the effectiveness of the options using the same unit of measurement.

5. Duration

6. Duration is in years. If partial years are specified the figure is rounded up to the nearest whole number.

7. The options summaries expressed no estimates for lower and upper ranges of duration. However, for ease of computation we copied the expected value of duration into cells for lower and upper ranges whenever lower and upper ranges of annual cost were expressed. The expected value of total cost could then be computed as the expected value of annual cost times expected value of duration; lower range of total cost could be computed as the lower value of annual cost times the lower value of duration; etc. As we refine this spreadsheet with more informed estimates of both cost and duration we expect the values for lower and upper ranges to become more meaningful.

V. Notes: Assumptions behind cost estimates are described under "NOTES" at the end of the spreadsheet.

RPWG
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ENDOWMENTS: A Method of Funding Restoration

Draft for RPWG, RT Review
December 22, 1992

This analysis summarizes endowment proposals recommended for use with the draft plan alternatives. The financial analysis that supports this summary is contained in the accompanying. These recommendations are intended for use with some of the alternatives. Not all endowments are appropriate with all alternatives, and more than one endowment proposals may be appropriate with some alternatives.

There are a variety of legal terms that describe a particular type of endowment such as a trust or permanent fund. In this memo, the term endowment is used to describe any funding mechanism that uses payments from one or more years to fund restoration projects beyond the ten-year planning horizon used in the draft plan, and uses interest from a fund as at least a partial funding source.

SUMMARY

No Endowment. Once funding choice is no endowment. In this case, all restoration funds are spent during the restoration plan's ten-year planning horizon. (The ten-year horizon ends September 30, 2003).

Operation and Maintenance Endowment. Some options may continue forever, or at least beyond the ten-year planning horizon. For example, an archaeology stewardship program may continue for generations. Similarly, if visitor centers are constructed, the annual operation and maintenance will not end after ten years. The same is true of land management costs for land acquired by this process, and for monitoring.

Amount of Money. This proposal assumes that principal is set aside to generate income sufficient to cover the annual costs of those options that continue beyond ten years. For each million 1993 dollars of perpetual, annual earnings required for operation and maintenance, approximately $35.5 million must be deposited as principal to the endowment.[1] The actual amount of money needed will change with each alternative. The amount required will be determined for each alternative. (That is, if an alternative includes more projects that continue past the ten-year horizon, it would require a large endowment to provide the on-going operation and maintenance funds. For example, an operation and maintenance endowment might have to be larger to fund the on-going costs of Alternative #6 than of Alternative #3.

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[1] Because of inflation, this relationship changes in depending on when the deposit is made. The $35.5 million figure assumes 50% is deposited in the 1994 federal fiscal year and the remaining amount is split between the 1995 and 1996 fiscal years. At high levels of deposits, this relationship changes somewhat because the deposits must be spread to late years of the settlement.

The table below shows the relationship between the endowment earnings and principal. Endowment spending is shown in constant, 1993 dollars.

Operation and Maintenance Endowment
Principal Required to fund
Annual Operation and Maintenance Costs of Restoration

Principal (Millions)	Endowment Spending (Millions of $1993)
$50	$1.41
$100	$2.81
$150	$4.22
$200	$5.40

Other Assumptions. This proposal assumes that the endowment has a perpetual life. It also assumes that as the initial spending for an option is allocated, the Trustees will also allocate to the endowment enough principal to assure funding of the on-going operation and maintenance costs.

Research and Monitoring Endowment. One proposal is to establish the *Exxon Valdez* Marine Sciences Endowment dedicated to long-term baseline marine research. The need for monitoring the status of spill-affected ecosystems will go on for a long time, perhaps forever. According to one proposal, "Given the infant status of restoration ecology, continual assessment of our efforts to restore Prince William sound and other areas is essential. Even if the cumulative wisdom gained by establishing a research endowment consists of no more than learning how nature heals itself, that knowledge will be unprecedented and priceless."[2]

Many groups are conducting important scientific research in Alaskan marine environments. Public and private universities, non-profit scientific groups, state and federal agencies, and individuals are all conducting research. Some of this research is funded from settlement monies, other from outside sources. A research endowment provides an opportunity to coordinate the long-term research into marine oil-spill affected environment. It provides a constant funding source and a single coordinating location to ensure that the range of basic research questions are addressed.

This endowment could be applied separately or in combination with the maintenance endowment described above.

Amount of Money. I am unsure how much money this endowment would require. I assume it would be somewhere in the neighborhood of $75 - $150 million. This analysis assumed that once established, the endowment should produce a steady flow of spending; that is, the same (in real terms) year after year.

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[2] Proposed Restoration Option; *Exxon Valdez Marine Sciences Endowment*; State Senator Arliss Sturgulewski; August 24, 1992; page 3.

Governing Board & Endowment Life. Spending decisions could be made either by a distinct governing board or by the Trustees. The decision depends, in part, on how much of the endowment purpose is constrained by the endowment charter. This proposal assume a perpetual life to the endowment.

Full Endowment with Large-project Withdrawals. This proposal assumes that the entire settlement is transferred to an endowment, but that large one-time projects such as land purchases are made from the principal of the endowment, and the remainder of the annual work projects are funded from annual earnings. In this way, the endowment would fund the full range of restoration decisions facing the trustees today. This endowment is a savings plan trading off today's spending to fund future restoration.

Governing Board & Endowment Life. In this proposal, the Trustees are the governing board, and the endowment has a perpetual life.

Pattern of Spending. Once established, an endowment should produce a steady flow of spending; that is, the same (in real terms) year after year. A constant level of spending, however, is more than the amount justified by real interest income in the early years, and the annual expenditures would not be fully funded by interest (after inflation-proofing) until the last deposit is made on September 30, 2001. The maximum amount of levelized spending that the endowment could sustain is $13.4 million per year in constant 1993 dollars.

Large-project Spending. Spending for large projects such as land purchases or other significant one-time expenses could be made either by taking it out of the annual earnings for more than one year, or by taking it from principal, thereby reducing the annual earnings for future years.

Amount of Money. There is a trade-off between the amount of money spent withdrawn from principal and the endowment earnings. The more money taken from the principal, the smaller the endowment balance, and the less the amount that will be available for spending each year from the endowment. This relationship is shown in the table below. The table shows that if all funds are put into the endowment, and none are spend for projects that reduce the endowment principal, the Trustees could sustain $13.36 million (in 1993 dollars) forever. If, say, $100 million were withdrawn from principal for near-term large-project spending and not put into the endowment, then the endowment would produce $10.64 million (constant 1993 dollars) for perpetual annual spending. If $200 million were withheld from the endowment, the endowment would produce $8.66 million (1993 dollars).

Endowment Spending and Withdrawals from Principal

Amount Withdrawn from Principal		Spending Available from Endowment	Endowment	
Percent of Funds	Millions	(Millions of 1993 $)	Millions	Percent of Funds
0%	$0	$13.29	$600	100%
8%	$50	$11.93	$560	92%
16%	$100	$10.56	$510	84%
25%	$150	$9.77	$460	75%
33%	$200	$8.59	$410	67%
41%	$250	$7.41	$360	59%
49%	$300	$6.24	$310	51%
57%	$350	$5.06	$260	43%
66%	$400	$4.12	$210	34%
74%	$450	$3.06	$160	26%
82%	$500	$1.92	$110	18%
100%	$600	$0.00	$0	0%

Critical Financial Assumptions. The financial assumptions for this analysis are explained in the accompanying draft. However, certain ones are critical.

- The endowments have a perpetual life. (If the endowment was to sunset after 20 years, it would require less principal than one that continues forever. However, the principal required for a perpetual endowment is not much different than the amount required for an endowment that sunsets after many years.)
- Spending is inflation-proofed. (That is, spending only includes interest *after* the amount to cover inflation has been returned to the principal.)
- Rate of inflation: Alaska Department of Revenue Fall Revenue Forecast mid-range assumptions. Because Exxon deposits money until the year 2001, the higher the rate of inflation, the lower the real earnings provided by the endowment. This analysis uses the mid-range inflation assumptions made by the Alaska Department of Revenue Fall 1992 Revenue Forecast. (It varies by year, but ranges from 3.39% for (state) fiscal year 1993, to 3.94% for the 2001 and beyond.)
- Real Rate of Return: The Alaska Permanent Fund Corporation. The higher the real rate of return, the less principal required to produce a given amount of annual, inflation-proofed spending. This analysis uses the real rate of return predicted by the Alaska Permanent Fund Corporation on assets of the Permanent Fund. The fund predicts a real rate of return of 3% per year prior to (state) Fiscal Year 1997, and 3.6%/yr beyond that time.

Endowments: A Method of Funding Restoration

INTRODUCTION

The Trustees have the opportunity to save a portion of today's restoration funds for tomorrow's needs by establishing an endowment. This paper does not describe all possible endowments. Rather, it distills proposals into a few endowment approaches for public review as part of the draft restoration plan alternatives. In developing these proposals, this paper discusses the following issues: How long a life should an endowment have? How to manage the funds? What should the purpose be? And how much of the funds should be put into an endowment.

There are a variety of legal terms that describe a particular type of endowment such as trust or permanent fund. In this paper the term endowment is used to describe any funding mechanism that uses payments from one or more years to fund restoration projects in future years, and uses interest from an accumulated fund as at least a partial funding source.

WHY AN ENDOWMENT? There are three basic reasons why the Trustees should consider an endowment for a portion of the payments from the *Exxon Valdez* civil settlement.

1. **On-going operation and maintenance.** Many of the restoration techniques used today will have permanent, on-going operation and maintenance costs. For example, facilities built today will have permanent annual costs. An endowment is one method to permanently funds the costs we are imposing on the future.

2. **Saving for the future.** If we are to use settlement funds after Exxon's last deposit in 2001, the Trustees must save some of Exxon's deposits for future use. Through an endowment, the trustees can maintain a funding source for guarding the resources of the spill-affected area, forever. An endowment provides an opportunity to change part of a large, one-time settlement into a resource for the future.

   The *Exxon Valdez* oil spill created damages that may not recover for generations. The extent of some of the oil-spill damage or recovery may not be completely known for a along time. Some of the resources and services we now believe are recovering on their own may not, in fact, recover completely. For some restoration activities, we may not know whether today's activities are successful for many years. Additional research may disclose additional damages. For these and other reasons, we can expect that restoration needs will continue past 2001, the year in which Exxon makes the last scheduled deposit under the civil settlement.

   An endowment provides an opportunity to complete restoration strategies at a different rate than that which would occur using current funds. Endowment is a broad term that covers a broad range of strategies. For example, endowments could be used to match the near-term accumulation of funds with the long-term need for restoration. It could be used to funding base to support permanent research, to fund long-term habitat acquisition needs, or even to accelerate purchase of habitat.

3. **Disciplining the present.** Governments have a difficult time not spending available funds.

But immediately spending the funds may not be the best use of the money. An endowment can be a savings plan to ensure that funds are not spent before the long-term needs become apparent. It provides some assurance that only the best restoration projects are funded.

4. **Earmarking part of the funds for a single, long-term use.** Some restoration needs are best conducted with a long-term source of funding. Examples might be long-term recovery monitoring, or a long-term research program. In these cases, an endowment may provide a method of achieving a stable funding source for a long-term program.

   Another example of a single-purpose endowment might be to provide for the operation and maintenance of a visitor's center. Funding construction without funding continued operation and maintenance might provide a burden on future generations rather than a benefit.

WHY *NOT* AN ENDOWMENT? There are also disadvantages to an endowment.

1. **An endowment takes away from today's use of the money.** An endowment pre-supposes that future use of the funds is as important as today's needs. It will decrease the amount we can apply to today's pressing needs.

2. **A structured savings plan decreases flexibility.** The most flexible way to use the money is on a case-by-case basis as the needs arise. An endowment structures the amount we can spend today. It limits our options to respond to the wishes of today.

ENDOWMENT LIFE

From Senator Sturgulewski's proposal for a Marine Research Foundation, "An endowment can begin with a perpetual (or unspecified) existence or as a limited duration sinking fund that will spend itself out of existence by a time certain. An unlimited period of existence is preferable, at least until the duration of tangible effects of the spill has been defined.[3]"

RECOMMENDATION. If we knew when injured resources and damaged services will be fully recovered, it would be possible to specify a date at which an endowment should spend itself out of existence. That is not now possible. Thus, only a perpetual endowment need be considered. If future generations decide that the spill area is fully recovered or to liquidate endowment assets, they would remain able to do that.

ENDOWMENT MANAGEMENT

Currently, settlement funds are deposited in the U.S. District Court Registry Investment System (CRIS) until the Trustees draw upon them. "CRIS regulations limiting investments to short-term U.S. Treasury securities make it impossible to earn returns adequate to fund a meaningful

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[3] Proposed Restoration Option; *Exxon Valdez Marine Sciences Endowment*; State Senator Arliss Sturgulewski; August 24, 1992; page 4.

program. The principal (the corpus) of an endowment should be withdrawn from CRIS and managed by an investment firm, or perhaps by trustees of the Permanent Fund Corporation.

RECOMMENDATION. As yet we have no recommendation. This question is relatively technical and it can be answered after the choice is made whether or not to set up an endowment.

SAMPLE ENDOWMENTS

Three examples are presented to illustrate some of the endowment concepts currently used in Alaska.

THE ALASKA PERMANENT FUND. Alaska's most famous endowment is the permanent fund. By law, at least 25% of all "mineral lease, rentals, royalties..." is deposited in the fund. Investment decisions of the fund are managed by a six-person board of trustees. Four of the six board members are public members with recognized competence and wide experience in finance, investment, or other business management-related fields. They are appointed by the governor for staggered four-year terms. The other members are the Commissioner of Revenue, and one cabinet member of the governor's choice.[4]" Spending decisions -- except for the permanent fund dividend which uses a formula established by law -- can only be made by legislative appropriation. The appointed representatives have no discretionary authority to spend the fund; they can only invest it.

THE ALASKA SCIENCE AND TECHNOLOGY FOUNDATION. The Foundation was set up by statute in 1988. It is governed by a board of nine directors, "appointed by the governor for staggered four year terms. Four of the directors must be recognized scientists or engineers (two from outside of Alaska); four members are to represent the general public; and one member must be employed by a state agency other than the University of Alaska."[5] The legislative plan is to use state surpluses from different legislative years to create an endowment of $100 million. "The Foundation's funds are held and managed by the Alaska Permanent Fund Corporation. All or a portion of the net income is available for appropriate each year." Spending decisions are made by the Foundation's board of directors.

THE KODIAK BROWN BEAR RESEARCH AND HABITAT MAINTENANCE TRUST "was established in 1981 to ensure that construction and operation of the Terror Lake Hydroelectric Project would not jeopardize the continued existence of Kodiak brown bears... and to mitigate impacts of the project on bear habitats in and adjacent to the Kodiak National Wildlife Refuge."[6] The trust was established in a joint Settlement Agreement between the Kodiak

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[4] An Alaskan's Guide to the Permanent Fund. Edition No. 5; September 30, 1992, Page 18.

[5] From Establishing the Fund for Alaska: The Procedural, Program, and Legal Options. Charles H.W. Foster et al. September 1989. A Feasibility Report Prepared For the World Wildlife Fund (U.S.), The Conservation Foundation.

[6] Kodiak Brown Bear Research and Habitat Maintenance Trust Agreement, page 2.

Electric Association (which originally sponsored the hydroelectric project), the State of Alaska, Department of Interior, Sierra Club, National Audubon Society, and National Wildlife Federation.

Management and spending decisions are made by four trustees: one designated by the Alaska Energy Authority (a state agency), one by the Governor, one by the Alaska Regional Director of the US Fish and Wildlife Service, and one by agreement of at least two of the environmental organizations named in the settlement agreement.

FINANCIAL CALCULATIONS

Spreadsheet #1 shows the basic financial calculations. It makes the unrealistic assumption of no spending after what is already scheduled, but it is a useful display to explain basic calculations and assumptions.

Fiscal Year. The table is based on the federal fiscal year (October 1 through September 30th), rather than calendar year, or state fiscal year. Federal fiscal year 1994 begins on October 1, 1993 and continues through September 30th 1994. Because Exxon makes deposits at the change of the federal fiscal year, and the yearly work plans are based on the federal fiscal year, using the federal fiscal year simplifies the analysis.

Beginning Balance. The spreadsheet assumes that as of October 1, 1993, the balance available to the Trustees will be $32.48 million. The tables below the estimates used to calculate that amount.

Table 1. Current Funds Projected to October 1, 1993

Description	Subtractions	Additions	Balance
Projected Balance as of January 1, 1993			$31.4
Projected Interest through July 1, 1993		$1.1	
Projected Balance as of July 1, 1993			$32.5
Projected Interest through October 1, 1993		$0.0015	
Projected Balance as of October 1, 1993			$32.5

Payments from Exxon. $100 million is due on September 30, 1993. Future payments will be $70 million every October 1st through 2001.

Spreadsheet #1. No Spending: Example to Show Calculations and Assumptions

Endowment Spreadsheet (All figures in Million $)

FISCAL YEAR		Payments from Exxon	Reimburse-ments to Gvts	Deposits Amount	Interest Prior to Oct 1 of Year Total	Inflation	Real	Balance Nominal Dollars	Balance 1993 Dollars	Spending Nominal Dollars	Spending 1993 Dollars
1993	(Beginning Oct. 1 1992)			Initial Balance (October 1, 1993) i				$32.48	$32.48		
1994	(Beginning Oct. 1 1993)	$100.0	$30.0	$70.0	See note below table			$102.48	$102.48	$0.00	$0.00
1995	(Beginning Oct. 1 1994)	$70.0	$30.0	$40.0	$7.38	$3.69	$3.69	$149.86	$144.65	$0.00	$0.00
1996	(Beginning Oct. 1 1995)	$70.0	$30.0	$40.0	$10.89	$5.50	$5.39	$200.75	$186.92	$0.00	$0.00
1997	(Beginning Oct. 1 1996)	$70.0		$70.0	$14.81	$7.58	$7.23	$285.56	$256.21	$0.00	$0.00
1998	(Beginning Oct. 1 1997)	$70.0		$70.0	$21.16	$10.88	$10.28	$376.72	$325.59	$0.00	$0.00
1999	(Beginning Oct. 1 1998)	$70.0		$70.0	$26.22	$14.35	$11.87	$472.94	$393.75	$0.00	$0.00
2000	(Beginning Oct. 1 1999)	$70.0		$70.0	$32.21	$18.02	$14.19	$575.15	$461.27	$0.00	$0.00
2001	(Beginning Oct. 1 2000)	$70.0		$70.0	$39.17	$21.91	$17.25	$684.31	$528.68	$0.00	$0.00
2002	(Beginning Oct. 1 2001)	$70.0		$70.0	$47.27	$26.74	$20.53	$801.58	$595.99	$0.00	$0.00
2003	(Beginning Oct. 1 2002)				$55.63	$31.58	$24.05	$857.21	$613.19	$0.00	$0.00
2004	(Beginning Oct. 1 2003)				$59.49	$33.77	$25.72	$916.70	$630.89	$0.00	$0.00
2005	(Beginning Oct. 1 2004)				$63.62	$36.12	$27.50	$980.32	$649.10	$0.00	$0.00

Note: Interest prior to October 1, 1993 is included in the initial, October 1, 1993 balance of: $32.48 million

Reimbursements to Governments. Under the terms of the settlement, the state and federal governments may reimburse themselves up to $67.0 million for the federal government and $75.0 million to the State of Alaska for cleanup, damage assessment and restoration, and litigation expenses incurred prior to January 1, 1991. The two governments may also reimburse themselves for cleanup costs after that time, damage assessment and restoration costs between March 1, 1991 and March 1, 1992, and for State of Alaska litigation costs after March 12, 1992.

The total amount of money to be reimbursed to the state and federal government is not final. We estimate that approximately $90 million will remain after October 1, 1993. We assume they will take in equal increments over the following three years, but other payment schedules are also possible.

Deposits. Deposits are Payments from Exxon less Reimbursements to the state and federal governments.

Interest. The total interest is the amount that would be earned on the balance of the previous year. Thus, the spreadsheet projects that during fiscal year 1994 (from October 1, 1993 through September 30, 1994) an endowment would earn $2.81 million on an initial balance of $40.25 million. The total interest composed of two sub-parts: interest due to inflation, and "real" interest.

Inflation. Changes in an endowment balance due to inflation create the illusion of growth, but the growth is not "real". That is, if a particular restoration option costs $1.00 million today, then after a year of 5% inflation, that same study will probably cost the trustees $1.05 million. That extra $50,000 does not buy anything more, it is just the amount of money needed to keep pace with the general level of price increases. Thus, the growth in the endowment balance needed to keep pace with inflation is not "real" growth. To forecast the "real" changes in the endowment balance, we must use a forecast of inflation.

The Alaska Department of Revenue forecasts inflation as part of its twice-annual revenue forecast. The most recent forecast is the Fall 1992 Revenue Forecast. Their inflation forecast is reprinted below.

Because the state forecasts inflation according to the *state* fiscal year, July 1 to June 30th, it is necessary to adapt the forecast to the federal fiscal year. The table below displays that adaption assuming a constant annual inflation rate (i.e., the federal fiscal year forecast assumes nine months one year's rate, and three months at the next year's rate).

Table 2. Inflation Rate Forecast
Alaska Department of Revenue, Fall 1992 Revenue Forecast

Fiscal Year	AK Department of Revenue Inflation Rate by *State* FY			(Adapted from AK DOR) Inflation Rate by *Federal* FY		
	Low	Mid	High	Low	Mid	High
1993	2.56%	3.39%	4.33%	2.58%	3.46%	4.39%
1994	2.62%	3.67%	4.56%	2.62%	3.67%	4.56%
1995	2.62%	3.67%	4.56%	2.68%	3.71%	4.63%
1996	2.85%	3.81%	4.84%	2.85%	3.81%	4.84%
1997	2.85%	3.81%	4.84%	2.85%	3.81%	4.84%
1998	2.85%	3.81%	4.84%	2.85%	3.81%	4.84%
1999	2.85%	3.81%	4.84%	2.85%	3.81%	4.84%
2000	2.85%	3.81%	4.84%	2.90%	3.84%	4.88%
2001	3.04%	3.94%	5.01%	3.04%	3.94%	5.01%
2002	3.04%	3.94%	5.01%	3.04%	3.94%	5.01%
2003	3.04%	3.94%	5.01%	3.04%	3.94%	5.01%
2004	3.04%	3.94%	5.01%	3.04%	3.94%	5.01%
2005 & beyond	3.04%	3.94%	5.01%	3.04%	3.94%	5.01%

This analysis uses the Alaska Department of Revenue mid-range forecast as the most-likely forecast of inflation.

Real Rate of Return. The real rate of return (or real interest) is the rate above of interest earned above and beyond inflation. The Alaska Permanent Fund Corporation forecasts real rate of return for the permanent fund. They use a goal of 3% per year as their target rate of increase, but forecast real return at 3.6% for state fiscal years 1994 through 1997 and 3% per year thereafter.[7]

Table 3 summarizes the interest rate assumptions used for the spreadsheets.

[7] An Alaskan's Guide to the Permanent Fund, Edition No. 5, September 30, 1992; Page 9. And Jim Kelly, Research & Liaison Officer, Alaska Permanent Fund Corporation, Personal Communication, November 1992; And Alaska Permanent Fund Corporation, February 1992 Financial Statements, pages 4 and 5.

Table 3. Assumptions Common to Endowment Calculations

Beginning Balance Analysis (figures in million $)

	Additions	Balance
Balance as of December 1, 1993		$31.4
Interest through July 1, 1993	$1.1	
Projected Balance as of July 1, 1993		$32.5
Interest through October 1, 1993	$0.0015	
Projected Balance as of October 1, 1993 (before other deposits)		$32.5

Interest Rate Analysis

Assumptions

Real Rate of Return

* Use the same rate assumed by the Alaska Permanent Fund Corporation
* 3.6%/yr through FY 97; 3%/yr thereafter (State FY ends June 30th; Adjustment for Federal FY)

Inflation Rate

* Taken from the Alaska Department of Revenue Long-range Fiscal Model,
* Fall 1992 Mid-range Forecast Assumptions (State FY; adjustment for Federal FY)

Interest Rate

* Annual Interest Rate = (Inflation Rate) + (Real Rate of Return)

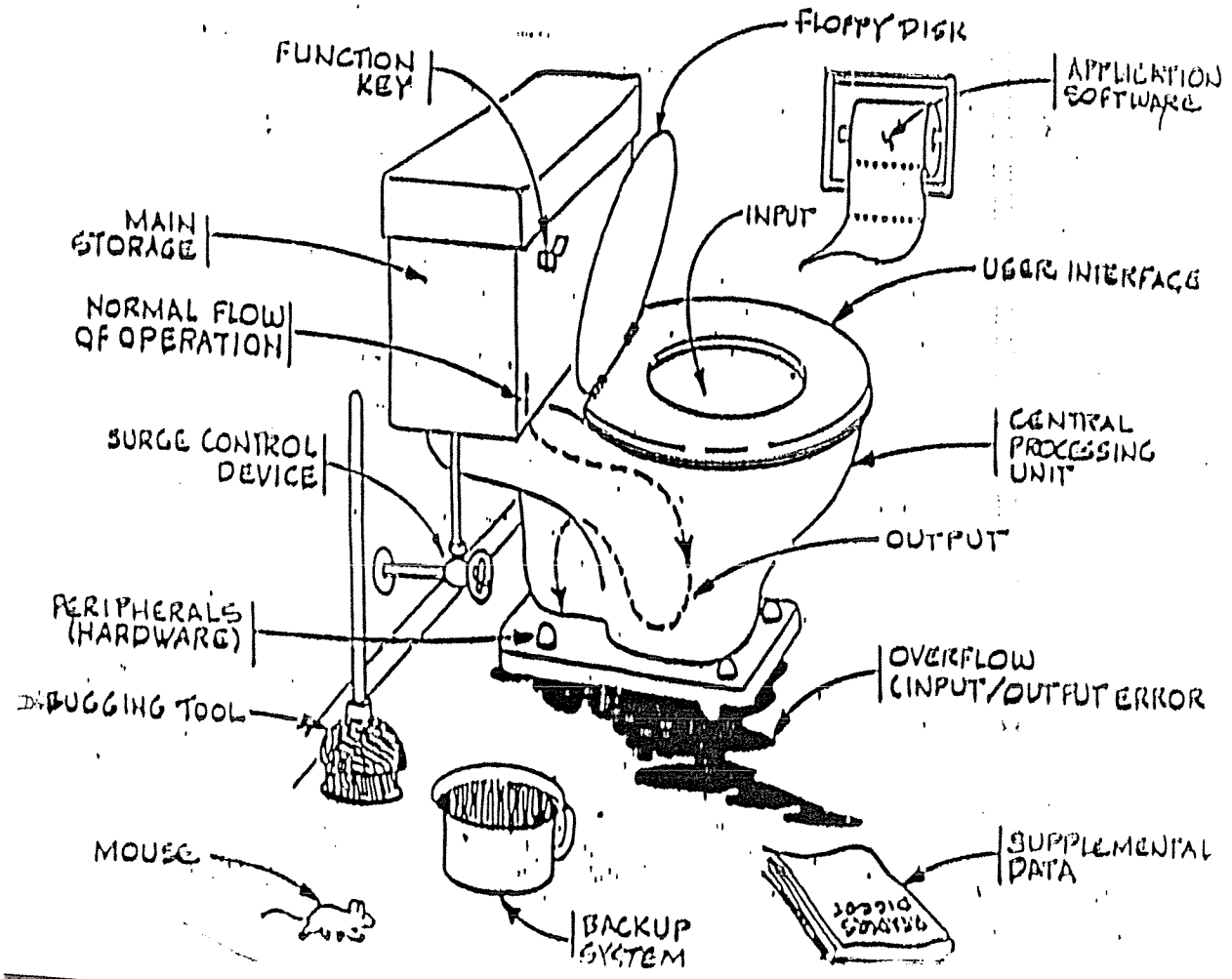
ANALYSIS

Year	Annual Rate by State Fiscal Year			Annual Rate by US Fiscal Year			Deflator by US Fiscal Year
	Real Rate	Inflation	Interest	Real Rate	Inflation	Interest	Base = Oct. 1, 1993
1992		3.09%					
1993	3.60%	3.39%	6.99%	3.60%	3.46%	7.06%	
1994	3.60%	3.67%	7.27%	3.60%	3.67%	7.27%	1.0000
1995	3.60%	3.67%	7.27%	3.60%	3.71%	7.31%	0.9646
1996	3.60%	3.81%	7.41%	3.60%	3.81%	7.41%	0.9301
1997	3.60%	3.81%	7.41%	3.60%	3.81%	7.41%	0.8960
1998	3.00%	3.81%	6.81%	3.15%	3.81%	6.81%	0.8631
1999	3.00%	3.81%	6.81%	3.00%	3.81%	6.81%	0.8314
2000	3.00%	3.81%	6.81%	3.00%	3.84%	6.84%	0.8009
2001	3.00%	3.94%	6.94%	3.00%	3.94%	6.94%	0.7713
2002	3.00%	3.94%	6.94%	3.00%	3.94%	6.94%	0.7420
2003	3.00%	3.94%	6.94%	3.00%	3.94%	6.94%	0.7139
2004	3.00%	3.94%	6.94%	3.00%	3.94%	6.94%	0.6869
2005	3.00%	3.94%	6.94%	3.00%	3.94%	6.94%	0.6608
							0.6358

Balance. The endowment balance is the previous year's balance plus that year's deposits, that year's total interest, and minus that year's spending. The column labeled "Balance, Nominal Dollars" shows the amount that the endowment is forecast to actually hold in the bank. The column labeled "Balance, 1993 dollars" shows the value of that amount at the October 1, 1993 price levels using the inflation forecast explained above. The column shows that in the unrealistic case that all funds are put into an endowment and the Trustees do not spend any further money for restoration until Fiscal Year 2003, the endowment will hold almost $893.65 million. And that balance will be worth approximately $594.9 million in 1993 dollars.

Spreadsheet #1 explained the financial calculations by assuming no spending. It is an unrealistic example to explain the basic financial calculations. Spreadsheet #2 uses another extreme example to show the effects of inflation-proofing. It makes the unrealistic assumption that all funds are put into the endowment, but that it assumes constant annual spending (that is, it calculates the maximum amount of real spending that could be sustained forever). That amount of spending is more than is justified by real interest income in the early years, and the annual expenditures are not fully funded by inflation-proofed interested until the last deposit is made on September 30, 2001. In this case, it shows the Trustees could sustain $13.29 million (in 1993 dollars) forever.

Understanding The Technology



Spreadsheet #2. Maximum Endowment, Constant Annual Spending

Endowment Spreadsheet (All figures in Million $)

FISCAL YEAR		Payments from Exxon	Reimburse-ments to Gvts	Deposits Amount	Interest Prior to Oct 1 of Year Total	Inflation	Real	Balance Nominal Dollars	Balance 1993 Dollars	Spending Nominal Dollars	Spending 1993 Dollars
1993	(Beginning Oct. 1 1992)				Initial Balance (October 1, 1993) i			$32.48	$32.48		
1994	(Beginning Oct. 1 1993)	$100.0	$30.0	$70.0	See note below table			$89.19	$89.19	$13.29	$13.29
1995	(Beginning Oct. 1 1994)	$70.0	$30.0	$40.0	$6.42	$3.21	$3.21	$121.84	$117.60	$13.77	$13.29
1996	(Beginning Oct. 1 1995)	$70.0	$30.0	$40.0	$8.86	$4.47	$4.39	$156.41	$145.63	$14.28	$13.29
1997	(Beginning Oct. 1 1996)	$70.0		$70.0	$11.54	$5.90	$5.63	$223.13	$200.20	$14.82	$13.29
1998	(Beginning Oct. 1 1997)	$70.0		$70.0	$16.53	$8.50	$8.03	$294.29	$254.35	$15.38	$13.29
1999	(Beginning Oct. 1 1998)	$70.0		$70.0	$20.48	$11.21	$9.27	$368.80	$307.05	$15.97	$13.29
2000	(Beginning Oct. 1 1999)	$70.0		$70.0	$25.12	$14.05	$11.06	$447.34	$358.77	$16.58	$13.29
2001	(Beginning Oct. 1 2000)	$70.0		$70.0	$30.46	$17.04	$13.42	$530.60	$409.92	$17.21	$13.29
2002	(Beginning Oct. 1 2001)	$70.0		$70.0	$36.65	$20.73	$15.92	$619.37	$460.51	$17.88	$13.29
2003	(Beginning Oct. 1 2002)				$42.98	$24.40	$18.58	$643.77	$460.51	$18.58	$13.29
2004	(Beginning Oct. 1 2003)				$44.68	$25.36	$19.31	$669.13	$460.51	$19.31	$13.29
2005	(Beginning Oct. 1 2004)				$46.44	$26.36	$20.07	$695.50	$460.51	$20.07	$13.29

Note: Interest prior to October 1, 1993 is included in the initial, October 1, 1993 balance of: $32.48 million

ENDOWMENT PROPOSALS FOR PUBLIC REVIEW

This section combines concepts and financial assumptions to describe endowment proposals recommended for public review. It repeats much of the explanation in the summary, but adds more detailed financial calculations.

OPERATION AND MAINTENANCE ENDOWMENT. This proposal assumes that principal is set aside to generate income sufficient to cover the annual costs of those options that continue beyond ten years. For each million 1993 dollars of perpetual, annual earnings required for operation and maintenance, approximately $35.5 million must be deposited as principal to the endowment.[8] The actual amount of money needed will change with each alternative. The amount required will be determined for each alternative. (That is, if an alternative includes more projects that continue past the ten-year horizon, it would require a large endowment to provide the on-going operation and maintenance funds. For example, an operation and maintenance endowment might have to be larger to fund the on-going costs of Alternative #6 than of Alternative #3.

Spreadsheet #3 shows the relationship between the endowment earnings and principal. Endowment spending is shown in constant, 1993 dollars.

This proposal assumes that the endowment has a perpetual life. It also assumes that as the initial spending for an option is allocated, the Trustees will also allocate to the endowment enough principal to assure funding of the on-going operation and maintenance costs.

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[8] Because of inflation, this relationship changes in depending on when the deposit is made. The $35.5 million figure assumes 50% is deposited in the 1994 federal fiscal year and the remaining amount is split between the 1995 and 1996 fiscal years. At high levels of deposits, this relationship changes somewhat because the deposits must be spread to late years of the settlement.

Spreadsheet #3. Summary Spreadsheet for Operation and Maintenance, or Research and Monitoring Endowments

Summary: Financial Calculations for Example Operation and Maintenance, or Research and Monitoring Endowments

Total Deposits =	**$50.0**		**$100.0**		**$150.0**		**$200.0**	
Fiscal Year	Deposits (Nominal)	Spending (1993 $)	Deposits (Nominal)	Spending (1993 $)	Deposits (Nominal)	Spending (1993 $)	Deposits (Nominal)	Spending (1993 $)
1993								
1994	$25.0	$0.00	$50.0	$0.00	$75.0	$0.00	$75.0	$0.00
1995	$12.5	$0.87	$25.0	$1.74	$37.5	$2.61	$25.0	$2.61
1996	$12.5	$1.29	$25.0	$2.57	$37.5	$3.86	$25.0	$3.44
1997	$0.0	$1.69	$0.0	$3.38	$0.0	$5.07	$25.0	$4.25
1998	$0.0	$1.69	$0.0	$3.38	$0.0	$5.07	$25.0	$5.02
1999	$0.0	$1.48	$0.0	$2.96	$0.0	$4.43	$25.0	$5.05
2000	$0.0	$1.41	$0.0	$2.81	$0.0	$4.22	$0.0	$5.41
2001	$0.0	$1.41	$0.0	$2.81	$0.0	$4.22	$0.0	$5.41
2002	$0.0	$1.41	$0.0	$2.81	$0.0	$4.22	$0.0	$5.41
2003	$0.0	$1.41	$0.0	$2.81	$0.0	$4.22	$0.0	$5.40
2004	$0.0	$1.41	$0.0	$2.81	$0.0	$4.22	$0.0	$5.40
2005	$0.0	$1.41	$0.0	$2.81	$0.0	$4.22	$0.0	$5.40

RESEARCH AND MONITORING ENDOWMENT. One proposal is to establish the *Exxon Valdez* Marine Sciences Endowment dedicated to long-term baseline marine research. The need for monitoring the status of spill-affected ecosystems will go on for a long time, perhaps forever. According to one proposal, "Given the infant status of restoration ecology, continual assessment of our efforts to restore Prince William sound and other areas is essential. Even if the cumulative wisdom gained by establishing a research endowment consists of no more than learning how nature heals itself, that knowledge will be unprecedented and priceless."[9]

Many groups are conducting important scientific research in Alaskan marine environments. Public and private universities, non-profit scientific groups, state and federal agencies, and individuals are all conducting research. Some of this research is funded from settlement monies, other from outside sources. A research endowment provides an opportunity to coordinate the long-term research into marine oil-spill affected environment. It provides a constant funding source and a single coordinating location to ensure that the range of basic research questions are addressed.

A research and monitoring endowment could be applied separately or in combination with the maintenance endowment described previously.

Amount of Money. I am unsure how much money this endowment would require. I assume it would be somewhere in the neighborhood of $75 - $150 million. This analysis assumed that once established, the endowment should produce a steady flow of spending; that is, the same (in real terms) year after year.

Governing Board & Endowment Life. Spending decisions could be made either by a distinct governing board or by the Trustees. The decision depends, in part, on how much of the endowment purpose is constrained by the endowment charter. This proposal assume a perpetual life to the endowment.

Financial Calculations. The financial calculations for this endowment are the same as for the operation and maintenance endowment. The amount of money may be different, but the range is given in Spreadsheet #3.

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[9] Proposed Restoration Option; *Exxon Valdez Marine Sciences Endowment*; State Senator Arliss Sturgulewski; August 24, 1992; page 3.

FULL ENDOWMENT WITH LARGE-PROJECT WITHDRAWALS. This proposal assumes that the entire settlement is transferred to an endowment, but that large one-time projects such as land purchases are made from the principal of the endowment, and the remainder of the annual work projects are funded from annual earnings. In this way, the endowment would fund the full range of restoration decisions facing the trustees today. This endowment is a savings plan trading off today's spending to fund future restoration.

Governing Board & Endowment Life. In this proposal, the Trustees are the governing board, and the endowment has a perpetual life.

Pattern of Spending. Once established, an endowment should produce a steady flow of spending; that is, the same (in real terms) year after year. A constant level of spending, however, is more than the amount justified by real interest income in the early years, and the annual expenditures would not be fully funded by interest (after inflation-proofing) until the last deposit is made on September 30, 2001. The maximum amount of levelized spending that the endowment could sustain is $13.29 million per year in constant 1993 dollars.

Large-project Spending. Spending for large projects such as land purchases or other significant one-time expenses could be made either by taking it out of the annual earnings for more than one year, or by taking it from principal, thereby reducing the annual earnings for future years.

Financial Calculations. There is a trade-off between the amount of money spent withdrawn from principal and the endowment earnings. The more money taken from the principal, the smaller the endowment balance, and the less the amount that will be available for spending each year from the endowment. This relationship is shown in the table below. The table shows that if all funds are put into the endowment, and none are spend for projects that reduce the endowment principal, the Trustees could sustain $13.29 million (in 1993 dollars) forever. If, say, $100 million were withdrawn from principal for near-term large-project spending and not put into the endowment, then the endowment would produce $10.56 million (constant 1993 dollars) for perpetual annual spending. If $200 million were withheld from the endowment, the endowment would produce $8.59 million (1993 dollars).

These calculations are somewhat sensitive timing of the principal withdrawals. The sooner the withdrawals are made, the greater effect on the annual inflation-proofed earnings.

Table 4. Endowment Spending and Withdrawals from Principal

Amount Withdrawn from Principal		Spending Available from Endowment	Endowment	
Percent of Funds	Millions	(Millions of 1993 $)	Millions	Percent of Funds
0%	$0	$13.29	$600	100%
8%	$50	$11.93	$560	92%
16%	$100	$10.56	$510	84%
25%	$150	$9.77	$460	75%
33%	$200	$8.59	$410	67%
41%	$250	$7.41	$360	59%
49%	$300	$6.24	$310	51%
57%	$350	$5.06	$260	43%
66%	$400	$4.12	$210	34%
74%	$450	$3.06	$160	26%
82%	$500	$1.92	$110	18%
100%	$600	$0.00	$0	0%

Spreadsheets #4 and #5 shows the example cases in which $100 and $200 are withdrawn from principal for whatever reasons. Table 4, above, was built up from spreadsheets like these two.

Spreadsheet #4. Full Endowment, $100 Million Withdrawn from Principal

Endowment Spreadsheet (All figures in Million $)

FISCAL YEAR		Payments from Exxon	Reimburse-ments to Gvts	Deposits Amount	Interest Prior to Oct 1 of Year Total	Inflation	Real	Balance Nominal Dollars	Balance 1993 Dollars	Spending Nominal Dollars	Spending 1993 Dollars
1993	(Beginning Oct. 1 1992)				Initial Balance (October 1, 1993) i			$32.48	$32.48		
1994	(Beginning Oct. 1 1993)	$100.0	$30.0	$70.0	See note below table			$41.92	$41.92	$10.56	$10.56
1995	(Beginning Oct. 1 1994)	$70.0	$30.0	$40.0	$3.02	$1.51	$1.51	$48.99	$47.29	$10.95	$10.56
1996	(Beginning Oct. 1 1995)	$70.0	$30.0	$40.0	$3.56	$1.80	$1.76	$56.20	$52.33	$11.35	$10.56
1997	(Beginning Oct. 1 1996)	$70.0		$70.0	$4.14	$2.12	$2.02	$118.57	$106.38	$11.78	$10.56
1998	(Beginning Oct. 1 1997)	$70.0		$70.0	$8.79	$4.52	$4.27	$185.14	$160.01	$12.22	$10.56
1999	(Beginning Oct. 1 1998)	$70.0		$70.0	$12.89	$7.05	$5.83	$255.33	$212.58	$12.69	$10.56
2000	(Beginning Oct. 1 1999)	$70.0		$70.0	$17.39	$9.73	$7.66	$329.55	$264.30	$13.17	$10.56
2001	(Beginning Oct. 1 2000)	$70.0		$70.0	$22.44	$12.56	$9.89	$408.31	$315.45	$13.67	$10.56
2002	(Beginning Oct. 1 2001)	$70.0		$70.0	$28.20	$15.95	$12.25	$492.31	$366.04	$14.21	$10.56
2003	(Beginning Oct. 1 2002)				$34.17	$19.40	$14.77	$511.71	$366.04	$14.77	$10.56
2004	(Beginning Oct. 1 2003)				$35.51	$20.16	$15.35	$531.87	$366.04	$15.35	$10.56
2005	(Beginning Oct. 1 2004)				$36.91	$20.96	$15.96	$552.82	$366.04	$15.96	$10.56

Note: Interest prior to October 1, 1993 is included in the initial, October 1, 1993 balance of: $32.48 million

Spreadsheet #5. Full Endowment, $200 Million Withdrawn from Principal

Endowment Spreadsheet (All figures in Million $)

FISCAL YEAR		Payments from Exxon	Reimburse-ments to Gvts	Deposits Amount	Interest Prior to Oct 1 of Year Total	Inflation	Real	Balance Nominal Dollars	Balance 1993 Dollars	Spending Nominal Dollars	Spending 1993 Dollars
1993	(Beginning Oct. 1 1992)			Initial Balance (October 1, 1993) i				$32.48	$32.48		
1994	(Beginning Oct. 1 1993)	$100.0	$30.0	$70.0	See note below table			$53.89	$53.89	$8.59	$8.59
1995	(Beginning Oct. 1 1994)	$70.0	$30.0	$40.0	$3.88	$1.94	$1.94	$68.87	$66.48	$8.90	$8.59
1996	(Beginning Oct. 1 1995)	$70.0	$30.0	$40.0	$5.01	$2.53	$2.48	$84.65	$78.82	$9.23	$8.59
1997	(Beginning Oct. 1 1996)	$70.0		$70.0	$6.24	$3.20	$3.05	$121.32	$108.85	$9.57	$8.59
1998	(Beginning Oct. 1 1997)	$70.0		$70.0	$8.99	$4.62	$4.37	$160.37	$138.61	$9.94	$8.59
1999	(Beginning Oct. 1 1998)	$70.0		$70.0	$11.16	$6.11	$5.05	$201.22	$167.53	$10.32	$8.59
2000	(Beginning Oct. 1 1999)	$70.0		$70.0	$13.70	$7.67	$6.04	$244.21	$195.86	$10.71	$8.59
2001	(Beginning Oct. 1 2000)	$70.0		$70.0	$16.63	$9.30	$7.33	$319.72	$247.01	$11.12	$8.59
2002	(Beginning Oct. 1 2001)	$70.0		$70.0	$22.08	$12.49	$9.59	$400.25	$297.59	$11.55	$8.59
2003	(Beginning Oct. 1 2002)				$27.78	$15.77	$12.01	$416.02	$297.59	$12.01	$8.59
2004	(Beginning Oct. 1 2003)				$28.87	$16.39	$12.48	$432.41	$297.59	$12.48	$8.59
2005	(Beginning Oct. 1 2004)				$30.01	$17.04	$12.97	$449.45	$297.59	$12.97	$8.59

Note: Interest prior to October 1, 1993 is included in the initial, October 1, 1993 balance of: $32.48 million

Spreadsheet #6. Assumptions Common to All Endowment Calculations

Beginning Balance Analysis (figures in million $)

	Additions	Balance
Balance as of December 1, 1993		$31.4
Interest through July 1, 1993	$1.1	
Projected Balance as of July 1, 1993		$32.5
Interest through October 1, 1993	$0.0015	
Projected Balance as of October 1, 1993 (before other deposits)		$32.5

Interest Rate Analysis

Assumptions

Real Rate of Return

* Use the same rate assumed by the Alaska Permanent Fund Corporation
* 3.6%/yr through FY 97; 3%/yr thereafter (State FY ends June 30th; Adjustment for Federal FY)

Inflation Rate

* Taken from the Alaska Department of Revenue Long-range Fiscal Model,
* Fall 1992 Mid-range Forecast Assumptions (State FY; adjustment for Federal FY)

Interest Rate

* Annual Interest Rate = (Inflation Rate) + (Real Rate of Return)

ANALYSIS

Year	Annual Rate by State Fiscal Year			Annual Rate by US Fiscal Year			Deflator by US Fiscal Year
	Real Rate	Inflation	Interest	Real Rate	Inflation	Interest	Base = Oct. 1, 1993
1992		3.09%					
1993	3.60%	3.39%	6.99%	3.60%	3.46%	7.06%	
1994	3.60%	3.67%	7.27%	3.60%	3.67%	7.27%	1.0000
1995	3.60%	3.67%	7.27%	3.60%	3.71%	7.31%	0.9646
1996	3.60%	3.81%	7.41%	3.60%	3.81%	7.41%	0.9301
1997	3.60%	3.81%	7.41%	3.60%	3.81%	7.41%	0.8960
1998	3.00%	3.81%	6.81%	3.15%	3.81%	6.81%	0.8631
1999	3.00%	3.81%	6.81%	3.00%	3.81%	6.81%	0.8314
2000	3.00%	3.81%	6.81%	3.00%	3.84%	6.84%	0.8009
2001	3.00%	3.94%	6.94%	3.00%	3.94%	6.94%	0.7713
2002	3.00%	3.94%	6.94%	3.00%	3.94%	6.94%	0.7420
2003	3.00%	3.94%	6.94%	3.00%	3.94%	6.94%	0.7139
2004	3.00%	3.94%	6.94%	3.00%	3.94%	6.94%	0.6869
2005	3.00%	3.94%	6.94%	3.00%	3.94%	6.94%	0.6608
							0.6358

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ENDOWMENTS: A Method of Funding Restoration

Draft for RPWG, RT Review
December 22, 1992

This analysis summarizes endowment proposals recommended for use with the draft plan alternatives. The financial analysis that supports this summary is contained in the accompanying. These recommendations are intended for use with some of the alternatives. Not all endowments are appropriate with all alternatives, and more than one endowment proposals may be appropriate with some alternatives.

There are a variety of legal terms that describe a particular type of endowment such as a trust or permanent fund. In this memo, the term endowment is used to describe any funding mechanism that uses payments from one or more years to fund restoration projects beyond the ten-year planning horizon used in the draft plan, and uses interest from a fund as at least a partial funding source.

SUMMARY

No Endowment. Once funding choice is no endowment. In this case, all restoration funds are spent during the restoration plan's ten-year planning horizon. (The ten-year horizon ends September 30, 2003).

Operation and Maintenance Endowment. Some options may continue forever, or at least beyond the ten-year planning horizon. For example, an archaeology stewardship program may continue for generations. Similarly, if visitor centers are constructed, the annual operation and maintenance will not end after ten years. The same is true of land management costs for land acquired by this process, and for monitoring.

Amount of Money. This proposal assumes that principal is set aside to generate income sufficient to cover the annual costs of those options that continue beyond ten years. For each million 1993 dollars of perpetual, annual earnings required for operation and maintenance, approximately $35.5 million must be deposited as principal to the endowment.[1] The actual amount of money needed will change with each alternative. The amount required will be determined for each alternative. (That is, if an alternative includes more projects that continue past the ten-year horizon, it would require a large endowment to provide the on-going operation and maintenance funds. For example, an operation and maintenance endowment might have to be larger to fund the on-going costs of Alternative #6 than of Alternative #3.

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[1] Because of inflation, this relationship changes in depending on when the deposit is made. The $35.5 million figure assumes 50% is deposited in the 1994 federal fiscal year and the remaining amount is split between the 1995 and 1996 fiscal years. At high levels of deposits, this relationship changes somewhat because the deposits must be spread to late years of the settlement.

The table below shows the relationship between the endowment earnings and principal. Endowment spending is shown in constant, 1993 dollars.

Operation and Maintenance Endowment
Principal Required to fund
Annual Operation and Maintenance Costs of Restoration

Principal (Millions)	Endowment Spending (Millions of $1993)
$50	$1.41
$100	$2.81
$150	$4.22
$200	$5.40

Other Assumptions. This proposal assumes that the endowment has a perpetual life. It also assumes that as the initial spending for an option is allocated, the Trustees will also allocate to the endowment enough principal to assure funding of the on-going operation and maintenance costs.

Research and Monitoring Endowment. One proposal is to establish the *Exxon Valdez* Marine Sciences Endowment dedicated to long-term baseline marine research. The need for monitoring the status of spill-affected ecosystems will go on for a long time, perhaps forever. According to one proposal, "Given the infant status of restoration ecology, continual assessment of our efforts to restore Prince William sound and other areas is essential. Even if the cumulative wisdom gained by establishing a research endowment consists of no more than learning how nature heals itself, that knowledge will be unprecedented and priceless."[2]

Many groups are conducting important scientific research in Alaskan marine environments. Public and private universities, non-profit scientific groups, state and federal agencies, and individuals are all conducting research. Some of this research is funded from settlement monies, other from outside sources. A research endowment provides an opportunity to coordinate the long-term research into marine oil-spill affected environment. It provides a constant funding source and a single coordinating location to ensure that the range of basic research questions are addressed.

This endowment could be applied separately or in combination with the maintenance endowment described above.

Amount of Money. I am unsure how much money this endowment would require. I assume it would be somewhere in the neighborhood of $75 - $150 million. This analysis assumed that once established, the endowment should produce a steady flow of spending; that is, the same (in real terms) year after year.

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[2] Proposed Restoration Option; *Exxon Valdez Marine Sciences Endowment*; State Senator Arliss Sturgulewski; August 24, 1992; page 3.

Governing Board & Endowment Life. Spending decisions could be made either by a distinct governing board or by the Trustees. The decision depends, in part, on how much of the endowment purpose is constrained by the endowment charter. This proposal assume a perpetual life to the endowment.

Full Endowment with Large-project Withdrawals. This proposal assumes that the entire settlement is transferred to an endowment, but that large one-time projects such as land purchases are made from the principal of the endowment, and the remainder of the annual work projects are funded from annual earnings. In this way, the endowment would fund the full range of restoration decisions facing the trustees today. This endowment is a savings plan trading off today's spending to fund future restoration.

Governing Board & Endowment Life. In this proposal, the Trustees are the governing board, and the endowment has a perpetual life.

Pattern of Spending. Once established, an endowment should produce a steady flow of spending; that is, the same (in real terms) year after year. A constant level of spending, however, is more than the amount justified by real interest income in the early years, and the annual expenditures would not be fully funded by interest (after inflation-proofing) until the last deposit is made on September 30, 2001. The maximum amount of levelized spending that the endowment could sustain is $13.4 million per year in constant 1993 dollars.

Large-project Spending. Spending for large projects such as land purchases or other significant one-time expenses could be made either by taking it out of the annual earnings for more than one year, or by taking it from principal, thereby reducing the annual earnings for future years.

Amount of Money. There is a trade-off between the amount of money spent withdrawn from principal and the endowment earnings. The more money taken from the principal, the smaller the endowment balance, and the less the amount that will be available for spending each year from the endowment. This relationship is shown in the table below. The table shows that if all funds are put into the endowment, and none are spend for projects that reduce the endowment principal, the Trustees could sustain $13.36 million (in 1993 dollars) forever. If, say, $100 million were withdrawn from principal for near-term large-project spending and not put into the endowment, then the endowment would produce $10.64 million (constant 1993 dollars) for perpetual annual spending. If $200 million were withheld from the endowment, the endowment would produce $8.66 million (1993 dollars).

Endowment Spending and Withdrawals from Principal

Amount Withdrawn from Principal		Spending Available from Endowment	Endowment	
Percent of Funds	Millions	(Millions of 1993 $)	Millions	Percent of Funds
0%	$0	$13.29	$600	100%
8%	$50	$11.93	$560	92%
16%	$100	$10.56	$510	84%
25%	$150	$9.77	$460	75%
33%	$200	$8.59	$410	67%
41%	$250	$7.41	$360	59%
49%	$300	$6.24	$310	51%
57%	$350	$5.06	$260	43%
66%	$400	$4.12	$210	34%
74%	$450	$3.06	$160	26%
82%	$500	$1.92	$110	18%
100%	$600	$0.00	$0	0%

Critical Financial Assumptions. The financial assumptions for this analysis are explained in the accompanying draft. However, certain ones are critical.

- The endowments have a perpetual life. (If the endowment was to sunset after 20 years, it would require less principal than one that continues forever. However, the principal required for a perpetual endowment is not much different than the amount required for an endowment that sunsets after many years.)
- Spending is inflation-proofed. (That is, spending only includes interest *after* the amount to cover inflation has been returned to the principal.)
- Rate of inflation: Alaska Department of Revenue Fall Revenue Forecast mid-range assumptions. Because Exxon deposits money until the year 2001, the higher the rate of inflation, the lower the real earnings provided by the endowment. This analysis uses the mid-range inflation assumptions made by the Alaska Department of Revenue Fall 1992 Revenue Forecast. (It varies by year, but ranges from 3.39% for (state) fiscal year 1993, to 3.94% for the 2001 and beyond.)
- Real Rate of Return: The Alaska Permanent Fund Corporation. The higher the real rate of return, the less principal required to produce a given amount of annual, inflation-proofed spending. This analysis uses the real rate of return predicted by the Alaska Permanent Fund Corporation on assets of the Permanent Fund. The fund predicts a real rate of return of 3% per year prior to (state) Fiscal Year 1997, and 3.6%/yr beyond that time.

Endowments: A Method of Funding Restoration

INTRODUCTION

The Trustees have the opportunity to save a portion of today's restoration funds for tomorrow's needs by establishing an endowment. This paper does not describe all possible endowments. Rather, it distills proposals into a few endowment approaches for public review as part of the draft restoration plan alternatives. In developing these proposals, this paper discusses the following issues: How long a life should an endowment have? How to manage the funds? What should the purpose be? And how much of the funds should be put into an endowment.

There are a variety of legal terms that describe a particular type of endowment such as trust or permanent fund. In this paper the term endowment is used to describe any funding mechanism that uses payments from one or more years to fund restoration projects in future years, and uses interest from an accumulated fund as at least a partial funding source.

WHY AN ENDOWMENT? There are three basic reasons why the Trustees should consider an endowment for a portion of the payments from the *Exxon Valdez* civil settlement.

1. **On-going operation and maintenance.** Many of the restoration techniques used today will have permanent, on-going operation and maintenance costs. For example, facilities built today will have permanent annual costs. An endowment is one method to permanently funds the costs we are imposing on the future.

2. **Saving for the future.** If we are to use settlement funds after Exxon's last deposit in 2001, the Trustees must save some of Exxon's deposits for future use. Through an endowment, the trustees can maintain a funding source for guarding the resources of the spill-affected area, forever. An endowment provides an opportunity to change part of a large, one-time settlement into a resource for the future.

   The *Exxon Valdez* oil spill created damages that may not recover for generations. The extent of some of the oil-spill damage or recovery may not be completely known for a along time. Some of the resources and services we now believe are recovering on their own may not, in fact, recover completely. For some restoration activities, we may not know whether today's activities are successful for many years. Additional research may disclose additional damages. For these and other reasons, we can expect that restoration needs will continue past 2001, the year in which Exxon makes the last scheduled deposit under the civil settlement.

   An endowment provides an opportunity to complete restoration strategies at a different rate than that which would occur using current funds. Endowment is a broad term that covers a broad range of strategies. For example, endowments could be used to match the near-term accumulation of funds with the long-term need for restoration. It could be used to funding base to support permanent research, to fund long-term habitat acquisition needs, or even to accelerate purchase of habitat.

3. **Disciplining the present.** Governments have a difficult time not spending available funds.

But immediately spending the funds may not be the best use of the money. An endowment can be a savings plan to ensure that funds are not spent before the long-term needs become apparent. It provides some assurance that only the best restoration projects are funded.

4. **Earmarking part of the funds for a single, long-term use.** Some restoration needs are best conducted with a long-term source of funding. Examples might be long-term recovery monitoring, or a long-term research program. In these cases, an endowment may provide a method of achieving a stable funding source for a long-term program.

   Another example of a single-purpose endowment might be to provide for the operation and maintenance of a visitor's center. Funding construction without funding continued operation and maintenance might provide a burden on future generations rather than a benefit.

WHY *NOT* AN ENDOWMENT? There are also disadvantages to an endowment.

1. **An endowment takes away from today's use of the money.** An endowment pre-supposes that future use of the funds is as important as today's needs. It will decrease the amount we can apply to today's pressing needs.

2. **A structured savings plan decreases flexibility.** The most flexible way to use the money is on a case-by-case basis as the needs arise. An endowment structures the amount we can spend today. It limits our options to respond to the wishes of today.

ENDOWMENT LIFE

From Senator Sturgulewski's proposal for a Marine Research Foundation, "An endowment can begin with a perpetual (or unspecified) existence or as a limited duration sinking fund that will spend itself out of existence by a time certain. An unlimited period of existence is preferable, at least until the duration of tangible effects of the spill has been defined.[3]"

RECOMMENDATION. If we knew when injured resources and damaged services will be fully recovered, it would be possible to specify a date at which an endowment should spend itself out of existence. That is not now possible. Thus, only a perpetual endowment need be considered. If future generations decide that the spill area is fully recovered or to liquidate endowment assets, they would remain able to do that.

ENDOWMENT MANAGEMENT

Currently, settlement funds are deposited in the U.S. District Court Registry Investment System (CRIS) until the Trustees draw upon them. "CRIS regulations limiting investments to short-term U.S. Treasury securities make it impossible to earn returns adequate to fund a meaningful

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[3] Proposed Restoration Option; *Exxon Valdez Marine Sciences Endowment*; State Senator Arliss Sturgulewski; August 24, 1992; page 4.

program. The principal (the corpus) of an endowment should be withdrawn from CRIS and managed by an investment firm, or perhaps by trustees of the Permanent Fund Corporation.

RECOMMENDATION. As yet we have no recommendation. This question is relatively technical and it can be answered after the choice is made whether or not to set up an endowment.

SAMPLE ENDOWMENTS

Three examples are presented to illustrate some of the endowment concepts currently used in Alaska.

THE ALASKA PERMANENT FUND. Alaska's most famous endowment is the permanent fund. By law, at least 25% of all "mineral lease, rentals, royalties..." is deposited in the fund. Investment decisions of the fund are managed by a six-person board of trustees. Four of the six board members are public members with recognized competence and wide experience in finance, investment, or other business management-related fields. They are appointed by the governor for staggered four-year terms. The other members are the Commissioner of Revenue, and one cabinet member of the governor's choice.[4]" Spending decisions -- except for the permanent fund dividend which uses a formula established by law -- can only be made by legislative appropriation. The appointed representatives have no discretionary authority to spend the fund; they can only invest it.

THE ALASKA SCIENCE AND TECHNOLOGY FOUNDATION. The Foundation was set up by statute in 1988. It is governed by a board of nine directors, "appointed by the governor for staggered four year terms. Four of the directors must be recognized scientists or engineers (two from outside of Alaska); four members are to represent the general public; and one member must be employed by a state agency other than the University of Alaska."[5] The legislative plan is to use state surpluses from different legislative years to create an endowment of $100 million. "The Foundation's funds are held and managed by the Alaska Permanent Fund Corporation. All or a portion of the net income is available for appropriate each year." Spending decisions are made by the Foundation's board of directors.

THE KODIAK BROWN BEAR RESEARCH AND HABITAT MAINTENANCE TRUST "was established in 1981 to ensure that construction and operation of the Terror Lake Hydroelectric Project would not jeopardize the continued existence of Kodiak brown bears... and to mitigate impacts of the project on bear habitats in and adjacent to the Kodiak National Wildlife Refuge."[6] The trust was established in a joint Settlement Agreement between the Kodiak

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[4] An Alaskan's Guide to the Permanent Fund. Edition No. 5; September 30, 1992, Page 18.

[5] From Establishing the Fund for Alaska: The Procedural, Program, and Legal Options. Charles H.W. Foster et al. September 1989. A Feasibility Report Prepared For the World Wildlife Fund (U.S.), The Conservation Foundation.

[6] Kodiak Brown Bear Research and Habitat Maintenance Trust Agreement, page 2.

Electric Association (which originally sponsored the hydroelectric project), the State of Alaska, Department of Interior, Sierra Club, National Audubon Society, and National Wildlife Federation.

Management and spending decisions are made by four trustees: one designated by the Alaska Energy Authority (a state agency), one by the Governor, one by the Alaska Regional Director of the US Fish and Wildlife Service, and one by agreement of at least two of the environmental organizations named in the settlement agreement.

FINANCIAL CALCULATIONS

Spreadsheet #1 shows the basic financial calculations. It makes the unrealistic assumption of no spending after what is already scheduled, but it is a useful display to explain basic calculations and assumptions.

Fiscal Year. The table is based on the federal fiscal year (October 1 through September 30th), rather than calendar year, or state fiscal year. Federal fiscal year 1994 begins on October 1, 1993 and continues through September 30th 1994. Because Exxon makes deposits at the change of the federal fiscal year, and the yearly work plans are based on the federal fiscal year, using the federal fiscal year simplifies the analysis.

Beginning Balance. The spreadsheet assumes that as of October 1, 1993, the balance available to the Trustees will be $32.48 million. The tables below the estimates used to calculate that amount.

Table 1. Current Funds Projected to October 1, 1993

Description	Subtractions	Additions	Balance
Projected Balance as of January 1, 1993			$31.4
Projected Interest through July 1, 1993		$1.1	
Projected Balance as of July 1, 1993			$32.5
Projected Interest through October 1, 1993		$0.0015	
Projected Balance as of October 1, 1993			$32.5

Payments from Exxon. $100 million is due on September 30, 1993. Future payments will be $70 million every October 1st through 2001.

Spreadsheet #1. No Spending: Example to Show Calculations and Assumptions

Endowment Spreadsheet (All figures in Million $)

FISCAL YEAR		Payments from Exxon	Reimburse-ments to Gvts	Deposits Amount	Interest Prior to Oct 1 of Year Total	Inflation	Real	Balance Nominal Dollars	Balance 1993 Dollars	Spending Nominal Dollars	Spending 1993 Dollars
1993	(Beginning Oct. 1 1992)			Initial Balance (October 1, 1993) i				$32.48	$32.48		
1994	(Beginning Oct. 1 1993)	$100.0	$30.0	$70.0	See note below table			$102.48	$102.48	$0.00	$0.00
1995	(Beginning Oct. 1 1994)	$70.0	$30.0	$40.0	$7.38	$3.69	$3.69	$149.86	$144.65	$0.00	$0.00
1996	(Beginning Oct. 1 1995)	$70.0	$30.0	$40.0	$10.89	$5.50	$5.39	$200.75	$186.92	$0.00	$0.00
1997	(Beginning Oct. 1 1996)	$70.0		$70.0	$14.81	$7.58	$7.23	$285.56	$256.21	$0.00	$0.00
1998	(Beginning Oct. 1 1997)	$70.0		$70.0	$21.16	$10.88	$10.28	$376.72	$325.59	$0.00	$0.00
1999	(Beginning Oct. 1 1998)	$70.0		$70.0	$26.22	$14.35	$11.87	$472.94	$393.75	$0.00	$0.00
2000	(Beginning Oct. 1 1999)	$70.0		$70.0	$32.21	$18.02	$14.19	$575.15	$461.27	$0.00	$0.00
2001	(Beginning Oct. 1 2000)	$70.0		$70.0	$39.17	$21.91	$17.25	$684.31	$528.68	$0.00	$0.00
2002	(Beginning Oct. 1 2001)	$70.0		$70.0	$47.27	$26.74	$20.53	$801.58	$595.99	$0.00	$0.00
2003	(Beginning Oct. 1 2002)				$55.63	$31.58	$24.05	$857.21	$613.19	$0.00	$0.00
2004	(Beginning Oct. 1 2003)				$59.49	$33.77	$25.72	$916.70	$630.89	$0.00	$0.00
2005	(Beginning Oct. 1 2004)				$63.62	$36.12	$27.50	$980.32	$649.10	$0.00	$0.00

Note: Interest prior to October 1, 1993 is included in the initial, October 1, 1993 balance of: $32.48 million

Reimbursements to Governments. Under the terms of the settlement, the state and federal governments may reimburse themselves up to $67.0 million for the federal government and $75.0 million to the State of Alaska for cleanup, damage assessment and restoration, and litigation expenses incurred prior to January 1, 1991. The two governments may also reimburse themselves for cleanup costs after that time, damage assessment and restoration costs between March 1, 1991 and March 1, 1992, and for State of Alaska litigation costs after March 12, 1992.

The total amount of money to be reimbursed to the state and federal government is not final. We estimate that approximately $90 million will remain after October 1, 1993. We assume they will take in equal increments over the following three years, but other payment schedules are also possible.

Deposits. Deposits are Payments from Exxon less Reimbursements to the state and federal governments.

Interest. The total interest is the amount that would be earned on the balance of the previous year. Thus, the spreadsheet projects that during fiscal year 1994 (from October 1, 1993 through September 30, 1994) an endowment would earn $2.81 million on an initial balance of $40.25 million. The total interest composed of two sub-parts: interest due to inflation, and "real" interest.

Inflation. Changes in an endowment balance due to inflation create the illusion of growth, but the growth is not "real". That is, if a particular restoration option costs $1.00 million today, then after a year of 5% inflation, that same study will probably cost the trustees $1.05 million. That extra $50,000 does not buy anything more, it is just the amount of money needed to keep pace with the general level of price increases. Thus, the growth in the endowment balance needed to keep pace with inflation is not "real" growth. To forecast the "real" changes in the endowment balance, we must use a forecast of inflation.

The Alaska Department of Revenue forecasts inflation as part of its twice-annual revenue forecast. The most recent forecast is the Fall 1992 Revenue Forecast. Their inflation forecast is reprinted below.

Because the state forecasts inflation according to the *state* fiscal year, July 1 to June 30th, it is necessary to adapt the forecast to the federal fiscal year. The table below displays that adaption assuming a constant annual inflation rate (i.e., the federal fiscal year forecast assumes nine months one year's rate, and three months at the next year's rate).

Table 2. Inflation Rate Forecast
Alaska Department of Revenue, Fall 1992 Revenue Forecast

Fiscal Year	AK Department of Revenue Inflation Rate by *State* FY			(Adapted from AK DOR) Inflation Rate by *Federal* FY		
	Low	Mid	High	Low	Mid	High
1993	2.56%	3.39%	4.33%	2.58%	3.46%	4.39%
1994	2.62%	3.67%	4.56%	2.62%	3.67%	4.56%
1995	2.62%	3.67%	4.56%	2.68%	3.71%	4.63%
1996	2.85%	3.81%	4.84%	2.85%	3.81%	4.84%
1997	2.85%	3.81%	4.84%	2.85%	3.81%	4.84%
1998	2.85%	3.81%	4.84%	2.85%	3.81%	4.84%
1999	2.85%	3.81%	4.84%	2.85%	3.81%	4.84%
2000	2.85%	3.81%	4.84%	2.90%	3.84%	4.88%
2001	3.04%	3.94%	5.01%	3.04%	3.94%	5.01%
2002	3.04%	3.94%	5.01%	3.04%	3.94%	5.01%
2003	3.04%	3.94%	5.01%	3.04%	3.94%	5.01%
2004	3.04%	3.94%	5.01%	3.04%	3.94%	5.01%
2005 & beyond	3.04%	3.94%	5.01%	3.04%	3.94%	5.01%

This analysis uses the Alaska Department of Revenue mid-range forecast as the most-likely forecast of inflation.

Real Rate of Return. The real rate of return (or real interest) is the rate above of interest earned above and beyond inflation. The Alaska Permanent Fund Corporation forecasts real rate of return for the permanent fund. They use a goal of 3% per year as their target rate of increase, but forecast real return at 3.6% for state fiscal years 1994 through 1997 and 3% per year thereafter.[7]

Table 3 summarizes the interest rate assumptions used for the spreadsheets.

[7] An Alaskan's Guide to the Permanent Fund, Edition No. 5, September 30, 1992; Page 9. And Jim Kelly, Research & Liaison Officer, Alaska Permanent Fund Corporation, Personal Communication, November 1992; And Alaska Permanent Fund Corporation, February 1992 Financial Statements, pages 4 and 5.

Table 3. Assumptions Common to Endowment Calculations

Beginning Balance Analysis (figures in million $)

	Additions	Balance
Balance as of December 1, 1993		$31.4
Interest through July 1, 1993	$1.1	
Projected Balance as of July 1, 1993		$32.5
Interest through October 1, 1993	$0.0015	
Projected Balance as of October 1, 1993 (before other deposits)		$32.5

Interest Rate Analysis

Assumptions

Real Rate of Return

* Use the same rate assumed by the Alaska Permanent Fund Corporation
* 3.6%/yr through FY 97; 3%/yr thereafter (State FY ends June 30th; Adjustment for Federal FY)

Inflation Rate

* Taken from the Alaska Department of Revenue Long-range Fiscal Model,
* Fall 1992 Mid-range Forecast Assumptions (State FY; adjustment for Federal FY)

Interest Rate

* Annual Interest Rate = (Inflation Rate) + (Real Rate of Return)

ANALYSIS

Year	Annual Rate by State Fiscal Year			Annual Rate by US Fiscal Year			Deflator by US Fiscal Year
	Real Rate	Inflation	Interest	Real Rate	Inflation	Interest	Base = Oct. 1, 1993
1992		3.09%					
1993	3.60%	3.39%	6.99%	3.60%	3.46%	7.06%	
1994	3.60%	3.67%	7.27%	3.60%	3.67%	7.27%	1.0000
1995	3.60%	3.67%	7.27%	3.60%	3.71%	7.31%	0.9646
1996	3.60%	3.81%	7.41%	3.60%	3.81%	7.41%	0.9301
1997	3.60%	3.81%	7.41%	3.60%	3.81%	7.41%	0.8960
1998	3.00%	3.81%	6.81%	3.15%	3.81%	6.81%	0.8631
1999	3.00%	3.81%	6.81%	3.00%	3.81%	6.81%	0.8314
2000	3.00%	3.81%	6.81%	3.00%	3.84%	6.84%	0.8009
2001	3.00%	3.94%	6.94%	3.00%	3.94%	6.94%	0.7713
2002	3.00%	3.94%	6.94%	3.00%	3.94%	6.94%	0.7420
2003	3.00%	3.94%	6.94%	3.00%	3.94%	6.94%	0.7139
2004	3.00%	3.94%	6.94%	3.00%	3.94%	6.94%	0.6869
2005	3.00%	3.94%	6.94%	3.00%	3.94%	6.94%	0.6608
							0.6358

Balance. The endowment balance is the previous year's balance plus that year's deposits, that year's total interest, and minus that year's spending. The column labeled "Balance, Nominal Dollars" shows the amount that the endowment is forecast to actually hold in the bank. The column labeled "Balance, 1993 dollars" shows the value of that amount at the October 1, 1993 price levels using the inflation forecast explained above. The column shows that in the unrealistic case that all funds are put into an endowment and the Trustees do not spend any further money for restoration until Fiscal Year 2003, the endowment will hold almost $893.65 million. And that balance will be worth approximately $594.9 million in 1993 dollars.

Spreadsheet #1 explained the financial calculations by assuming no spending. It is an unrealistic example to explain the basic financial calculations. Spreadsheet #2 uses another extreme example to show the effects of inflation-proofing. It makes the unrealistic assumption that all funds are put into the endowment, but that it assumes constant annual spending (that is, it calculates the maximum amount of real spending that could be sustained forever). That amount of spending is more than is justified by real interest income in the early years, and the annual expenditures are not fully funded by inflation-proofed interested until the last deposit is made on September 30, 2001. In this case, it shows the Trustees could sustain $13.29 million (in 1993 dollars) forever.

Spreadsheet #2. Maximum Endowment, Constant Annual Spending

Endowment Spreadsheet (All figures in Million $)

FISCAL YEAR		Payments from Exxon	Reimburse-ments to Gvts	Deposits Amount	Interest Prior to Oct 1 of Year Total	Inflation	Real	Balance Nominal Dollars	Balance 1993 Dollars	Spending Nominal Dollars	Spending 1993 Dollars
1993	(Beginning Oct. 1 1992)			Initial Balance (October 1, 1993) i				$32.48	$32.48		
1994	(Beginning Oct. 1 1993)	$100.0	$30.0	$70.0	See note below table			$89.19	$89.19	$13.29	$13.29
1995	(Beginning Oct. 1 1994)	$70.0	$30.0	$40.0	$6.42	$3.21	$3.21	$121.84	$117.60	$13.77	$13.29
1996	(Beginning Oct. 1 1995)	$70.0	$30.0	$40.0	$8.86	$4.47	$4.39	$156.41	$145.63	$14.28	$13.29
1997	(Beginning Oct. 1 1996)	$70.0		$70.0	$11.54	$5.90	$5.63	$223.13	$200.20	$14.82	$13.29
1998	(Beginning Oct. 1 1997)	$70.0		$70.0	$16.53	$8.50	$8.03	$294.29	$254.35	$15.38	$13.29
1999	(Beginning Oct. 1 1998)	$70.0		$70.0	$20.48	$11.21	$9.27	$368.80	$307.05	$15.97	$13.29
2000	(Beginning Oct. 1 1999)	$70.0		$70.0	$25.12	$14.05	$11.06	$447.34	$358.77	$16.58	$13.29
2001	(Beginning Oct. 1 2000)	$70.0		$70.0	$30.46	$17.04	$13.42	$530.60	$409.92	$17.21	$13.29
2002	(Beginning Oct. 1 2001)	$70.0		$70.0	$36.65	$20.73	$15.92	$619.37	$460.51	$17.88	$13.29
2003	(Beginning Oct. 1 2002)				$42.98	$24.40	$18.58	$643.77	$460.51	$18.58	$13.29
2004	(Beginning Oct. 1 2003)				$44.68	$25.36	$19.31	$669.13	$460.51	$19.31	$13.29
2005	(Beginning Oct. 1 2004)				$46.44	$26.36	$20.07	$695.50	$460.51	$20.07	$13.29

Note: Interest prior to October 1, 1993 is included in the initial, October 1, 1993 balance of: $32.48 million

ENDOWMENT PROPOSALS FOR PUBLIC REVIEW

This section combines concepts and financial assumptions to describe endowment proposals recommended for public review. It repeats much of the explanation in the summary, but adds more detailed financial calculations.

OPERATION AND MAINTENANCE ENDOWMENT. This proposal assumes that principal is set aside to generate income sufficient to cover the annual costs of those options that continue beyond ten years. For each million 1993 dollars of perpetual, annual earnings required for operation and maintenance, approximately $35.5 million must be deposited as principal to the endowment.[8] The actual amount of money needed will change with each alternative. The amount required will be determined for each alternative. (That is, if an alternative includes more projects that continue past the ten-year horizon, it would require a large endowment to provide the on-going operation and maintenance funds. For example, an operation and maintenance endowment might have to be larger to fund the on-going costs of Alternative #6 than of Alternative #3.

Spreadsheet #3 shows the relationship between the endowment earnings and principal. Endowment spending is shown in constant, 1993 dollars.

This proposal assumes that the endowment has a perpetual life. It also assumes that as the initial spending for an option is allocated, the Trustees will also allocate to the endowment enough principal to assure funding of the on-going operation and maintenance costs.

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[8] Because of inflation, this relationship changes in depending on when the deposit is made. The $35.5 million figure assumes 50% is deposited in the 1994 federal fiscal year and the remaining amount is split between the 1995 and 1996 fiscal years. At high levels of deposits, this relationship changes somewhat because the deposits must be spread to late years of the settlement.

Spreadsheet #3. Summary Spreadsheet for Operation and Maintenance, or Research and Monitoring Endowments

Summary: Financial Calculations for Example Operation and Maintenance, or Research and Monitoring Endowments

Total Deposits =	**$50.0**		**$100.0**		**$150.0**		**$200.0**	
Fiscal Year	Deposits (Nominal)	Spending (1993 $)	Deposits (Nominal)	Spending (1993 $)	Deposits (Nominal)	Spending (1993 $)	Deposits (Nominal)	Spending (1993 $)
1993								
1994	$25.0	$0.00	$50.0	$0.00	$75.0	$0.00	$75.0	$0.00
1995	$12.5	$0.87	$25.0	$1.74	$37.5	$2.61	$25.0	$2.61
1996	$12.5	$1.29	$25.0	$2.57	$37.5	$3.86	$25.0	$3.44
1997	$0.0	$1.69	$0.0	$3.38	$0.0	$5.07	$25.0	$4.25
1998	$0.0	$1.69	$0.0	$3.38	$0.0	$5.07	$25.0	$5.02
1999	$0.0	$1.48	$0.0	$2.96	$0.0	$4.43	$25.0	$5.05
2000	$0.0	$1.41	$0.0	$2.81	$0.0	$4.22	$0.0	$5.41
2001	$0.0	$1.41	$0.0	$2.81	$0.0	$4.22	$0.0	$5.41
2002	$0.0	$1.41	$0.0	$2.81	$0.0	$4.22	$0.0	$5.41
2003	$0.0	$1.41	$0.0	$2.81	$0.0	$4.22	$0.0	$5.40
2004	$0.0	$1.41	$0.0	$2.81	$0.0	$4.22	$0.0	$5.40
2005	$0.0	$1.41	$0.0	$2.81	$0.0	$4.22	$0.0	$5.40

RESEARCH AND MONITORING ENDOWMENT. One proposal is to establish the *Exxon Valdez* Marine Sciences Endowment dedicated to long-term baseline marine research. The need for monitoring the status of spill-affected ecosystems will go on for a long time, perhaps forever. According to one proposal, "Given the infant status of restoration ecology, continual assessment of our efforts to restore Prince William sound and other areas is essential. Even if the cumulative wisdom gained by establishing a research endowment consists of no more than learning how nature heals itself, that knowledge will be unprecedented and priceless."[9]

Many groups are conducting important scientific research in Alaskan marine environments. Public and private universities, non-profit scientific groups, state and federal agencies, and individuals are all conducting research. Some of this research is funded from settlement monies, other from outside sources. A research endowment provides an opportunity to coordinate the long-term research into marine oil-spill affected environment. It provides a constant funding source and a single coordinating location to ensure that the range of basic research questions are addressed.

A research and monitoring endowment could be applied separately or in combination with the maintenance endowment described previously.

Amount of Money. I am unsure how much money this endowment would require. I assume it would be somewhere in the neighborhood of $75 - $150 million. This analysis assumed that once established, the endowment should produce a steady flow of spending; that is, the same (in real terms) year after year.

Governing Board & Endowment Life. Spending decisions could be made either by a distinct governing board or by the Trustees. The decision depends, in part, on how much of the endowment purpose is constrained by the endowment charter. This proposal assume a perpetual life to the endowment.

Financial Calculations. The financial calculations for this endowment are the same as for the operation and maintenance endowment. The amount of money may be different, but the range is given in Spreadsheet #3.

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[9] Proposed Restoration Option; *Exxon Valdez Marine Sciences Endowment*; State Senator Arliss Sturgulewski; August 24, 1992; page 3.

FULL ENDOWMENT WITH LARGE-PROJECT WITHDRAWALS. This proposal assumes that the entire settlement is transferred to an endowment, but that large one-time projects such as land purchases are made from the principal of the endowment, and the remainder of the annual work projects are funded from annual earnings. In this way, the endowment would fund the full range of restoration decisions facing the trustees today. This endowment is a savings plan trading off today's spending to fund future restoration.

Governing Board & Endowment Life. In this proposal, the Trustees are the governing board, and the endowment has a perpetual life.

Pattern of Spending. Once established, an endowment should produce a steady flow of spending; that is, the same (in real terms) year after year. A constant level of spending, however, is more than the amount justified by real interest income in the early years, and the annual expenditures would not be fully funded by interest (after inflation-proofing) until the last deposit is made on September 30, 2001. The maximum amount of levelized spending that the endowment could sustain is $13.29 million per year in constant 1993 dollars.

Large-project Spending. Spending for large projects such as land purchases or other significant one-time expenses could be made either by taking it out of the annual earnings for more than one year, or by taking it from principal, thereby reducing the annual earnings for future years.

Financial Calculations. There is a trade-off between the amount of money spent withdrawn from principal and the endowment earnings. The more money taken from the principal, the smaller the endowment balance, and the less the amount that will be available for spending each year from the endowment. This relationship is shown in the table below. The table shows that if all funds are put into the endowment, and none are spend for projects that reduce the endowment principal, the Trustees could sustain $13.29 million (in 1993 dollars) forever. If, say, $100 million were withdrawn from principal for near-term large-project spending and not put into the endowment, then the endowment would produce $10.56 million (constant 1993 dollars) for perpetual annual spending. If $200 million were withheld from the endowment, the endowment would produce $8.59 million (1993 dollars).

These calculations are somewhat sensitive timing of the principal withdrawals. The sooner the withdrawals are made, the greater effect on the annual inflation-proofed earnings.

Table 4. Endowment Spending and Withdrawals from Principal

Amount Withdrawn from Principal		Spending Available from Endowment	Endowment	
Percent of Funds	Millions	(Millions of 1993 $)	Millions	Percent of Funds
0%	$0	$13.29	$600	100%
8%	$50	$11.93	$560	92%
16%	$100	$10.56	$510	84%
25%	$150	$9.77	$460	75%
33%	$200	$8.59	$410	67%
41%	$250	$7.41	$360	59%
49%	$300	$6.24	$310	51%
57%	$350	$5.06	$260	43%
66%	$400	$4.12	$210	34%
74%	$450	$3.06	$160	26%
82%	$500	$1.92	$110	18%
100%	$600	$0.00	$0	0%

Spreadsheets #4 and #5 shows the example cases in which $100 and $200 are withdrawn from principal for whatever reasons. Table 4, above, was built up from spreadsheets like these two.

Spreadsheet #4. Full Endowment, $100 Million Withdrawn from Principal

Endowment Spreadsheet (All figures in Million $)

FISCAL YEAR		Payments from Exxon	Reimburse-ments to Gvts	Deposits Amount	Interest Prior to Oct 1 of Year Total	Inflation	Real	Balance Nominal Dollars	Balance 1993 Dollars	Spending Nominal Dollars	Spending 1993 Dollars
1993	(Beginning Oct. 1 1992)			Initial Balance (October 1, 1993) i				$32.48	$32.48		
1994	(Beginning Oct. 1 1993)	$100.0	$30.0	$70.0	See note below table			$41.92	$41.92	$10.56	$10.56
1995	(Beginning Oct. 1 1994)	$70.0	$30.0	$40.0	$3.02	$1.51	$1.51	$48.99	$47.29	$10.95	$10.56
1996	(Beginning Oct. 1 1995)	$70.0	$30.0	$40.0	$3.56	$1.80	$1.76	$56.20	$52.33	$11.35	$10.56
1997	(Beginning Oct. 1 1996)	$70.0		$70.0	$4.14	$2.12	$2.02	$118.57	$106.38	$11.78	$10.56
1998	(Beginning Oct. 1 1997)	$70.0		$70.0	$8.79	$4.52	$4.27	$185.14	$160.01	$12.22	$10.56
1999	(Beginning Oct. 1 1998)	$70.0		$70.0	$12.89	$7.05	$5.83	$255.33	$212.58	$12.69	$10.56
2000	(Beginning Oct. 1 1999)	$70.0		$70.0	$17.39	$9.73	$7.66	$329.55	$264.30	$13.17	$10.56
2001	(Beginning Oct. 1 2000)	$70.0		$70.0	$22.44	$12.56	$9.89	$408.31	$315.45	$13.67	$10.56
2002	(Beginning Oct. 1 2001)	$70.0		$70.0	$28.20	$15.95	$12.25	$492.31	$366.04	$14.21	$10.56
2003	(Beginning Oct. 1 2002)				$34.17	$19.40	$14.77	$511.71	$366.04	$14.77	$10.56
2004	(Beginning Oct. 1 2003)				$35.51	$20.16	$15.35	$531.87	$366.04	$15.35	$10.56
2005	(Beginning Oct. 1 2004)				$36.91	$20.96	$15.96	$552.82	$366.04	$15.96	$10.56

Note: Interest prior to October 1, 1993 is included in the initial, October 1, 1993 balance of: $32.48 million

File = ENDBASIC.XLS

Date = 12/22/92

Spreadsheet #5. Full Endowment, $200 Million Withdrawn from Principal

Endowment Spreadsheet (All figures in Million $)

FISCAL YEAR		Payments from Exxon	Reimburse-ments to Gvts	Deposits Amount	Interest Prior to Oct 1 of Year Total	Inflation	Real	Balance Nominal Dollars	Balance 1993 Dollars	Spending Nominal Dollars	Spending 1993 Dollars
1993	(Beginning Oct. 1 1992)			Initial Balance (October 1, 1993) i				$32.48	$32.48		
1994	(Beginning Oct. 1 1993)	$100.0	$30.0	$70.0	See note below table			$53.89	$53.89	$8.59	$8.59
1995	(Beginning Oct. 1 1994)	$70.0	$30.0	$40.0	$3.88	$1.94	$1.94	$68.87	$66.48	$8.90	$8.59
1996	(Beginning Oct. 1 1995)	$70.0	$30.0	$40.0	$5.01	$2.53	$2.48	$84.65	$78.82	$9.23	$8.59
1997	(Beginning Oct. 1 1996)	$70.0		$70.0	$6.24	$3.20	$3.05	$121.32	$108.85	$9.57	$8.59
1998	(Beginning Oct. 1 1997)	$70.0		$70.0	$8.99	$4.62	$4.37	$160.37	$138.61	$9.94	$8.59
1999	(Beginning Oct. 1 1998)	$70.0		$70.0	$11.16	$6.11	$5.05	$201.22	$167.53	$10.32	$8.59
2000	(Beginning Oct. 1 1999)	$70.0		$70.0	$13.70	$7.67	$6.04	$244.21	$195.86	$10.71	$8.59
2001	(Beginning Oct. 1 2000)	$70.0		$70.0	$16.63	$9.30	$7.33	$319.72	$247.01	$11.12	$8.59
2002	(Beginning Oct. 1 2001)	$70.0		$70.0	$22.08	$12.49	$9.59	$400.25	$297.59	$11.55	$8.59
2003	(Beginning Oct. 1 2002)				$27.78	$15.77	$12.01	$416.02	$297.59	$12.01	$8.59
2004	(Beginning Oct. 1 2003)				$28.87	$16.39	$12.48	$432.41	$297.59	$12.48	$8.59
2005	(Beginning Oct. 1 2004)				$30.01	$17.04	$12.97	$449.45	$297.59	$12.97	$8.59

Note: Interest prior to October 1, 1993 is included in the initial, October 1, 1993 balance of: $32.48 million

Spreadsheet #6. Assumptions Common to All Endowment Calculations

Beginning Balance Analysis (figures in million $)

	Additions	Balance
Balance as of December 1, 1993		$31.4
Interest through July 1, 1993	$1.1	
Projected Balance as of July 1, 1993		$32.5
Interest through October 1, 1993	$0.0015	
Projected Balance as of October 1, 1993 (before other deposits)		$32.5

Interest Rate Analysis

Assumptions

Real Rate of Return

* Use the same rate assumed by the Alaska Permanent Fund Corporation
* 3.6%/yr through FY 97; 3%/yr thereafter (State FY ends June 30th; Adjustment for Federal FY)

Inflation Rate

* Taken from the Alaska Department of Revenue Long-range Fiscal Model,
* Fall 1992 Mid-range Forecast Assumptions (State FY; adjustment for Federal FY)

Interest Rate

* Annual Interest Rate = (Inflation Rate) + (Real Rate of Return)

ANALYSIS

Year	Annual Rate by State Fiscal Year			Annual Rate by US Fiscal Year			Deflator by US Fiscal Year
	Real Rate	Inflation	Interest	Real Rate	Inflation	Interest	Base = Oct. 1, 1993
1992		3.09%					
1993	3.60%	3.39%	6.99%	3.60%	3.46%	7.06%	
1994	3.60%	3.67%	7.27%	3.60%	3.67%	7.27%	1.0000
1995	3.60%	3.67%	7.27%	3.60%	3.71%	7.31%	0.9646
1996	3.60%	3.81%	7.41%	3.60%	3.81%	7.41%	0.9301
1997	3.60%	3.81%	7.41%	3.60%	3.81%	7.41%	0.8960
1998	3.00%	3.81%	6.81%	3.15%	3.81%	6.81%	0.8631
1999	3.00%	3.81%	6.81%	3.00%	3.81%	6.81%	0.8314
2000	3.00%	3.81%	6.81%	3.00%	3.84%	6.84%	0.8009
2001	3.00%	3.94%	6.94%	3.00%	3.94%	6.94%	0.7713
2002	3.00%	3.94%	6.94%	3.00%	3.94%	6.94%	0.7420
2003	3.00%	3.94%	6.94%	3.00%	3.94%	6.94%	0.7139
2004	3.00%	3.94%	6.94%	3.00%	3.94%	6.94%	0.6869
2005	3.00%	3.94%	6.94%	3.00%	3.94%	6.94%	0.6608
							0.6358

RPWG
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July 13, 1992

RPWG ISSUE STATEMENTS AND COMMENTS

1. TIMELINESS OF RESTORATION, INCLUDING CRITICAL LAND ACQUISITION, IS IMPORTANT AND MAY HAVE AN EFFECT ON HOW A RESOURCE OR SERVICE WILL RECOVER.

Seems like the 1993 work should be started on now. (1)

The 1992 Work Plan seems almost futile. (1)

People want to put money directly back into restoration as quickly as possible. (1)

Appears to be a lot of willingness to put money into things which had a greater urgency. (1)

Suggest that a reasonable time frame be established within which recovery is desirable. (1)

The impacted resources need to recover now and need protection from further damage. (1)

The fact that NRDA studies are incomplete and should be continued must not be used as an excuse to delay the initiation of restoration options. (1)

Uncertainty concerning the rate and degree of natural recovery should not be used as an excuse to delay restoration. (1)

Acquire protection in a timely manner. (1)

Importance of starting now/soon. (1)

Disagrees with having unanimous approval of the six Trustee Council members for the final 15 members of the Public Advisory Group; a 4-member approval would be sufficient; getting different disciplines involved is necessary. (1)

EVOS TC has done nothing. (1)

Trustees should implement imminent threat process to immediately identify and act to acquire threatened habitats. (3)

The imminent threat protection process is inadequate and should already be underway. (1)

Immediately protect areas that are under an imminent threat. (1)

Imminent threat protection process needs to begin immediately. (1)

Imminent threat protection process needs to be better promoted within the Restoration Framework to fast track acquiring and protecting habitat. (1)

The "imminent threat process" is important for determining acquisition priorities. (4)

2. CONSIDER THE PROS AND CONS OF ADDITIONAL CLEAN-UP ACTIVITIES.

Bioremediation did not help. (1)

Didn't agree with the steam cleaning which was killing some of the survivors (eel grasses). (1)

Has gone out in his boat and seen oil still pouring out; wants to know if any more removal and cleanup will be done. (1)

Area is still subject to major oil impact; in order to restore property, the oil has to still be removed. (1)

Little effort should be given to removing remaining oil on beaches. (1)

More cleanup should be done (shellfish); Exxon should be required to clean oiled mussels. (1)

There is an impression that they did not get oil that is still out there. (1)

3. CONSIDER CONTINUATION OR INITIATION OF ADDITIONAL INJURY ASSESSMENT STUDIES TO PROVIDE INFORMATION AT ALL STAGES OF THE RESTORATION PROCESS FOR ALL INJURED RESOURCES AND SERVICES TO (1) EVALUATE NEED FOR PRESENT AND FUTURE RESTORATION AND (2) EVALUATE EFFECTIVENESS OF RESTORATION.

There were a number of commercial fisheries projects which had merit; the public has not been presented with a full range of possibilities and has been given a distilled version. (1)

Doesn't see any projects having to do with identification of replacing injured services; nothing categorizes what resource services were injured and what the options are for replacing these services. (1)

Was very disappointed with paying back state and federal agencies; money should be used for more critical things, such as herring studies and habitat acquisition. (1)

All proposals on lost resource services were rejected by the Trustees. (1)

There are some valuable fisheries projects that could occur. (1)

Wants a strong adherence that there was some damage here due to the spill; tying the injury to the spill should be a strong criteria. (1)

There was not a lot on shellfish, particularly spot shrimp, discussed in the framework document. (1)

The feeding grounds have changed and they are seeing more aggressive fish. (1)

There was no money appropriated to study shellfish in the Sound; would like some restoration money put into this study. (1)

The threatened species that were affected by the oil spill should be looked at; Fish and Wildlife has gotten close to identifying these species, four mammals and three birds. (1)

Statements on stellar sea lions are not accurate. (1)

Is very concerned about the stellar sea lions; wants a better job done on the results from these studies; there is very little mentioned in the framework document regarding this species. (1)

Would like to see more work done on assessing the stellar sea lions and why this species is being given up on so soon. (1)

Glacier Bay has a study to look at impacts on harbor seals from disturbance. (1)

There were no economic studies done after the Exxon Valdez spill in regard to tourism; she did a survey of disbursed recreation and the tourism businesses in Prince William Sound; none of them were contacted for any economic survey. (1)

Understands from the Trustees that they were not doing any more damage assessment. (1)

Not all resources studied are listed in the summary of injury. (1)

Dall porpoise is not being studied on a regular basis; those who have a charter business have noticed some porpoise are missing; from a tourism and recreation point of view, a picture of the porpoise is worth money; feels left out on this resource. (1)

Wild deer studies should be considered. (1)

Focus should be on doing something with a resource that can be helped. (1)

There is a need for archaeological assessment and protection. (1)

There is still a question of the health of clams and the system in general. (1)

Should look at what could have been done better; thinks a lot has been left out. (1)

Current technology does not allow an accurate assessment. (1)

Some analysis of herring and clam resources is needed. (1)

Further analysis on protection of artifacts needs to be examined. (1)

Was disappointed that a couple of high priority projects were deleted; would like to see these two projects funded out of the 1992 funds. (1)

Presented a concept by Dr. Sylvia Earl - not much has changed in scientific techniques; there is a lot of potential for the money to change the course of knowledge and do some unconventional things; would like to see some input into new ways of collecting information. (1)

Thinks the Restoration Framework document is off to a real good start, but there is one glaring omission, the impact on human resources. (1)

Concerned about how traditional clam areas are being assessed. (1)

Concerned about cultural artifacts which are irreplaceable and the damage from the spill. (1)

Would like more issues addressed on ongoing health of the environment and ongoing populations. (1)

Assessment and Quality Assurance of Shellfish Resources. (1)

Enhancement of the Pacific Herring in Uyak Bay. (1)

The point is if no work is done, then there is no recommendation for this area, which is a Catch 22 situation. (1)

Need some chum salmon work done on the outer coast but won't know until next year if they were drastically affected. (1)

He is a commercial seiner and there appears to be no recommendation for restoration in the outer coast. (2)

There has not been enough time to do the required study. (1)

Considerable damage was done to the sea lions. (1)

There should be some concentration on the sea lions' food supply. (1)

Prince William Sound regulars state that there are far fewer harbor porpoises and Dall porpoises in the spill area. (1)

No discussion is given to the inability to measure or assess injury to some resources; must recognize that we will be unable to quantify the damages in some areas. (2)

The definition of injuries should be flexible enough to include possible spill injuries which are not yet documented with certainty. (1)

Trustees continue to ignore the imminent threats to archeological/cultural resources. (1)

Injuries to resources and services should not be categorized as 'significant' or 'insignificant' since there is insufficient data to make this distinction. (1)

There is not enough emphasis on describing and quantifying injuries to services. (1)

Must continue to explore full range of damages. (1)

There is some resource damage in species not studied. (1)

Continue to include new information as process matures and restoration is done. (1)

There is no discussion of resources that may have been damaged but were not studied. (1)

Relatively little attention has been given to effects on National Park Resources. (1)

Archeological resources are significant on both public and private lands and should be studied and monitored on both. (1)

Too much emphasis is given to commercial fish studies and not enough consideration to other species and intrinsic values such as wilderness. (1)

Injuries to services were not adequately represented in NRDA studies (2).

Continue NRDA work as appropriate; don't artificially stop. (1)

The need to assess effects on archaeological resources. (1)

NRDA should be done carefully and thoroughly. (1)

"...the framework is much too inflexible...the restoration phase should not be limited by the inability to detect impacts." As the science improves, the knowledge of impacts will improve and restoration should respond. (1)

Reduce some studies to monitoring status but keep them going. (1)

The need to continue damage assessment. (1)

It is necessary to assess and restore archeological/cultural resources. (2)

Archeological resources need immediate evaluation and planning in order to provide adequate protection to sites. (2)

Further synthesis of effects on coastal, riverine, and upland habitats and the array of species they support is needed. (1)

The most beneficial use of settlement monies is for continued research activities that will help us learn about the spill. (1)

4. LONG TERM, COMPREHENSIVE, SCIENTIFIC MONITORING AND BASIC RESEARCH, INCLUDING COLLECTION OF BASELINE DATA, MAY BE CRITICAL IN ASSESSING LATENT AND SUBLETHAL OIL SPILL INJURIES, RATE OF RECOVERY, AND LONG-TERM HEALTH AND MANAGEMENT OF AFFECTED ECOSYSTEMS.

Acquisition is not the only option; every public testimony meeting has had strong support for resource research. (1)

Would like to reiterate overall that continued emphasis on scientific study and monitoring is unnecessary; any further study on wildlife and bird species is unnecessary; foxes should be eliminated; there should be continued emphasis on the acquisition and replacement of lands, which will be the thrust of the next five years. (1)

Some baseline data in terms of natural loss is needed to compare to the future; could build off existing systems and increase capabilities to do monitoring; need a laboratory locally for capability to do analysis of clam and fish to determine oil contamination; $1 million was spent to get answers on the clams. (1)

Support basic research. (1)

Adequate recovery should reflect that monitoring will continue to assure that further injury wasn't detected or arise later as a result of latent injury or complex ecological interactions. (1)

How do we determine naturally operating relationships of ecosystems without baseline information on injured resources. (1)

Continued research and monitoring over time needs to be reviewed for relevance on a periodic basis. (1)

Long-term recovery monitoring should comprehensively approach the entire

ecosystem. (5)

Long-term monitoring is important. (2)

Food web relationships need greater attention. (1)

Definition of injury should cover more than population level effects, i.e. degradation of habitats and sub-lethal effects. (1)

Birds, marine mammals, invertebrates and other non-game species need to be monitored as a significant part of the ecosystem. (1)

Monitoring should include representatives from enough guilds and habitats to monitor the health of all injured ecosystems (1).

Additional baseline information needs to be obtained to better understand injured species and ecosystems (2).

The most beneficial use of settlement monies is an environmental monitoring program for the region that will ensure we have the baseline data necessary to better understand the ecosystem's interdependencies. (1)

Each research and monitoring proposal should be within an approved scientific design (see notes in letter 920604114 statement 24). (1)

The need for long-term and comprehensive monitoring. (3)

Monitoring programs are dominated by commercially valuable species and need to give equal consideration to all species and ecosystems. (1)

All species should be equally considered in comprehensive monitoring programs. (1)

The need to see that what is monitored is not dominated by commercial species. (1)

Baseline environmental data should be acquired. (1)

Sublethal effects should be monitored. (1)

Designate and protect "bench mark" monitoring sites. Long-term monitoring, comprehensive. (1)

Asked for clarification of what is meant by enhancement as it applies to services. (1)

Some people are very concerned about enhancement to recreation; concerned that the level of recreation will be changed in the name of enhancement. (1)

The Restoration Framework fails to recognize the importance of the "whole" coastal forest ecosystem, including old growth forest, to number of damaged species. (1)

Beyond restoration, resources should be enhanced under the settlement. (1)

On-going management and long-term health of ecosystems need to be given equal priority. (1)

There is no justification for ignoring the damage to a resource or service, just

because some people judge that it ultimately has or will recover to pre-spill condition or population size. (1)

The goal of restoration should be permanent improvements in environmental protection for the sake of the people and the environment. (1)

After a resource is restored, restoration should continue to include maintenance of the resource. (1)

Restoration should not stop once a particular resource or service is judged to be returned to pre-spill level. (1)

Restoration plans should consider the health of entire ecosystems. (1)

Enhance fish and shellfish, including habitat improvement. (1)

Restoration of wild salmonids. Enhance habitat for spawning. (1)

Establish new salmon runs. (1)

5. DESIGNATION OF WILDERNESS AREAS, MARINE SANCTUARIES OR OTHER SPECIAL MANAGEMENT AREAS AND PRESERVATION OF WILDERNESS QUALITIES AND CRITICAL HABITAT VALUES MAY FACILITATE RESTORATION OF INJURED RESOURCES AND SERVICES.

Has put together a committee to work on proposals for a Prince William Sound marine sanctuary. (1)

Wilderness qualities should be protected. (2)

An option considering wilderness classification could reduce long-term management opportunities. (1)

Include USFS in discussions on protecting marine areas adjacent to Chugach National Forest. (1)

The need to develop a National Marine Sanctuary. (1)

Chugach National Forest to National Recreation Area or Wilderness Area. (1)

Do not establish "special management area." (1)

6. CONSIDER THE VALUE OF INFORMATION DISSEMINATION, EDUCATION, INTERPRETATION AND MEANINGFUL PUBLIC PARTICIPATION IN RESTORATION PLANNING AND PUBLIC UNDERSTANDING OF RESTORATION.

Requested that contingent valuation of economic studies be released. (1)

Concerned about what was in the Work Plan for funding and that they are only getting a small snapshot of the total; seems they are rather arbitrarily sorted through; not sure there was any real peer review. (1)

There is so much paperwork involved in this process and people are being overwhelmed with NEPA. (1)

Encouraged the Public Participation group to keep coming out to the communities to explain materials. (1)

The transcripts of these meetings should be made available to the public with monthly updates of meetings held, attendance and a general reflection of the meeting. (1)

DNR and the Forest Service should be the source of more information. (1)

It is very disturbing that through this entire process there have been no maps. (1)

Agrees that the mapping projects have not been distributed through this process. (1)

One method of distributing the damage assessment information would be to have copies left at major copy centers and advising the public. (1)

There should be a fold out map which traces the flow of the oil spill; the framework document contains some excellent coverage, but more information is needed on locations. (1)

The lines showing oiling need to be modified to be more accurate; it is misleading. (1)

Would take money from her budget to have a representative attend the symposium. (1)

Need to spread the word to the community of how far this process has gone. (1)

A symposium will be very helpful to get questions answered about why decisions were made the way they were; it is necessary to get up to speed; the reports will generate questions to the professionals regarding process and substance; would like one symposium per month to focus on disciplines. (1)

Put out a proposal for a brochure to go to charter boat operators for minimizing the disturbance to wildlife, which would not cost much. (1)

Has tried to get out flyers on how to prevent oil spills on a boat. (1)

Wants public input into EIS's; not quite sure how to feed this into the comment process. (1)

Not all resources studied are listed in the summary of injury. (1)

One problem is that they have not had time to review the reports and most of the people have not seen them. (1)

Can't figure out if the studies being kept from the public show that the resources are contaminated more than they are being told; would like to know what is dangerous now and long term. (1)

Hasn't read all the information but wants to say don't forget about Kodiak. (1)

The amount of information is intimidating. (1)

A suggestion was made to index the framework with areas of concern alphabetically and regionally. (1)

Another suggestion is information should be sent to areas where projects will take place. (1)

Wants more digestible documents that the public can grasp. (1)

Would like more emphasis on cultural artifacts. (1)

An important concern is fecundity of all resources. (1)

Would like to file some complaints; the documents are very hard to understand; the public will not be able to grasp what is going on. (1)

Scientific release of information will tell (a) if anyone did the analysis and b) what the analysis said. (1)

Felt he was asked for comments without being given scientific information. (1)

Use restoration funds prudently to manage controversy about resource development, preservation and use. (1)

Information on injury needs to assess damages and impacts to resources and economy. (1)

Produce user-friendly synopsis of injury. (1)

Meaningful comment impossible without unrestricted access to data. (1)

It is difficult for the public to evaluate project funding information because sufficient information from all research and studies is not yet broadly available for public review. (1)

Use consistent descriptions of impacts for better public understanding. (1)

Make the State of Alaska economic studies available so the cost-benefit can be determined and understood by the public. (1)

Public needs access to all scientific data. (1)

Release state economic data. (1)

Economic studies must be released in order to assess spill impacts. (1)

State and federal governments have failed to release economic studies of damages. (1)

Public needs to be kept informed as new studies become available. (1)

It is difficult for the public to evaluate project funding information because sufficient information from all research and studies is not yet broadly available for public review. (1)

Thinks there is a profound paradox in that the Trustees are slowing down the process. (1)

Comments from API and Exxon regarding damages were similar and seem to attempt to dismiss financial liability of the spill. Trustees are opening themselves up to huge political liability by playing into Exxon's hands. (1)

The Trustee Council needs to visit this area before they can make any real decisions. (1)

Senior high school classes should be encouraged to attend these meetings because

they will be the ones dealing with these issues in the future; this is a good resource to tap into. (1)

The public needs to see what the Trustee Council has rejected to make them accountable to the public. (1)

Seems the plan doesn't come close to covering expenditure costs. (1)

Suggested that school children could attend future public participation meetings to get an idea of how this process works. (1)

A lot of people were not involved in the process from the beginning; there is still the idea that this was just a Prince William Sound spill. (1)

There should be extreme public scrutiny of these projects with no expenditure on dead areas. (1)

Prevention in the future and education of youth are important issues; resource materials for the schools could be obtained for pennies. (1)

Need money for education programs to communicate and make sure this doesn't happen again; human resources are extremely important. (1)

A public understanding of cumulative impacts of agency activities and oil spill activities is needed. (1)

Public understanding of the nature and extent of the injury to resources and services is needed. (1)

Public needs to be informed. (1)

Add public education program and facility in Valdez. (1)

Put research reports into final form and index. (1)

Some settlement money should go to educating the public about oil impacted waters and coastlines. (1)

Suggested scheduling a meeting when the fisheries are closed. (1)

It is ironic that there was a fishing opener and a public participation meeting scheduled on the same night. (1)

Has been very critical in the past of the public meeting notice. (1)

The working group process should be open to the public per the open meeting concept adopted by the Trustee Council; would like to know the logic of decisions because this is such an important role. (1)

A lot of people are still affected by the spill; people are concerned about how to get involved in restoration. (1)

A committee was formed with representation from the Alaska Departments of Fish and Game and Environmental Conservation, Federal Fish and Wildlife, Native associations, National Marine Fisheries Service, state and federal parks, Kodiak Island Borough, Kodiak Regional Aquaculture Association, Area K Seiners, and Alyeska Regional Citizens Advisory Council; have taken the shore line committee from the spill and are working to identify where the mitigation can be most effective and where most good can be done in terms of positive restoration for

public resources. (1)

Concern was expressed about where the money is going. (1)

Would like a different system to have direct access to the Trustees. (1)

Came into this meeting cold without any prior information and would like more prior notification publicizing meetings and suggested more time. (1)

Community-wise more input is needed and additional meetings would help. (1)

This is a busy season and may account for the lack of participation. (1)

Insure the Trustees represent the public trust of ALL Americans while decision making. (1)

More public participation is needed in the decision-making process for restoration of damaged resources. (1)

Live up to your public participation goals. (1)

The proposed action statement should contain a strong reference to public involvement. (2)

Insufficient time was allowed for public review of the restoration document. (1)

Alaska residents have had little to no opportunity to review and comment on public information regarding the spill. (1)

Develop a substantive, coordinated citizen participation process. (1)

The need for the 93' Work Plan to be available to the public in 92'. (1)

7. CONSIDER THE NEED FOR CONSTRUCTION OF SCIENTIFIC, RECREATIONAL AND OTHER FACILITIES.

Everyone has liked the Sea Life Center project and feel it fits in with the settlement criteria; this is the first field group that a presentation has been made to. (1)

A big plus for having the Sea Life Center in Seward is accessibility. (1)

A main focus of Seward is the Alaska Sea Life Center; support SAAMS as a great educational tie. (1)

Feels the proposed Sea Life Center will bring in dollars to the state instead of just spending settlement dollars. (1)

So far all funds for the center have come from donations. (1)

Option 12 deals with creation of recreational services; concerned about creating new recreation sites. (1)

Need funding for tech center and long-term planning for that facility. (1)

A local laboratory is needed. (1)

The KANA museum is the least that is deserved. (1)

A learning center at the Kodiak Community College where the data could be available to mitigate another oil spill would be helpful. (1)

Construction of the KANA (Kodiak Area Native Association) Museum would aid archaeological research; archaeologist could excavate the artifacts. (1)

Suggested developing a first class research facility; this is an area where there is a lax in research on the damage done by the oil platforms to the crab supply; poor monitoring has also added to this problem; a marine research center could perform this type of monitoring; it may appear as a pork barrel project because Seldovia would be a beneficiary economically, but it also is an ideal area for such a facility; the Trustees should consider a research facility of some sort which could be funded with government and university monies as a universal project; Homer and Seldovia are very accessible by boat for the lower Cook Inlet area, which makes this area ideal for a research facility. (1)

Concerned about building monuments to the spill and not having anything viable that would give benefit to the people from now on, such as a science school. (1)

Creation of recreational facilities should not compromise wilderness or recreational values. (1)

Existing marine environmental institutes should receive additional funding, but new institutes should not be built. (1)

Opposed to the construction of intrusive, new recreational facilities including roads, ports, hotels and other like facilities. (1)

Oppose new scientific institutes which would needlessly duplicate the function of many existing agencies and research institutions. (1)

Creation of new recreation facilities should be done only if it decreases rather than increases negative impacts on the ecosystem. (1)

Creation of a new Marine Environmental Institute could be extremely costly for relatively little benefit; it would be better for an independent board of scientists to distribute funds among existing institutions for specific purposes. (1)

Money should not be used for backcountry facility development/construction. (3)

Settlement money should not be used to construct new facilities, such as roads, docks, etc. (2)

Don't establish marine environmental institute, would duplicate CRDI, PWS Science Center, and UAF Seward Marine Center. (1)

Roads, airports, ferries, hatcheries, etc. are inappropriate. (1)

Funding of construction projects, additional hatcheries, docks, roads, and other built projects should not be considered with settlement monies. (1)

Settlement money should not be used for hatchery construction. (1)

8. CONSIDER THE EFFECTS OF RESTORATION ACTIVITIES ON LOCAL ECONOMIES AND SUBSISTENCE.

It was brought up in several meetings that the departments have to work together to get full use of the community. (1)

Seward is fighting a battle to be included with respect to oil spill responsibility. (1)

Social and economic impacts need to be examined more closely and are appropriate for discussion and remediation. (1)

This area is looking hard at activities in Prince William Sound with respect to its economy; thinks there is room for good timber harvest and habitat protection as well. (1)

Read a statement that new releases of studies back up what the health task force has been saying; statements like this make it hard for them to believe what is being said by the task force; they aren't able to trust anything. (1)

Does not feel this is an issue of money but one of responsibility. (1)

No amount of money can fix this but they can be reassured by having some local control. (1)

A good case can be made over the ten-year period for spending $300 million of the settlement funds in the Kodiak Island Borough due to the impact by the oil spill. (1)

Bristol Bay's marketability of fish was affected; wants funding for marketing salmon. (1)

Must focus on the fact that the outer coast was heavily hit and there is a significant impact to the economy. (1)

Pointed out that the village's needs are different from the city's needs. (1)

The cannery's closing could be attributed to the Exxon oil spill. (1)

Seldovia is looking for a means to help their community to be viable. (1)

Use Forest Service methodology for determining secondary impacts to the economy. (1)

Employment of local residents should be a priority. (1)

Compensate net secondary gains lost through acquisition. (1)

Greater consideration needs to be taken when analyzing the total economic impact of taking developable land out of private ownership and restricting its use under public control. (1)

Intact forests provide for the long-term stability of the economy. (1)

Logging creates jobs in the short term and damages sustainable industries. (1)

Social, cultural, economic impact studies to develop mitigation efforts for past and potential impacts. (1)

Importance of species for subsistence uses. (1)

Has a proposal for replacement of subsistence resources; would like to have this proposal included in the 1992 Work Plan. (1)

Subsistence does not appear very much in the framework document. (1)

Inquired if the villages in Kodiak are being addressed. (1)

The most important issue in this area is subsistence. (1)

Wants to know if the Trustee Council is aware that subsistence users have been impacted more strongly than any other group in the state. (1)

New reports show that the damage to subsistence resources has been a lot heavier than was previously realized. (1)

Has a memo written to the Subsistence Division requesting funding for the project, Subsistence Information and Response; on January 23, the people at the Subsistence Division stated that no more projects were to be funded through that budget; they were told the project was worthwhile but was too late to get funded; they were told that the money is there but the Trustees want to appear cost conscience and that puts a lot of pressure on the project director to cut costs to the bone. (1)

Concerned that every new study shows that the subsistence resources were damaged more than they were led to believe. (1)

They depend on the resources for their livelihood. (1)

A letter will be drafted addressing each subsistence issue. (1)

Doesn't think the Trustee Council is aware of how important subsistence resources are to this community. (1)

9. CONSIDER (1) THE ABILITY OF VARIOUS RESTORATION STRATEGIES (INCLUDING MANAGEMENT MECHANISMS, NATURAL RECOVERY AND OTHERS) TO RESTORE INJURED RESOURCES AND SERVICES, AND (2) THE POSITIVE AND NEGATIVE EFFECTS ON BOTH INJURED AND NONINJURED RESOURCES AND SERVICES.

Allowing undisturbed natural recovery should be considered simultaneously with other restoration options and should not automatically be given preference. (1)

Injured areas and resources should be allowed to recover on their own without human help. (2)

Restoration options should always be considered when the rate of natural recovery is slow. (1)

Consider natural recovery alternative equal to others. (1)

Providing protection to let Natural Recovery occur is the only reasonable restoration method. (1)

A grass roots effort should be organized for volunteer efforts. (1)

The problem now is not the oil spill but management; dead otters can't be replaced. (1)

Some kind of coordinated management is needed. (1)

Need more confidentiality of archaeological sites. (1)

One fear was that we would end up with 100 Phd's out there. (1)

Redirect sport fishing. (1)

Leave wildlife alone. (1)

Injured lands should not be given special management status since resource agencies allow too many human uses of land. (1)

Agency management planning as related to the spill should not be the focus of the Trustee Council, but an agency responsibility. (1)

Restoration should consist solely of banning all human use or presence in the spill area. (1)

In some cases, changing the land designation, classification, or intensive management of a particular human activity or wildlife species may be considered sufficient habitat protection. (1)

Preventing timber harvesting is crucial to restoring injured species. (2)

Habitat protection and acquisition should be considered prior to management options/activities. (1) [also under Habitat Acquisition]. (1)

Too many restoration options propose funding conventional agency management programs, such as commercial fisheries stock separation studies. (1)

Changes in management actions on public lands should insure that future restoration opportunities are not compromised. (2)

Define impact areas for each resource and service as related to Federal or State management responsibilities. (1)

The need to recognize that USFS administration and management of natural resources are in keeping with the principle of multiple use and sustained yield. (1)

The need to recognize that National Forest lands in Alaska include tidelands, submerged lands (sic) and wetlands above mean high tide. (1)

The need to increase management in parks and refuges. (1)

The need for developing opportunities for management and interpretation as restoration options. (1)

The need for restoration options that do not limit future management opportunities to maintain a healthy ecosystem. (1)

Include USFS in discussions on protecting marine areas adjacent to Chugach National Forest. (1)

Management in parks and refuges. (1)

USFS would be the logical manager of tidelands. (1)

Will do some work on the technique of planting eggs to maintain wild stock. (1)

There is a question of can we survive the process that comes in after the oil spill to try to help. (1)

(When conducting restoration) avoid manipulating habitat without rigorous

scientific testing and modeling. (1)

Concerned that restoration projects for fisheries may be dominated by projects to develop artificial populations whereas the emphasis should be on protecting the wild stocks of salmon. (1)

Wild and hatchery pinks are different; acquire essential fresh water and intertidal habitat; don't just introduce more hatchery stocks. (1)

Restoration projects should not enhance hatchery salmon at the expense of wild salmon. (1)

Enhancements should not compromise wilderness and recreation values. (1)

The need to evaluate/analyze options applying the provisions of NEPA. (1)

Recommend that any alternative include "prevent further damage to resources and services." (1)

Options designed to restore a single species should not be undertaken if they may be damaging to another species. (1)

10. CONSIDER VARIOUS FUNDING TECHNIQUES FOR RESTORATION ACTIVITIES INCLUDING (1) ESTABLISHING ENDOWMENT FUNDS TO FACILITATE LONG-TERM PLANNING, (2) SEEKING MATCHING FUNDS TO DEVELOP RESTORATION PARTNERSHIPS AND (3) USING OPEN COMPETITION TO ALLOW ALL INTERESTED PARTIES THE OPPORTUNITY TO RECEIVE FUNDING.

$100 million could be put into an endowment fund to continue scientific work and projects proposed on an ongoing basis. (1)

Don't hoard money in an endowment. (2)

Endowments could prevent effective restoration by locking up necessary funds when the need and opportunities for restoration are greatest. (1)

Endowments delay doing restoration projects and should not be supported. (1)

Money that could be used for imminent threats should not be put into endowment funds for future construction projects. (1)

The need to start restoration now; do not lock-up funds in an endowment. (1)

Endowments should be kept to a minimum. (1)

Support endowment. (1) "...the recovery time, cost of restoration and monitoring need not be directly tied to damage settlement payments...provide for a portion of the settlement payments being placed into an endowment...." (1)

Oppose endowment. (1) "Given the immediate threats of logging and other development activities...we oppose locking up the settlement money into an endowment." (1)

Create an endowment and administrative entity to provide money for research, etc., over a longer than 10 year period. (1)

Money that could be used for imminent threats should not be put into endowment funds for future construction projects. (1)

Settlement money should not be put into endowments. (2)

Support the idea of an endowment. (2)

Endowment fund for restoration, with priorities for spending to be based on public input. (1)

Consider restoration funds as an opportunity for matching funds. (2)

Create partnerships between private and public entities using restoration funds. (1)

Non-commercial reps should be on equal footing with commercial reps re: research and monitoring. (1)

Interested in being a subcontractor in the monitoring activities; sent a letter in March to the Trustee Council regarding this but has not received a response. (1)

If any agencies need logistical help, they should contact his office. (1)

Human nature is such that every one will try to get a chunk of the money on the table. (1)

Concerned that money not be spent on one study after another. (1)

Most people who shot down his arguments were agency types. (1)

Research and monitoring are an agency responsibility. (1)

Let public environmental protection groups manage injured areas. (1)

Ongoing research efforts be directed by a board of independent scientists in conjunction with the National Science Foundation so that research projects are done by the most qualified agency or research center. (2)

The need for the Trustees to seek open competition for project monies, to obtain the most qualified scientific staff to undertake additional research and monitoring. (1)

It is vitally important that restoration funds not be used to expand or replace agency budgets for activities they otherwise would or should support through general funds. (1)

Money should not go just to agencies. (1)

Restoration should not enlarge or replicate agency budgets currently supported by the general fund. (1)

11. CONSIDER USING SETTLEMENT MONIES TO PROTECT HABITAT AND TO ACQUIRE LAND OR INTERESTS IN LAND THAT WILL RESTORE OR REPLACE INJURED RESOURCES AND SERVICES, INCLUDING LANDS IN PARKS, REFUGES AND FORESTS, INTERTIDAL AREAS, WILDERNESS AREAS, AND MARINE BIRD COLONIES THROUGH THE SPILL AREA.

The public is pissed; something needs to be done; they have been told privately that the Trustee Council has no intention of following through on habitat

protection. (1)

Contingent valuation was not mentioned in the habitat protection section; seems unnecessarily restrictive; surprised the Attorney General had to bring up the contingent valuation idea. (1)

The single most important issue that the public was bringing up, habitat protection, was omitted from the framework. (1)

The only thing that has any hope for success will be the acquisition of equivalent resources. (1)

The Restoration Team and replacement team should concentrate on acquiring land from willing sellers throughout the Gulf of Alaska; the Trustees should not hold out the argument that timber harvest is some kind of benefit to the region. (1)

Personal interest is to see that Chugach Forest be put in willing seller status. (1)

Thinks buying timber rights is a bad idea. (1)

The habitat acquisition process is somewhat confusing; would like time to review the flow charts on acquisition. (1)

Is very disappointed that their timber is not being looked at as much as Kodiak's timber; damage has already been done and what is left should be preserved. (1)

Chenega Bay is the most severely impacted area; they need to be involved in all the acquisition process. (1)

A main focus of Seward is land acquisition. (1)

The Nature Conservancy study talks about various ways of evaluating the land and use and trying to come up with some solution; this information is almost non-existent. (1)

In Chapter 7, the definition of habitat acquisition is too narrow. (1)

People are looking for restoration of the health of every thing; thinks the jury is still out on this. (1)

Working closely with Fish and Wildlife for acquisition on Afognak Island; most projects fit within the options in Appendix B. (1)

Worked with federal parks on inholdings on the Catmai coast. (1)

Feels no one has pushed for projects. (1)

Costs for timber rights need to be objectively determined and timber purchases should be clearly linked to environmental degradation directly caused by the oil spill. (1)

The plan should address the protection and restoration of wilderness values, including replacement of lost wilderness values. (1)

The need to acquire marine bird habitat. (1)

While some acquisition should occur, it should not be the exclusive focus for restoring the area (1).

Habitat acquisition is overwhelmingly supported by public testimony because it provides long-term economic benefits to a broad range of sustainable Alaskan industries, including commercial fishing, sport fishing, sport hunting, recreation, tourism, Native corporations, and subsistence. (1)

Habitat protection and acquisition, including purchase of land, conservation easements and timber rights in perpetuity are the most effective means of restoration and should receive priority use of settlement funds. (2)

The need to acquire inholdings. (1)

Recovery must include protection of habitat for natural recovery. (1)

Acquisition and protection should be given top priority. (6)

Habitat protection and acquisition need to be given concurrent consideration in the restoration process. (1)

The need that 90% or the bulk (significant amount) of settlement fund should be used for acquisition. (2)

The need that acquisition of habitat should be given a high priority. (3)

The need to preserve wilderness. (2)

Use 80% of the Settlement Funds for habitat acquisition. (1)

At least 70% of money should be spent on acquisition. (1)

Protection of upland habitats should not be limited to anadromous streams; other kinds of upland areas provide valuable habitat to some injured species. (1)

At least 80% of money should be spent on acquisition. (2)

The best use of restoration money is to acquire habitat (5) to restore injured services. (1)

Start buying habitat now. Planning is not an excuse for delay. (1)

It is essential that the Trustees demonstrate to the private owners that habitat acquisition is a viable option. (1)

The need to acquire uplands. (1)

Habitat acquisition and protection should be a top priority because it would restore and protect the largest number of resources and services and because it would provide for the most long lasting restoration and maintenance. (1)

The majority (80%) of the settlement funds should go toward habitat protection and acquisition to prevent further and future damages and compensate for lost resources and services on an equivalent resource basis. (2)

Habitat protection and acquisition should be considered prior to management options/activities. (1)

Acquiring areas important to services should be treated equally with acquiring key habitats (need to change criteria) (2).

The most beneficial use of settlement monies is habitat protection and

acquisition that will "replace or substitute for the injured, lost or destroyed resources and affected services." (1)

Acquire Native inholdings in the Kodiak National Wildlife Refuge. (1)

Section D, "Habitat Protection and Acquisition," add "acquire 'inholdings' within parks and refuges" (Option 24). (1)

Purchase of lands needs full consideration toward habitat protection and acquisition. (1)

Emphasize habitat acquisition on Kodiak. (1)

Acquisition of intertidal areas is very important. (1)

Conservation easements should receive full consideration for habitat protection. (1)

To be effective, do some acquisition now. (3)

Land acquisition is too focussed on restoration of injured resources and should consider restoration of services also. (1)

80% of the settlement should be used to acquire habitat. (2)

Acquire lands adjacent to Chugach National Forest. (1)

Acquire now. (1)

No less than 80% of funds for habitat acquisition. (1)

Primary use of money (at least 80%) should be to protect land by acquisition, easements, and conservation restrictions. (1)

Acquire inholdings in Chugach National Forest as well as in refuges and parks. (1)

Acquire wildlife habitat in Kodiak. (1)

Preserve wilderness shorelines. (1)

Preserve wildlife habitat in ancient forests. (1)

Use 80% of money for acquisition. (1)

12. CONSIDER PROTECTING INJURED RESOURCES, THEIR HABITATS AND SERVICES FROM ACTIVITIES THAT ADVERSELY AFFECT THEIR ABILITY TO RECOVER.

The need to stay current on subsistence in reference to the harm from harvesting injured species. (1)

Buffer zones for nesting birds, if it would encourage accelerated recovery. (1)

Decrease disturbance to marine bird and mammal. (1)

Makes sense to eliminate foxes. (1)

The overall scope of the timber buy-backs should not constitute the expenditure of more than one-third of the fine of the criminal plea agreement. (1)

The need to prevent further destruction due to logging. (1)

Favors stopping timber harvest. (1)

Restoration should include prevention of future damage to injured resources not just from another oil spill but from other developments such as logging. (1)

Prevent timber harvest that would harm multiple species. (1)

Explore the acquisition of timber rights for a regeneration period. (1)

Timber/mineral rights acquisition needs to be fully considered for habitat protection and acquisition. (1)

There should be a moratorium on logging in the Prince William Sound portion of the Chugach National Forest until the Sound has recovered. (1)

Support a moratorium on logging in Chugach National Forest until recovery is complete. (1)

Protect habitat from resource extraction, such as logging and mining. (1)

Protect PWS from logging, resort/subdivision, mineral development. (2)

Restoration should include eliminating the threat to habitat from imminent logging. (1)

Trustees have the responsibility of ensuring that a resource and its ecosystem is protected, enhanced and maintained from future damages. (1)

13. CONSIDER USING SETTLEMENT MONIES TO ACQUIRE LAND OR IMPLEMENT OTHER RESTORATION ACTIONS INSIDE OR OUTSIDE THE SPILL AREA.

The definition of oil spill area should not be a limiting factor of acquisition from willing sellers; the public attitude of Trustees has been to lobby long and hard against SB 483; Mr. Cole and Mr. Sandor do not have a proper conservation ethic. (1)

Language should be added to option and alternative discussions to make it clear that restoration actions outside the spill area are allowable and may be appropriate. (1)

All of the damaged species occur in other parts of Alaska, and restoration of their populations could occur by protecting them in these other areas. (1)

Acquisition of timber rights and conservation easements should be considered for uplands and areas outside the spill. (1)

To be effective, do some acquisition now and consider areas outside the spill area. (1)

14. ALL INJURED RESOURCES AND SERVICES SHOULD RECEIVE EQUAL CONSIDERATION IN RESTORATION AND MONITORING ACTIVITIES.

Cannot ignore human resources and need to fix the settlement language to expand a certain percentage to offset the human mitigation factor. (1)

Human impacts of potential decisions should be in the EIS. (1)

Has watched far out uses of the oil and hazardous substances response fund; the Trustee Council will come under pressure in defining injury criteria; they should find some very tight spending criteria that fits injury criteria; this should be dealt with up front. (1)

Concerned that money go toward restoration of species and not recreational areas. (1)

Monitoring should focus on noncommercial as well as commercial species. (2)

While restoration priority might be given to resources and services which are slowest to recover, recovery should not preclude restoration and maintenance actions. (1)

Don't limit restoration to species of "commercial" importance, especially as wildlife viewing becomes increasingly important to the recreation and tourism industry. (1)

Don't limit restoration "to 'the areas affected' by the Exxon Valdez oil spill. We find no language in the Settlement which creates this limitation." (1)

Restoration options overemphasize restoring the spill area, and should also look at replacement resources from outside the spill area. (1)

Restoration options overemphasize restoring resources and should also look at restoring services. (1)

Some options under "Management of Human Uses" and "Manipulation of Resources" (options 11, 15, and 18) would restore certain species important to commercial or sport users at the expense of other species. (1)

15. EQUAL AND CONCURRENT CONSIDERATION SHOULD BE GIVEN TO ALL RESTORATION MECHANISMS.

More comfortable with the concurrent approach to restoration. (1)

Feels more comfortable with the horizontal matrix, which is more accessible to the communities. (1)

Acquisition can only be considered concurrently. (2)

Hierarchical approach to restoration is weak; habitat acquisition not given adequate consideration. (1)

The hierarchical approach in Figure 6 should not even be considered because there is no scientific, or legal justification for it and it is contrary to public testimony. (1)

Restoration options should be analyzed using a non-hierarchical approach. (4)

Against hierarchial approach (pg. 51); doesn't like Figure 6, likes Figure 7. (2)

There should be a flow chart (Figure 8) which would be a hierarchical approach

with habitat acquisition at the top. (1)

Use the equivalent resource concept for acquisition. (2)

Most important is recovery of injured species. (1)

No single approach is appropriate for a goal as large as restoration of the oil spill. (1)

RPWG
I

MEMORANDUM State of Alaska

DEPARTMENT OF ENVIRONMENTAL CONSERVATION
OIL SPILL RESTORATION OFFICE

TO: Restoration Team DATE: September 1, 1992

FROM: Bob Loeffler TELE: 278-8012
Acting Chair, RPWG FAX: 276-7178

SUBJECT: RPWG Products for next RPWG-RT Meeting

ATTACHMENTS. Attached are revisions as discussed at August 26th RT-RPWG meeting:

1. Revised Issues
2. Criteria
3. Annotated Outline
4. Attachment to Annotated Outline (describing an alternative)

PROPOSED MEETING AGENDA. We suggest the following agenda for the RT-RPWG meeting.

1. **What will go to the Trustees for Sept. 14th TC meeting?**

2. **Revised Issues**

3. **Evaluation Criteria.** Most changes are an exact reflection of agreements made at the RT meeting. In some areas, however, we were asked to come up with a revision without exact wording. These are:
   - *New Criteria 1b, Potential to prevent degradation and decline.* This was originally in criteria #1. But the RT asked that it be made a separate criteria patterned after the language in the original criteria #1.
   - *Revised Criteria 1c, Enhancement.* This was originally a tracking criteria, but we were asked to make it a "regular" criteria and to pattern it after the old Criteria #1.
   - *Revision to Additional Characteristics (pg. 9).* We were asked to revise these characteristics and come up with a more thoughtful organization.

4. **Annotated Outline (without attachment).**

5. **Attachment to Annotated Outline**.
   DOI concerns seem to focus on what level of specificity will be in the alternatives. We understand those concerns, but will not be able to fully resolve them until we actually write the alternatives. The attachment outlines the process and a general description of the what an alternative will include. However, a discussion of the following concerns seems appropriate:
   - Level of specificity about projects. How specific will the alternative be?
   - Level of specificity about geographic scope.

6. **Alternative "Themes"**
   One concern raised (by DOI): Where to put the question of a Science Center? (As these are draft alternatives and may change, the RT may not need to resolve this question now.)

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[2]Battelle, Marine Sciences Laboratory, 439 West Sequim Bay Road, Sequim, Washington 98382

Fate of Bunker C Fuel Oil in Washington Coastal Habitats Following the December 1988 *NESTUCCA* Oil Spill

Abstract

Following the December 1988-spill of 230,000 gallons of Bunker C fuel oil from the barge *NESTUCCA*, a year-long monitoring program was conducted to follow the fate of spilled oil in selected intertidal and shallow subtidal habitats of the Washington coast, including a 40-mile-long strip of Olympic National Park (ONP). Following clean-up, beach surveys were conducted in July and September 1989 and February 1990 at eight coastal sites inside ONP: four oiled areas, four unoiled areas; and at four oiled sites (coastal and estuarine) outside ONP. The finding of only trace levels (63-250 $\mu g/g$ dry weight by infrared spectrometry) of oil in surface (0-15 cm in depth) sediments associated with coastal sites 13 months after oiling suggested that depuration had occurred rapidly and that little oil residual remained. The essentially background levels (mostly <45 ng/g dry weight by gas chromatographic mass spectrometry) of aromatic hydrocarbons found in invertebrates associated with oiled sediments also suggested that most oil had been rapidly metabolized and depurated or was no longer biologically available. Factors contributing to these findings likely included: 1) the time of year when the spill occurred, 2) the type of beach or coastline affected, and 3) the timely and efficient clean-up. Most spilled oil congealed before stranding due to cold air and water temperatures. The area of the coast most affected consisted of unprotected, high-energy, sand beaches and rocky headlands, which self-cleanse rapidly. Finally, clean-up was immediate and congealed oil was easily removed from affected beaches.

Introduction

On December 23, 1988, the barge *NESTUCCA* was accidently struck by its tow, a Souse Brothers Towing tug, releasing approximately 230,000 gallons of Bunker C fuel oil and fouling beaches from Grays Harbor, Washington, north to Vancouver Island, British Columbia. Affected beaches in Washington included a 40-mile-long strip that recently had been added to Olympic National Park (ONP).

Following the spill, the efficacy of clean-up, the extent of weathering and the release of persistent hydrocarbons to the water column from oil buried both intertidally and subtidally along ONP beaches were largely unknown. Past experience indicated that buried oil from the spill could remain unweathered for several years or more (Teal *et al.* 1978, Burns and Teal 1979). The potential for long-term effects of the *NESTUCCA* barge spill on marine life suggested that a monitoring program should be initiated to assess fate and effects of unrecovered oil on the ONP beaches.

This paper presents the results of a year-long monitoring program to follow the fate of spilled oil on selected ONP beaches and on other Washington coast habitats. The key questions addressed by this research included: 1) How much oil remained on Washington beaches following clean-up and weathering; 2) To what extent were intertidal and shallow subtidal biotic assemblages contaminated; and 3) How rapidly did oil leave the system? Factors likely influencing weathering and depuration of hydrocarbon burdens from affected ecosystem components are also discussed.

Methods

Study Sites

Preliminary to sampling design, study sites were selected by consensus of staff from ONP, the Minerals Management Service (MMS), and Battelle, Marine Sciences Laboratory (MSL). First-hand information on the distribution and density of oil and the implementation of clean-up procedures was provided by ONP. Additional information on shoreline contamination (distribution and density of oil) was obtained from the Washington State Department of Ecology (Holcomb 1989).

Eight sites were selected from inside the Park; four from areas with moderate or heavy contamination (if possible), and four from no known or very light contamination, to serve as reference sites (Table 1). Additionally, four study sites with moderate or heavy contamination were selected from outside the Park. Site selection criteria included the

TABLE 1. Study sites selected to follow the fate of Bunker C fuel oil spilled on Washington coastal beaches in December 1988.

Beach	Location	Status	Substrate
Wedding Rocks	Olympic National Park	Light Oil	Rock/Cobble
Norwegian Memorial North	Olympic National Park	Heavy Oil	Rock/Cobble
Norwegian Memorial South	Olympic National Park	Reference	Rock/Cobble
Kayostla Beach North	Olympic National Park	Moderate/ Heavy Oil	Rock/Cobble
Cedar Creek	Olympic National Park	Reference	Sand/Cobble
Hole-in-the-Wall	Olympic National Park	Reference	Rock/Cobble
Second Beach	Olympic National Park	Moderate/ Heavy Oil	Sand
Ruby Beach	Olympic National Park	Reference	Sand
Whale Creek	Quinault Indian Res.	Moderate Oil	Sand
Pt. Grenville	Quinault Indian Res.	Light Oil	Sand
Ocean Shores-North Jetty	Grays Harbor	Heavy Oil	Sand
Sand Island	Grays Harbor	Heavy Oil	Sand

extent of oiling, the presence of valued biological communities, beach substrate type (sand, gravel, cobble, rock), and accessibility. Although it was particularly important to sample cobble beaches (such areas do not naturally depurate rapidly), only one beach in ONP (Norwegian Memorial North) having relatively deep deposits (>15 cm) of gravel and cobble was also heavily oiled (Holcomb 1989). This was the only site found by clean-up crews and staff from ONP to contain buried oil. On the other cobble beaches sampled, the depth of cobble and gravel was generally <15 cm and was typically underlaid with bedrock.

All oiled beaches in this study were cleaned within the first month following the spill. At a minimum, cleaning involved the removal or burning of oil-spattered logs. Maximum cleaning included the collection of oil using pom-poms and absorbent pads and the removal of oil mats and oiled debris. All beaches along the Washington coast may have received some oiling, if not from the December 1988 spill, then from indiscriminate bilge pumping and from small, unreported oil spills from coastal shipping in the past.

Figure 1 shows the locations of study sites and also the locations of known natural oil seeps. Natural oil and gas seeps occur near the Pysht River, at Hoh Head near Ruby Beach, at Shi Shi Beach, east along the Hoh River (not shown) and near Taholah on the Quinault River (Snavely and Kvenvolden 1989). The oil seep at Ruby Beach is the closest to any of our sampling sites but is still 2 km distant. It is not likely, then, that oil released from this seep, or other seeps, confounded sampling and subsequent chemical analyses at any of the designated study sites. Also, because of the patchy nature of the oiling of ONP beaches, the relatively close location of oiled and reference sites (Norwegian Memorial North and South and Kayostla Beach North) was not considered a problem.

Selection of Survey Dates

Beach surveys were scheduled during the lowest tides in July and September 1989 and in February 1990. The July and September surveys were to occur when beach accretion was at or near maximum annual height. The February survey was to coincide when beach accretion was minimal, i.e., when target beaches were near their lowest height.

Sediment Sampling

As shown in Figure 2, sediments at each of the 12 study sites were sampled at the +8.2-ft (+2.5-m), +1.1-ft (+0.5-m), −1.7-ft (−0.5-m), and −3.0-ft (−1.0-m) tidal contours along single, randomly located transects placed perpendicular to the coastline.

At the designated sampling locations, a 0.5-L sediment sample from a 0.1-m^2 area was collected from the top 15 cm of the beach surface. Sediments from cobble areas were necessarily collected from depths shallower or deeper than 15 cm, depending on the depth of the cobble or the presence of bedrock. In many cases sediments from the rock/cobble beaches were collected from sediment pockets among and under small boulders and rocks. Sediment samples were taken from the beach using a solvent-rinsed stainless-steel coring device and placed in labeled and dated sampling jars, also solvent-rinsed. Sediment composition was also recorded. To attest to the cleanliness of sampling equipment, a control (blank) sample was

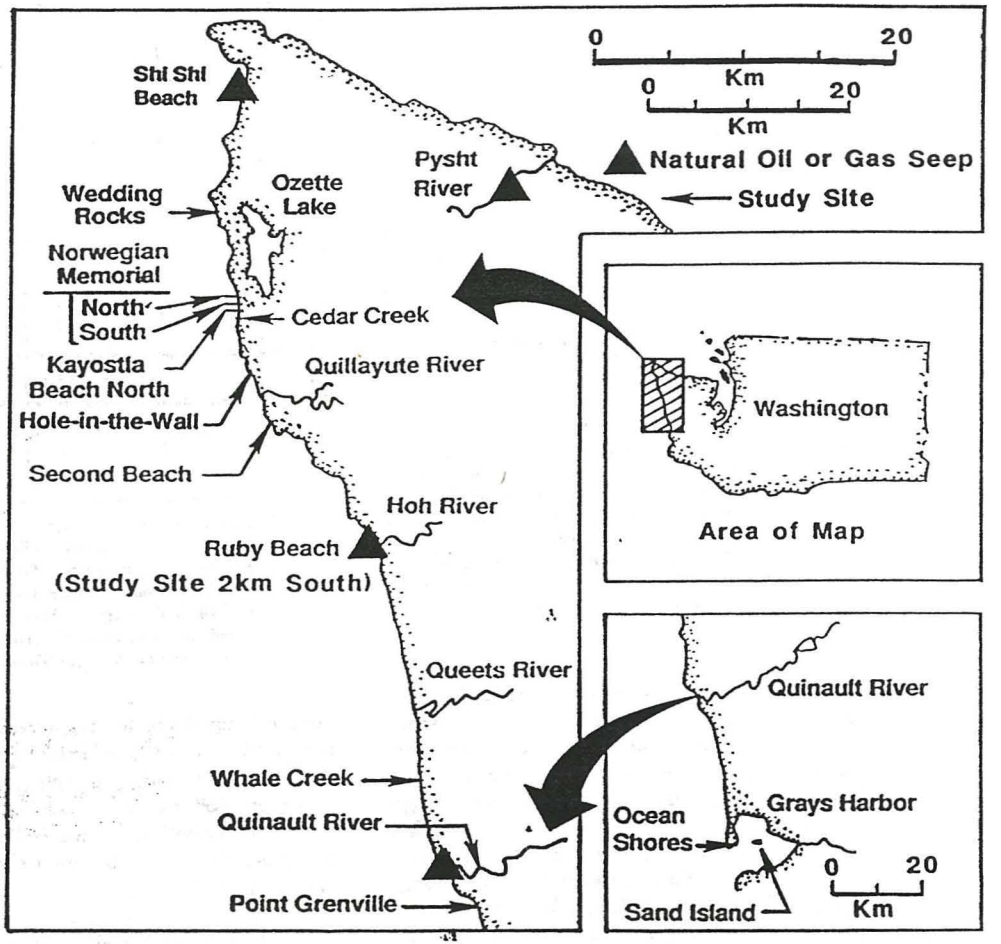

Figure 1. Relative locations of each sutdy site and known naturally occurring oil and gas seeps along the Washington Coast.

collected once each day. The sampling jar used for this purpose was handled in the same way as all other sampling jars except that no sediment was placed in the sampling jar. Upon return to the laboratory, the control (blank) sample jar was extracted in the same way as those jars containing sediments. Target sampling requirements for intertidal and shallow subtidal sediments are summarized in Table 2.

For the first survey, elevations (tidal height) at the four positions along the transect line were determined by level and stadia rod referencing known tidal heights. Distances to each sampling location on each transect also were recorded, and a monument was placed at the high-tide-line of each transect. During the second and third surveys, sampling locations on each transect were determined solely by distance from the high-tide-line monument.

Compositing

Sediment samples were composited to reduce costs of chemical analyses and to maintain large spatial coverage. Each sample was homogenized by mixing in a stainless steel bowl until uniformly colored and split in half. One-half was composited with the

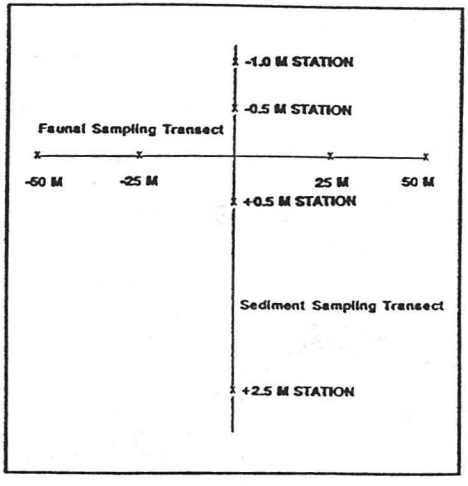

Figure 2. Sediment and faunal sampling stations (X) form perpendicular transects such that each sampling station lies within a specific tide-height contour. Sediment sampling stations are spaced logarithmically within intertidal and subtidal sampling zones while the faunal sampling stations are equally spaced away from the sediment sampling transect between the +0.5 m and −0.1 m tide-height contour.

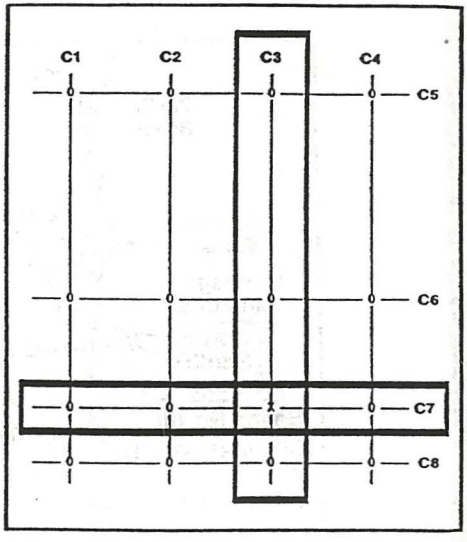

Figure 3. Compositing design for which samples are composited across columns (C1 to C4) and Rows (C5 to C8). This design preserves the location of contamination without requiring chemical analysis at every sampling station (0). In this scenario, high oil residue was detected in composites C3 and C7, indicating contamination at sampling-station X.

remaining samples from the same transect; the other half was composited with samples from the same tidal contour from transects with the same designation of contamination (oiled or unoiled). Compositing samples from similar columns (transects) and rows (tidal contours) of a lattice design preserves information on the location of oil residue without requiring chemical analysis for each sampling station. As shown in Figure 3, compositing samples from transect C3, and from tidal contour C8 located contamination at sampling station X.

Samples composited in this way were not diluted with clean sediments below a selected level of concern (LC) so that information on the location of potential oil was not lost. Compositing was done with equal quantities of materials from each sampling location included in the composite so that the analytical results represented the mean concentration of oil residue for each location sampled. To minimize dilution, the maximum number (N) of samples that should be composited was determined by the formula

$$N = LC/DL$$

where DL is the analytical detection limit (Skalski and Thomas 1984). Data from Vanderhorst et al. (1980) showed that along the Strait of Juan de Fuca, background levels of total hydrocarbon concentrations ranged form 20 to 140 $\mu g/g$ in

TABLE 2. Target Sampling Requirements of Intertidal and Shallow Subtidal Habitats for Each Survey

Sample Type	No. Samples/ Station	No. Stations/ Transect	No. Transects	Total Samples	Composites Analyzed (a)
Sediment (IR)	1	4	12	48	26
Sediment (GC)	1	4	12	48	16
Tissue (GC)	1	4	12	48	26

(a) Includes duplicates.

intertidal sediments. Based on this data, the LC of 100 µg/G was selected for the present study. The DL of infrared spectrophotometry (IR) for total hydrocarbon concentration is about 20 µg/g; thus, to minimize dilution, no more than five samples were composited. For gas chromatography (GC), the DL for both polycyclic aromatic and saturate hydrocarbons in sediments was about 10 ng/g, yielding an N much greater than that for IR.

Faunal Sampling

Faunal samples were collected from four sampling stations along a 100-m transect established parallel to the coastline along a tidal-height contour between the +1.1-ft and −3.0-ft sediment sampling stations (Figure 2). These four sampling locations were placed 25 and 50 m either side of the sediment sampling transect.

If a sandy beach was selected for sampling, razor clams (*Siliqua patula*) were collected. From a rock/cobble beach, California mussels (*Mytilus californianus*) were sampled. If this species was unavailable, organisms of opportunity (polychaetes, limpets, snails, chitons, crustaceans) were collected. The organisms were wrapped in ashed aluminum foil, placed on ice, and transported to the laboratory within 48 hours of collection, where they were immediately frozen at −18°C until dissection. After freezing, samples of tissue were obtained through dissection and packed in wide-mouth glass jars with Teflon™-lined screw caps. These samples were refrozen and stored at −75°C until analysis. Target sampling requirements for tissues are summarized in Table 2.

Compositing

Tissue from 3 to 5 clams, 4 to 12 mussels, or enough organisms of opportunity to produce a minimum of 10 g wet weight, from each of the two stations equally distant from the sediment sampling transect, were combined for a composite chemical analysis.

Sampling Exceptions

Because of severe weather conditions, high wave action, and periodic unavailability of appropriate organisms, it was not always possible to collect a full complement of sediment and faunal samples at each study site. Of 12 target sediment samples per study site (four from each survey), all sites had a minimum of 8 target samples collected, except Sand Island which had three target samples collected. Sand Island was surveyed only twice (September 1989, March 1990). All target sediment composites were made, again with the exception of Sand Island from the first survey. Of a target six faunal samples per sampling site (two from each survey), six sites had all six samples collected, again except for Sand Island where no faunal samples were collected. The intertidal fauna at Sand Island appeared to be limited to sparse populations of clams occupying sediments too dense to excavate using a clam gun.

When possible, extra sediments, cores, and/or faunal samples were collected at some of the sampling sites during each of the surveys. Because of suspected contamination from a small, yet unreported oil spill occurring off the Washington coast in February 1990, extra samples were collected and analyzed from Hole-in-the-Wall and Ruby Beach, both reference sites, during the third survey. Two sediment samples were collected and analyzed from a site further north of the Norwegian Memorial (designated as HNMX), and from Goose Island in Grays Harbor during the third survey. The HNMX site is the location of intertidal community studies conducted by the University of Washington. Because of the very gradual beach slope at Sand Island, sediment samples were collected at +15.2-, +13.3-, +8.2-, and +7.8-ft tidal levels. The +7.8-ft sample was composited as if it were the +1.1-ft sample.

Analytical Chemistry

Sediments

Chemical analysis for sediments was conducted in stages. Composite samples first were screened for oil by analyzing for total oil and grease using infrared spectrophotometry (IR), a relatively inexpensive method of analysis. Samples were analyzed by a Beckman Acculab™ Model 4 Infrared Spectrophotometer within a spectral range of 3200 to 2600 cm-1 and a scan time of 25 to 27 min. Sediment was extracted within freon following Standard Method 503 (American Public Health Association 1985). To distinguish between the target oil and

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oils of biogenic origin, the extract was mixed with silica gel to remove fatty acids.

Sediment samples showing a signal above detection were analyzed by GC for a more accurate characterization of the source of contamination (finger-printing). Samples were analyzed using a Hewlett Packard (HP) 589AO GC equipped with a HP 7673A automatic sampler and a flame ionization detector (FID) or a 5970 mass-selective detector (MS). An HP 5895A gas-chromatographic workstation was used for control of the GC, integration, quantification, and preparation of the chromatograms. Sediment samples including control blanks were extracted using a process developed by Krahn *et al.* (1988).

Tissues

Composite tissue samples (enough to produce a minimum of 10 g wet weight) from each site, were homogenized using a Tekmar Tissumizer™. Five gram subsamples of wet tissue were digested with 30 ml of 6 M KOH at 35°C for 18 hours, then extracted three times with 30 ml of ethyl ether, followed by alumina column clean-up to remove matrix interferences (U.S. Environmental Protection Agency 1986). As with sediment samples, tissue samples were analyzed using the HP 5890A GC equipped with an HP 7673A automatic sampler and an FID, or an HP 5970 MS. The HP 5895A gas-chromatographic workstation controlled the GC and was used to prepare the chromatograms.

For both tissues and sediments, petroleum residues were characterized by relative peak areas for the concentration of individual identified normal branched saturate and polycyclic aromatic hydrocarbons, the ratios of nC_{17}/Pristane and nC_{18}/Phytane, and the carbon preference index (CPI), i.e., (odd to even saturate ratio). Changes in one or more of these characteristics provided an estimate of weathering and/or the degree of mixing with other potential sources of hydrocarbons. Chromatograms from all sediment and tissue samples were compared with chromatograms from identical analyses of the spilled oil obtained from the Washington State Department of Ecology.

All analytical and associated quality-assurance and -control procedures (including the use of standard reference materials, chemical spikes, and duplicate analyses) followed *Recommended Protocols for Measuring Selected Environmental Variables in Puget Sound* (Tetra Tech, Inc. 1986).

Results and Discussion

Sediments

Total Oil and Grease

Those analytical results showing above detection limits are presented in Table 3. Because all composites collected during the first survey (July 1989) contained essentially background levels (<50 μg/g dry weight) of total oil and grease, these composites were not analyzed further.

From the second survey (September 1989), only the extra sediments from Sand Island contained detectable levels of oil and grease, with concentrations of 6,255 and 19,015 μg/g dry weight in the sediments from the +15.2- and +13.3-ft tidal levels, respectively. Oily residue was clearly visible in these samples, and a strong petroleum (Bunker C) odor was evident. These sediments were further analyzed for aromatic and saturate hydrocarbons. Because levels of total oil and grease at Norwegian Memorial, Kayostla Beach, and Whale Creek were below detection, extra cores collected from these sites were not analyzed.

Detectable levels of total oil and grease were found in several sediment composites and extra sediments from the third survey (February 1990), including samples from Wedding Rocks, Norwegian Memorial North, Kayostla Beach and Hole-in-the-Wall. The Oiled Park Beaches composite, which included sediments from the −3.0-ft tidal contour at Wedding Rocks, Norwegian Memorial North, and Kayostla Beach North, suggested that this elevation contour was potentially contaminated with oil. These eight composites, along with suspect extra sediments, were further analyzed for aromatic and saturate hydrocarbons.

Aromatic and Saturate Hydrocarbons

Sediment concentrations of aromatic hydrocarbons are presented in Table 4. The sample from Wedding Rocks revealed moderately low concentrations (2,875 and 18,236 ng/g dry weight, respectively) of both aromatic and saturate hydrocarbons. The extra sediment from Norwegian Memorial (+82) also contained moderately low levels of both hydrocarbon fractions: 1553 ng/g of aromatics and 14,178 ng/g of saturates. Only the extra

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TABLE 3. Sediments from Washington coast beaches with above-detection levels of total oil and grease (μg/g dry weight) as detected by infrared spectrophotometry.

Composites (a)		
Location (Tidal Height in ft)	Survey Date	Oil and Grease (μg/g)
Wedding Rocks	Feb/Mar 1990	63
Norwegian Memorial North	Feb/Mar 1990	72
Kayostla Beach North	Feb/Mar 1990	154
Oiled Park Beaches (−3.0) (b)	Feb/Mar 1990	251
Extra Sediments		
Location (Tidal Height in ft)	Survey Date	Oil and Grease (μg/g)
Sand Island (+13.2)	Sept 1989	19015
Sand Island (+15.2)	Sept 1989	6255
Norwegian Memorial (+8.2)	Feb/Mar 1990	115
Norwegian Memorial (+1.1)	Feb/Mar 1990	73
Hole-in-the-Wall (+15.0)	Feb/Mar 1990	170
Ruby Beach (+14.0)	Feb/Mar 1990	86

(a) Composite of all four samples collected from each transect.

(b) Composite of −3.0 ft samples from Wedding Rocks, Norwegian Memorial North, Kayostla Beach North, Second Beach.

TABLE 4. Sediment concentrations of total aromatic (PAH) and saturate (C_9-C_{36}) hydrocarbons (ng/g dry weight) detected by GC/FID and GC/MS.

Location (Tidal Height in ft)	Survey Date	Total PAH	Sum C9-C36
	Composites (a)		
Wedding Rocks	Sept 1989	2876	18236
Wedding Rocks	Feb/Mar 1990	478	2236
Norwegian Memorial North	Feb/Mar 1990	80	1792
Kayostla Beach North	Feb/Mar 1990	64	2158
Oiled Park Beaches (−3.0) (b)	Feb/Mar 1990	59	901
Cedar Creek	Feb/Mar 1990	164	2756
Sand Island	Sept 1989	(c)	455
	Extra Sediments		
Sand Island (+13.2)	Sept 1989	27624	1570069
Sand Island (+15.3)	Sept 1989	83399	488977
Norwegian Memorial (+8.2)	Feb/Mar 1990	1268	8893
		1553 (d)	14178 (d)
Hole-in-the-Wall (+15.0)	Feb/Mar 1990	80	3829
Ruby Beach (+14.0)	Feb/Mar 1990	45	2354
Ocean Shores (+11.0)	Sept 1989	(c)	748

(a) Composite of all four samples collected from each transect.

(b) Composite of −3.0 ft samples from Wedding Rocks, Norwegian Memorial North, Kayostla Beach North and Second Beach.

(c) Not Detected; detection limits were 3 to 10 ng/g for individual aromatic hydrocarbon compounds, and 100 ng/g for individual saturate hydrocarbon compounds.

(d) Duplicate analysis.

sediments from Sand Island showed relatively high concentrations of both categories of hydrocarbons. The sums of the aromatic hydrocarbons for these samples were 27,624 and 83,399 ng/g dry weight, respectively. The sums of the resolved saturate hydrocarbons for these samples were 488,977 and 1,570,069 ng/g, respectively. The extra Ocean Shores sample and the composite from Sand Island demonstrated less than detectable concentrations (<10 ng/g dry weight) of individual aromatic hydrocarbons, and very low levels (748 and 455 ng/g dry weight, respectively) of individual saturate hydrocarbons. The Cedar Creek composite was used for quality assurance and contained 164 ng/g dry weight of aromatic hydrocarbons and 2756 ng/g dry weight of saturate hydrocarbons, both relatively low levels.

Invertebrate Tissues

Tissues from Norwegian Memorial North (+25 m) and Wedding Rocks (+25 m) contained from 90 to 100 ng/g dry weight total aromatic hydrocarbons (Table 5). All other tissue concentrations were below 50 ng/g, and most were less than 20 ng/g. The extra tissue sample collected from the University of Washington site north of Norwegian Memorial North indicated a total aromatic hydrocarbon concentration of 24 ng/g (data not shown).

Tissue samples from Whale Creek and Point Grenville had the highest concentrations of total resolved saturate hydrocarbons, 23,650 and 22,349 ng/g dry weight, respectively (Table 5). However, tissue samples from Kayostla Beach and

TABLE 5. Selected tissue concentrations of total aromatic (PAH) and saturate (C_9-C_{36}) hydrocarbons (ng/g dry weight).

Location (a)	Tissue (b)	Survey Date	Total PAH	Total C9-C36	Sum Even C10-C36
Wedding Rocks (+25)	CM	July/Aug 1989	43	7745	4293
	CM	Sept 1989	100	11945	1523
	CM	Feb/Mar 1990	29	2085	(d)
Norwegian Memorial North (+25)	CM	July/Aug 1989	95	10923	5592
	C,S	Sept 1989	44	5850	2198
	CM,L,C,S	Feb/Mar 1990	90	3166	990
Kayostla Beach North (+25)	CM,L	July/Aug 1989	22	5619	2739
	L,C,S	Sept 1989	23	13137	9831
	L,C,S	Feb/Mar 1990	(d)	2421	1225
Hole-in-the-Wall (+25)	CM,L	July/Aug 1989	15	7637	3879
	CM,L,C,S	Sept 1989	8	13478	8351
	CM	Feb/Mar 1990	20	3075	917
Cedar Creek (+25)	CM	July/Aug 1989	8	7896	4195
	CM,C,S	Sept 1989	(d)	7611	3145
	CM	Feb/Mar 1990	19	421	881
Whale Creek (+50)	RC, DC	July/Aug 1989	7	23650	3748
	MS,H	Sept 1989	(d)	(d)	(d)
	(c)	Feb/Mar 1990	–	–	–
Pt. Grenville (+25)	CM,RC	July/Aug 1989	(d)	4151	3611
	RC,MS	Sept 1989	21	22349	4384
	CM	Feb/Mar 1990	(d)	(d)	(d)
Ocean Shores (+50)	RC,CM	July/Aug 1989	(d)	2166	1377
	CM	Sept 1989	12	1046	536
	CM	Sept 1989	(d)	6583 (e)	3694 (e)

(a) Composite from each of two stations either side and equal distance (25 or 50 m) from sediment sampling transect.

(b) CM = California mussel; L = shield limpet; AC = assorted crustacea; S = snails; C = chitons; RC = razor clams; DC = Dungeness crabs; MS = mud shrimp; H = beach hoppers.

(c) No organisms sampled due to severe weather.

(d) Not detected; detection limits were 3 to 10 ng/g for individual aromatic hydrocarbon compounds, and 100 ng/g for individual saturate hydrocarbon compounds.

(e) Duplicate analysis.

Hole-in-the-Wall had the highest concentrations of even saturate hydrocarbons, 9831 and 8351 ng/g dry weight, respectively, which do not include those of biogenic origin.

Source Identification

Sediments

Chromatograms of oil (aromatics fraction) associated with Sand Island sediments in September 1989 display patterns strikingly similar to those of Bunker C collected from the barge *NESTUCCA* by the Washington State Department of Ecology in December 1988 (Figure 4). The lower CPI values (< 1) associated with the Sand Island sediment samples also are indicative of an anthropogenic source of contamination (Table 6). The CPI values for the *NESTUCCA* oil, Alaska North Slope (ANS) crude oil, and Sand Island sediments are all essentially the same (0.90-0.94).

TABLE 6. Ratios of nC_{17}/Pristane, nC_{18}/Phytane, and the Carbon Preference Index (CPI) of Reference Oils and Selected Sediment Samples

	nC_{17}/ Pristane	nC_{18}/ Phytane	CPI
Reference Oils			
NESTUCCA Oil	1.83	1.27	0.90
Alaska North Slope Crude Oil	1.54	1.78	0.94
Sediment Samples (Tidal Height in ft)			
Sand Island (+15.2)	1.33	0.90	0.94
Sand Island (+13.3)	1.67	1.16	0.92
Oiled Park Beaches Composite (−3.0) (a)	(b)	(b)	0.67
Hole-in-the-Wall (+15.0)	(b)	(b)	0.68
Ruby Beach (+14.0)	(b)	2.20	1.02
Norwegian Memorial Extra (+8.2)	0.34	1.33	1.11
Norwegian Memorial Extra (+1.1)	0.51	(b)	0.78

(a) Composite of −3.0 ft samples from Wedding Rocks, Norwegian Memorial North, Kayostla Beach North, Second Beach.

(b) Not calculated because target hydrocarbons not detected.

Additionally, relatively little change is observed in the ratios of nC_{17}/Pristane and nC_{18}/Phytane when the Sand Island samples are compared with

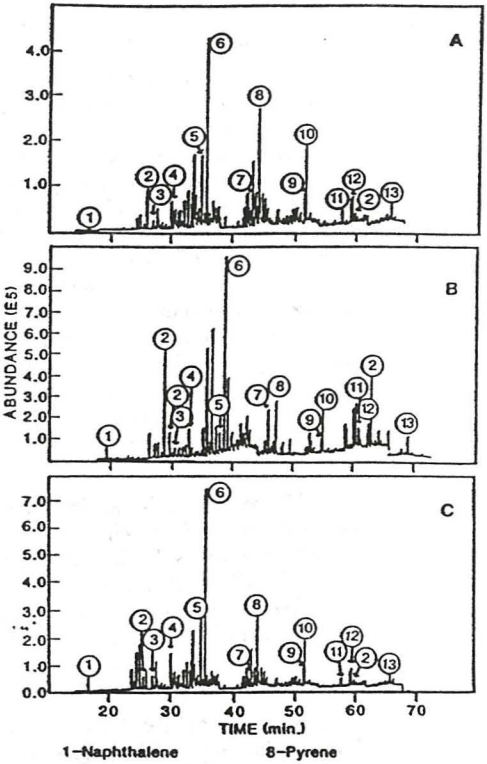

Figure 4. Total Ion Chromatograms (Polynuclear Aromatic Hydrocarbons) for Surface Sediments from Sand Island (A) and Norwegian Memorial-University of Washington Transect (B) Compared with the Total Ion Chromatogram for *NESTUCCA* Oil. (C) (The symbol E5 denotes values times 10^5.)

the *NESTUCCA* oil (Table 6). Significant changes have been reported in these ratios after six to nine months of weathering of intertidal sediments amended with ANS crude (Anderson *et al.* 1978), suggesting the presence of hydrocarbon degrading microorganisms (Blumer and Sass 1972). The finding of little change in these key hydrocarbon ratios indicates that biodegradation played a relatively minor role in the weathering of the Sand Island samples. This is not surprising, since the oil on Sand Island was buried just beneath the surface

(<5 cm in depth) in relatively coarse sand in the high (+13.3 to +15.2-ft) intertidal zone.

The lack of significant weathering is also evident in the chromatograms of aromatic hydrocarbons from the Sand Island samples. The only significant changes that occurred are associated with the more volatile compounds. While concentrations of the more volatile compounds from the *NESTUCCA* oil are relatively low, the notable difference when comparing the aromatic hydrocarbon fraction of each chromatogram is the absence of napthalene from the Sand Island samples. There are, however, few other changes. Dibenzothiophene, phenanthrene, pyrene, chrysene, benzo(b)fluoranthene, and benzo(g,h,i,)perylene all persist in the Sand Island samples at generally the same relative concentrations as in the *NESTUCCA* oil.

While not shown, changes in saturate hydrocarbons were slight. As anticipated, some of the saturate hydrocarbons (C_9-C_{13}), although present in the *NESTUCCA* oil, were not detectable in either of the Sand Island samples. However, the remaining saturate hydrocarbons (C_{14}-C_{36}) were detected in the Sand Island samples, generally at the same relative concentrations as in the *NESTUCCA* oil.

Sediments collected during the third survey from the University of Washington study site north of Norwegian Memorial (Figure 4) and from Wedding Rocks, Norwegian Memorial North, Kayostla Beach North, and Second Beach (chromatograms not shown) may contain remnants of weathered Bunker C oil. The relative concentrations of fluorene, fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(a)pyrene, and benzo(g,h,i)perylene are comparable to the *NESTUCCA* oil. A complication to source identification, however, is that these samples contain other hydrocarbon components which are not consistent with Bunker C oil and may be of a biogenic origin.

Invertebrate Tissues

Chemical analyses of mussels, razor clams and other invertebrates revealed little information useful in determining the origin of essentially trace quantities of aromatic hydrocarbons contained in some of their tissues. While no naphthalenes were found in any of their tissues, phenanthrenes occurred in tissues from seven of twelve beaches sampled, including Ocean Shores, Point Grenville, Second Beach, Kayostla Beach, Norwegian Memorial North and South (including the transect sampled by the University of Washington), and Wedding Rocks. However, phenanthrene concentrations were generally less than 20 ng/g.

Perspective on Levels of Residual Oil Contamination

Although relatively high concentrations of oil (6,255 and 19,015 μg/g dry weight by IR) were found on Sand Island in Grays Harbor during the second survey, the relatively low concentrations of oil (63 to 250 μg/g by IR), essentially trace amounts, associated with the coastal stations during the third survey suggest that relatively little oil remains from the 1988 *NESTUCCA* spill. The relatively high concentrations of oil found on Sand Island were restricted to a narrow band 3 to 4 m wide over a 10- to 13-m stretch of beach on the southwest side of the Island. Attempts to relocate this band of oil during the third survey proved unsuccessful, further suggesting that weathering and depuration proceeded rapidly.

Interestingly, oil was not found associated with beaches hypothesized to be oiled (Kayostla, Norwegian Memorial, Wedding Rocks) until the third survey (February 1990). Low concentrations of oil were also detected at Ruby Beach and at Hole-in-the-Wall (both hypothesized unoiled beaches), although analyses of all samples collected from both beaches during the first and second surveys (July and September 1989, respectively) failed to detect the contaminant. While it is difficult to totally eliminate the possibility of altogether missing the oil on our first two surveys of oiled beaches, a possible explanation for not detecting oil on sand beaches is associated with the normal cycle of beach accretion and erosions. Because the spill occurred in December and January, when beaches were fully eroded, it follows that as beaches accreted sediments during summer and autumn months (also at the time of our first and second surveys), oil not removed by the clean-up crews potentially could have been buried and hence inaccessible to our sampling. We generally sampled to a depth of 15 cm, while beach accretion may total 1 to 2 m. Hence, when the beaches again eroded in the winter of 1990 (at the time of our third survey), the potentially buried oil could have again become accessible to our sampling methods. This explanation, however, might not equally apply to rocky beaches.

The finding of essentially little more than background concentrations of total oil and grease during the third survey (13 months after the spill) also suggested that weathering and depuration occurred more rapidly than indicated by the available and relevant literature. For comparisons, Bunker C fuel oil spilled from the *ARROW* in Chedabucto Bay, Nova Scotia in February 1970, was much more persistent (Vandermeulen and Gordon 1976, Vandermeulen *et al.* 1977). Seven years after the spill, analyses of subsurface sediments (7 to 11 cm in depth) collected from the mid-tide level revealed concentrations of hydrocarbons as high as 1,281 μg/g. In related studies, Betancourt and McLean (1973) found that Bunker C spilled from the *ARROW* weathered only 20 percent after one year in low energy environments as on the shoreline above the limit of wave activity.

Concentrations of aromatic hydrocarbons in California mussels, razor clams, and other invertebrates following the *NESTUCCA* spill were also relatively low. All concentrations were <100 ng/g (dry weight); most concentrations were <45 ng/g (dry weight). These levels generally were as low as the "cleanest" sites sampled as part of the NOAA Status and Trends Program (National Oceanic and Atmospheric Administration 1987). Of the 100 sites sampled routinely, only 26 sites resulted in aromatic hydrocarbon concentrations of <45 ng/g (dry weight) in oyster or mussel tissue. Coastal sites at Cape Flattery and Grays Harbor in Washington, and Coos Bay in Oregon, ranged from 20 to 141 ng/g (dry weight) from 1986 to 1989.

In contrast, Vandermeulen *et al.* (1977) found considerably more oil associated with tissues of bivalves, even seven years after the *ARROW* spill. As determined by fluorescence, clam tissues (siphon epidermis, siphon, mantle, mantle edge) collected from chronically-oiled beaches in Moussiliers Passage in Chedabucto Bay contained relatively high concentrations of aromatic and cyclo-alkane hydrocarbons (93 μg/g, 16 μg/g, 11 μg/g, and 16 μg/g (wet weight), respectively. In follow-on studies, Gilfillan and Vandermeulen (1978) determined by fluorescence that clams from Janvrin Lagoon in Chedabucto Bay also contained relatively high burdens (up to 200 μg/g wet weight) of petroleum hydrocarbons. To explain how oil from the *ARROW* spill could remain bioavailable, even six or seven years after the spill, Vandermeulen and Gordon (1976) hypothesized that persistent hydrocarbon fractions found in clams represented oil that chronically re-entered surficial sediments and interstitial water as leachates from stranded and weathered oil (tar). The assumption was that significant deposits of oil were not cleaned and left to weather naturally.

There are unfortunately few other case histories where the fate of Bunker C fuel oil has been studied, particularly in northern latitudes. There are, however, other relevant data now beginning to emerge from studies of the spill of North Slope crude oil by the *EXXON VALDEZ* in Prince William Sound, Alaska. While comparison to the *NESTUCCA* spill cannot be rigorous, concentrations of total aromatic hydrocarbons in mussels one year after the spill ranged from 235 ng/g to 82,352 ng/g dry weight with a mean of 16,236 ng/g and standard deviation of 28,139 ng/g (Houghton *et al.* 1991). Because many of the study sites are classified as protected, low-energy sites, and much buried oil still exists, sediment-bound oil will likely continue to be available to intertidal resources for a relatively long time.

Factors Influencing Weathering and Depuration

There are likely several factors that accounted for the relatively rapid depuration of oil following the *NESTUCCA* spill including: 1) the time of year in which it occurred, 2) the type of beach or coastline affected, and 3) the timely and efficient clean-up.

Time of Year

Because the spill occurred in winter when water and air temperatures were lowest, much of the oil rapidly congealed into "blobs," "patties" and large "mats" before coming ashore. In some cases, the Bunker C oil from the *NESTUCCA* was at sea from 1-2 weeks before grounding on some of the ONP beaches, and it had weathered significantly during this period. The relatively high sea state at the time of the spill also likely served to enhance weathering; high winds increased evaporation and the resulting high seas increased dissolution and dispersion. This was not the case in every location affected by the spill, however, as shortly after the accident, heavy accumulations of fresh (unweathered) Bunker C came ashore at Ocean Shores and also entered Grays Harbor. Relatively fresh oil also stranded at Whale Creek on the Quinault Indian Reservation and on the more southern

beaches of ONP (Second Beach, Kayostla Beach, Norwegian Memorial North).

Type of Beach

The area of the Washington coast most affected by the spill is characterized by unprotected, high energy, rocky headlands and sand beaches. Fortunately, this type of shoreline tends to cleanse itself most rapidly (Duval *et al.* 1981). Most Bunker C stranding on the rocky shorelines (Kayostla Beach, Norwegian Memorial North, Wedding Rocks) of the Washington coast was removed relatively quickly by wave action and a series of severe winter storms that occurred immediately following the spill. The relatively low concentrations of oil (63 to 250 $\mu g/g$ by IR), essentially trace amounts, associated with these coastal stations during the third survey, confirmed that weathering and depuration proceeded rapidly. What residual oil remained was restricted to the more protected rock and cobble substrates associated with gently sloping beaches at Kayostla Beach and Norwegian Memorial. The finding of significantly decreased nC_{17}/Pristane and nC_{18}/Phytane ratios associated with the extra sediments collected in the Norwegian Memorial area of ONP also suggested that weathering occurred very rapidly in selected Washington coastal sediments (Table 6).

Although the sand beaches at Ocean Shores (North Jetty area) were heavily oiled, oil was not detected during any of the three surveys conducted at this location, suggesting more rapid depuration from open sand beaches. Polycyclic aromatic hydrocarbons were also mostly undetectable in razor clams and mussels from Ocean Shores. Finally, even though very high concentrations of oil (6,255 and 19,015 $\mu g/g$ dry weight by IR) were found on Sand Island during the second survey, attempts to relocate this oil during the third survey proved unsuccessful, possibly indicating that weathering and depuration in this habitat proceeded rapidly. Shifts in the configuration of sand dunes on the Island mediated by intense storm events during the winter of 1989-1990 were likely partially responsible.

Efficacy of Clean-up

Finally, clean-up was implemented immediately and was extensive. Clean-up crews worked all affected beaches; only one "set-aside" beach was established in ONP to study potential effects of oiling on intertidal ecology. Absorbent pads were used during the first few days of the spill when the oil was still fresh. Pom-poms were installed and used effectively over cobble substrates containing buried oil at Norwegian Memorial North. Intense winter storms accompanied by extremely high tides at the time of the spill refloated extensive amounts of stranded debris, effectively adding much natural oil-absorbent material to affected waters. Oil in the form of "mats" and smaller "patties" were easily picked-up or scraped-off rocks. Oiled debris consisting of kelp mats, eel grass, driftwood and other flotsam were also removed for ultimate disposal in a certified landfill. Helicopter access to even the most remote beaches on the coast greatly facilitated the clean-up process. Approximately 45,000 yd^3 of oiled logs were also burned on Washington coastal beaches (including those of ONP) following the spill (Lt. M. Smith, Marine Safety Office, U.S. Coast Guard, Seattle District, pers. comm.). Other logs as well as large rocks and boulders were "brush-torched" to remove oil, although this technique had only limited success. Oil adherent to logs and rocks was heated until formation of an ash, but because rocks often exploded during this process, raising concern for operator safety, this technique was discontinued. Propane-fired torches were also used on heavily oiled, cobble beaches of Vancouver Island, but again with little effectiveness (Harding and Englar 1989).

Relatively high concentrations of total oil and grease (30,000 mg/kg by IR) were also significantly reduced by clean-up following the spill of Alaska North Slope crude oil from the *ARCO ANCHORAGE* in Port Angeles harbor in December 1985 (Word *et al.* 1987a, b). Average concentrations of residual oil and grease at the end of an intensive four month clean-up period were 450 mg/kg. The maximum observed average concentration in mixed-soft sediments (0-38 cm in depth) within treated areas was approximately 1100 mg/kg. In contrast, Vanderhorst *et al.* (1981) showed in field experiments that residual Prudhoe Bay crude oil concentrations in intertidal sediments under natural conditions of weathering and depuration decreased from about 2000 mg/kg to undetectable levels within 18.5 months. The Strait of Juan de Fuca and the harbor at Port Angeles can be described as protected, low-energy environments.

Clean-up on Vancouver Island following the *NESTUCCA* spill proceeded in much the same way as efforts along the Washington coast and over essentially the same timeframe. Canadian officials (Harding 1990) also indicated that a rapid and thorough clean-up program following grounding of the oil in early January 1989 served to reduce the impacts of the spill. The grounding of oil in locations where natural self-cleaning was at maximum (high wave action) also limited impacts.

Conclusions

Although relatively high concentrations of oil (6255 and 19,015 $\mu g/g$ dry weight) were found on Sand Island in Grays Harbor during the second survey, the relatively low concentrations of oil (63 to 250 $\mu g/g$ dry weight), essentially trace amounts, associated with the coastal sites during the third survey suggest that depuration was relatively rapid and that little oil residual remains from the 1988 *NESTUCCA* oil spill. The relatively low concentrations of aromatic hydrocarbons (mostly <45 ng/g dry weight) found in invertebrates following the spill also represent essentially background levels and indicate that oil was rapidly metabolized and depurated, or is no longer biologically available. These data tend to confirm results of analyses of surficial sediments indicating that little residual oil remains.

Factors likely contributing to the relatively rapid weathering and depuration of oil from impacted beaches include 1) the time of year in which the spill occurred, 2) the type of beach or coastline affected, and 3) the timely and efficient clean-up. Most spilled oil congealed before stranding due to cold air and water temperatures. Large amounts of floating debris also tended to catch (adsorb) significant quantities of oil. The area of the Washington coast most affected is characterized by unprotected, high-energy sand beaches and rocky headlands, which tend to rapidly cleanse themselves. Finally, clean-up was immediate and the congealed oil was easily removed from affected beaches.

Despite our conclusion that little oil remains after the *NESTUCCA* oil spill, the potential for buried, virtually unweathered oil resurfacing on Sand Island and possibly coastal beaches still exists. Sampling on Sand Island and the Washington coast was minimal (one transect per beach), and it is conceivable that surveys conducted by the U.S. Coast Guard, the State of Washington, and others, upon which our survey design was based, could have overlooked some deposits of buried oil. Our conclusions, therefore, should be viewed with that understanding.

Acknowledgements

The authors would like to thank Dr. Ahmad E. Nevissi of the University of Washington who acted as technical advisor to the project. Mr. John H. Aho, Mr. John H. Meyer and Mr. Bruce B. Moorehead of Olympic National Park provided logistical support and assisted with field collections. This study was funded by the U.S. Department of the Interior, Minerals Management Service under Interagency Agreement No. 10683 with the U.S. Department of Energy and Pacific Northwest Laboratory. Pacific Northwest Laboratory, of which Battelle/Marine Sciences Laboratory is a component, is operated by Battelle Memorial Institute for the U.S. Department of Energy.

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

TO: Dave Gibbons
RESTORATION TEAM

Sept. 1, 1992

FROM: RPWG, John Strand and Ray Thompson

RE: ISSUES FOR THE DRAFT RESTORATION PLAN

The Restoration Planning Working Group has completed the enclosed issues for the Draft Restoration Plan. These eleven issues are the product of our evaluation of public and agency comments on the Restoration Framework, Volume I, and comments from the Restoration Team.

Please note that the issues presented here are specifically for guiding the design and development of the Restoration Plan. These will be shared with the environmental impact statement contractor for use in developing the EIS. The issues developed for the EIS will most certainly be similar but may not be identical to those used for the Restoration Plan. Following Forest Service procedures for National Environmental Policy Act analyses of environmental impacts, the issues used for the EIS must be approved by the deciding official (Trustees) prior to their use in the EIS.

The Restoration Team may want to forward these issues to the Trustee Council now, or may want to wait for the EIS issues to be developed and forward both issue sets as a package. RPWG now requests your concurrence on attached issues for the Restoration Plan.

Enclosure

ISSUE STATEMENTS FOR THE DRAFT RESTORATION PLAN

1. Injured resources and services vary in level of injury, rate of recovery, location, and value to ecosystem and humans. What priority or weight should be given to these factors in determining priorities for restoration options?

2. What level of information, either from new or continuing damage assessment studies, including socio-economic studies, is necessary to evaluate the need for and effectiveness of present and future restoration?

3. What level of monitoring or research is appropriate to determine the rate of recovery, health, and management of injured species, ecosystems, and services?

4. How will habitat protection mechanisms (such as special management designations, land acquisition and others) for public and private land and water be integrated into an overall restoration program?

5. What information should be distributed to the public and how should it be disseminated?

6. If there is a need for scientific, recreational or other facilities, where, how, and when should they be constructed?

7. What are the effects of restoration activities on local economies and subsistence?

8. What are the appropriate restoration strategies for restoring or enhancing both injured and non-injured resources and services?

9. What are the opportunities and appropriateness for long-term funding of programs through endowments?

10. How will restoration funds be managed and allocated?

11. Should restoration activities be evaluated concurrently or hierarchically?

END

September 01, 1992

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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

September 15, 1992

MEMORANDUM FOR: Distribution

FROM: Bruce Wright
Program Manager, OOSDAR

SUBJECT: ASTM Symposium

ASTM is sponsoring a symposium on environmental toxicology and risk assessment. This symposium will take place in Atlanta, Georgia on April 26-29, 1993. The Exxon Company plans to present a number of papers at this symposium (Exxon does not plan to participate in the EVOS Trustee Council sponsored symposium). ASTM is planning to incorporate a series of technical sessions on the EVOS (see attached letter from Jane Hughes).

ASTM symposium chairman, Jane Hughes, would like the EVOS Trustee agencies to present papers at the ASTM symposium thus providing a balanced set of papers and presentations. I suspect that technical papers discussing methodology advances would be particularly welcome to ASTM. Although papers published in the Anchorage symposium proceedings will probably not be published in the ASTM proceedings, they will be considered for presentation at the ASTM symposium.

When asked about abstract submission, Ms. Hughes said the same abstracts submitted for the Trustee Council sponsored symposium can be submitted for consideration for the ASTM symposium. The Call for Papers deadline has been extended to September 30, 1992 (see attached brochure) to allow for Trustee agency participation.

You are on your own if you would like to participate in the ASTM symposium; you will be responsible for abstract submission, travel and other expenses. The registration fee has not yet been set but will be in the $50 to $99 range. If you cannot travel to Atlanta, you may want to consider having a poster presentation.

I request that you keep me informed of your participation in the ASTM symposium. If you have any questions please contact me or Ms. Hughes at (919) 942-3985. They are also looking for session chairs.

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Molly Sturdevant
Usha Varanasi
Alex Wertheimer — L.J. Evans
Doug Wolfe
And anyone else I may have missed!

Attachments

cc: Byron Morris

Committee E-47 ON BIOLOGICAL EFFECTS AND ENVIRONMENTAL FATE

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Staff Manager: SUSAN P. CANNING (215-299-5490)

September 10, 1992

Byron Morris
Chief, Office of Oil Spill Damage Assessment & Restoration
U.S. Dept. of Commerce - NOAA
National Marine Fisheries Service
11305 Glacier Hwy.
Auke Bay, AK 99821

Dear Mr. Morris:

I am serving as chairman of the Third ASTM Symposium on Environmental Toxicology and Risk Assessment to be held April 26-29, 1993 in Atlanta, GA. This symposium is sponsored by ASTM Committee E-47 on Biological Effects and Environmental Fate.

Recently, representatives from Exxon Company sent us a number of abstracts, concerning the Exxon Valdez oil spill, for proposed presentations at the Symposium. The symposium chairmen and ASTM are therefore planning to incorporate a series of technical sessions on this subject, and feature the background of the incident in our plenary session. We feel that the people who typically attend our symposium will be very interested in (finally) seeing the data from these studies. It is our intention to develop a separate peer-reviewed Special Technical Publication (STP) encompassing a balanced set of papers discussing the environmental impacts of the incident.

On behalf of the Symposium Committee, I invite you to be a part of the technical sessions on the Exxon Valdez. Ideally, we are soliciting papers that would be both presented and published, but we can accept papers that are "for presentation only" or "for publication only". We are also soliciting nominations for session chairs.

We have added this topic at a rather late date, relative to ASTM deadlines. We have extended the deadline for submission of abstracts to **September 30**, which I realize does not allow very much time. (Please note that manuscripts submitted for publication in the peer-reviewed STP that will result from this symposium are due no later than February 28, 1993).

Further information and a copy of the "Call for Papers" is enclosed. Feel free to circulate this information to others who may be interested in participating. One of my co-chairmen will be coordinating the portion of the symposium and STP relating to the Exxon Valdez; thus, any questions and copies of submitted abstracts should be directed to him:

Dr. Greg Biddinger, Exxon Biomedical Sciences, Inc., Mettlers Rd., CN 2350, East Millstone, NJ 08875-2350
Phone: 908-873-6030 Fax: 908-873-6009

You may also call me (919-942-3985), Co-chairman Gene Mones of Unilever (201-943-7100 (ext. 2373)), or Dorothy Savini of ASTM (215-299-5413) if you have any questions.

Sincerely,

Jane Hughes

Jane Hughes, Symposium Chairman

Standard guides on the reduction, recycling, reuse and disposal of various types of containers are being prepared by a task group within Subcommittee D10.44 on Containers. The guides will address containers made of aluminum, aseptic, fiber, glass, paper, plastic and steel. The task group will next meet during the Oct. 18-22 meeting of Committee D-10 on Packaging. For more information, contact: Greg Crawford, Steel Can Recycling Institute, Foster Plaza X, 680 Anderson Drive, Pittsburgh, Pa. 15220 (412/922-2772); or Margie Lawlor, ASTM (215/299-5518).

Determining the compatibility of agricultural chemicals with water soluble films used for packaging is the subject of a new task group within Committee E-35 on Pesticides. The group hopes to standardize testing methods between compound manufacturers and water soluble film manufacturers. The group will next meet during the Nov. 17-20 meeting of E-35. For more information, contact: Daniel A. Volk, Chris Craft Industrial Products Inc., 407 County Line Road, Gary, Ind. 46403 (219/762-3165); or Susan Canning, ASTM (215/299-5490).

A new standard guide for safe use of recycled oil in metalworking fluids is being prepared by Subcommittee E34.50 on Health and Safety Standards for Metalworking Fluids. Interested parties are invited to participate. The subcommittee will next meet in Miami, Fla., during the Nov. 15-17 meeting of Committee E-34 on Occupational Health and Safety. For more information, contact: John Howell, Castrol Industries Inc., 630 W. Washington Blvd., Chicago, Ill. 60606 (312/454-1000); or Teresa Cendrowska, ASTM (215/299-5546).

A new standard guide for packaging of silicon carbide whiskers and fibers is being prepared by Subcommittee E34.70 on Single Crystal Ceramic Whiskers. Interested parties are invited to participate. The subcommittee will next meet in Miami, Fla., during the Nov. 15-17 meeting of Committee E-34 on Occupational Health and Safety. For more information, contact: Dr. Sam Weaver, Third Millennium Technologies, P.O. Box 23556, Knoxville, Tenn. 37933-1556 (615/691-2170); or Teresa Cendrowska, ASTM (215/299-5546).

The U.S. Department of Agriculture (USDA) is now licensing production of the first starch encapsulated pesticides designed to stick to the leaves of plants. The new technology promises to reduce the risk of contamination of groundwater as well as reduce pest-control costs. The technology was invented by two doctors of the Agricultural Research Service (ARS) National Center for Agricultural Utilization Research in Peoria, and is being patented by the USDA. For more information, contact: Baruch Shasha or Michael McGuire, National Center for Agricultural Utilization, ARS, USDA, Peoria, Ill. 61604 (309/685-4011).

The National Institute of Standards and Technology (NIST) is screening for 12 potential chemicals as possible replacements for Halon 1301. Halon 1301 has been used widely as a fire suppressant because it is safe, effective and gentle to materials and equipment. However, the halon family of chemicals is believed to be damaging to the Earth's protective ozone layer and is being phased out worldwide before the end of the century. The NIST screening will provide data on properties such as flame extinction efficiency, chemical stability, combustion by-products and compatibility with metals and elastomer products. For more information, contact: Jan Kosko (301/975-2767).

Three guides are being developed by Section E47.13.04 on Risk Characterization of Committee E-47 on Biological Effects and Environmental Fate. The guides will address defining the scope of uncertainty in risk, evaluating multiple endpoints, and using quantitative and qualitative ecological risk assessment. The section will next meet in conjunction with E-47, Nov. 6-10. For more information, contact the section chairman: Suellen Pirages, Karch & Associates Inc., 1701 K St. N.W. #1000, Washington, D.C. 20006 (202/463-0400); or Susan Canning, ASTM, (215/299-5490).

The first public presentation of certain research efforts undertaken in the wake of the Exxon Valdez oil spill will be a highlight of the Third Symposium on Environmental Toxicology and Risk Assessment: Aquatic, Plant and Terrestrial to be held April 26-29, 1993. Sponsored by Committee E-47 on Biological Effects and Environmental Fate, the symposium's theme is "Critical Issues in Environmental Toxicology and Risk Assessment" and will include a series of sessions on "The Exxon Valdez: Environmental Response and Assessment." Other sessions planned are on ecological risk assessment, biodegradation, sediment toxicology and more. The symposium will also include meetings of ASTM standards development working groups. For more information, contact: Jane Hughes, Malcolm Pirnie Inc., 126 Cobblestone Drive, Chapel Hill, N.C. 27516 (919/942-3985); or Susan Canning, ASTM (215/299-5490).

ASTM Standards on Soil Compaction provides 26 standards on the construction of fills, dams, liners, caps, structure foundations, backfill and other earth structures. The standards are useful for classifying soil to be used, determining the soil's compaction characteristics, and controlling the compaction of water content of the soil as it is being placed. Sponsored by Committee D-18 on Soil and Rock, the publication is intended for design engineers, specifiers, consultants, inspectors, soils engineers and more. The book is available from ASTM Customer Service (215/299-5585). (List price $45, member price $41). SN

ASTM

Manuscript Review

ASTM is a consensus organization and as such requires input from industry, government, and academia in its peer-reviewed publication. We are searching for, and preparing a list of, those individuals who are willing to review manuscripts submitted to ASTM for publication in Special Technical Publications (STP) for Committee E-47 on Biological Effects and Environmental Fate. Reviewers would receive no more than three manuscripts for any STP.

If you are willing to serve as a reviewer of manuscripts submitted for the Third Symposium on Environmental Toxicology and Risk Assessment, please complete the following information and mail to Jane Hughes, Symposium Chairman, Malcolm Pirnie, Inc., 126 Cobblestone Drive, Chapel Hill, NC 27516.

Name: _____

Title: _____

Organization: _____

Address: _____

_____

Phone: _____ Fax: _____

Areas of expertise (feel free to circle as many as appropriate):

Aquatic	Behaviorial	Biodegradation
Biomarkers	Ecological Modeling	Neurotoxicology
Ecosystem	Effluents	Plants
Ecological Risk Assessment	Sediment	Terrestrial
Oil spills	Product life cycle	

OTHER (please specify): _____

_____

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Thank you for offering your services.

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ASTM Third Symposium on
Environmental Toxicology and Risk Assessment: Aquatic, Plant and Terrestrial

April 26 - 29, 1993
Atlanta, GA

If you are willing to serve as a session chair, please complete the following information and mail to Jane Hughes, Symposium Chairman, Malcolm Pirnie, Inc., 126 Cobblestone Drive, Chapel Hill, NC 27516

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Thank you for offering your services.

Third Symposium on Environmental Toxicology and Risk Assessment: Aquatic, Plant, and Terrestrial

April 25-28, 1993 Atlanta, Georgia

Papers are requested for the Third Symposium on Environmental Toxicology and Risk Assessment: Aquatic, Plant, and Terrestrial. The symposium, sponsored by ASTM Committee E-47 on Biological Effects and Environmental Fate, will be held April 25-28, 1993 in Atlanta, Georgia. The symposium combines poster and platform presentations with the individual subcommittees' standards development meetings. This format allows dynamic discussion of current findings and incorporation of these findings into standard guides for which ASTM is noted.

The symposium covers a broad range of environmental topics including mechanisms of toxicity to the effects of contaminants on ecosystem structure. The symposium will begin with a reception Sunday evening and paper presentations will continue through Wednesday. Tuesday morning and Wednesday afternoon are set aside for ASTM subcommittee meetings with paper presentations on Tuesday afternoon and Wednesday morning.

In addition, a special poster session on Monday afternoon will emphasize creative presentations of environmental toxicological research. Displays, videos, and demonstrations are encouraged for this session. The poster session is planned to stimulate discussion among participants. Please check the appropriate box on the ASTM Paper Submittal Form below to indicate your preference for a platform or a poster session. Prospective poster authors are asked to submit abstracts. Papers are invited on the following topics:

- Product Life-Cycle Assessment
- Comparative Toxicity and Mechanisms
- Complex Mixtures: Interactions, Toxicity, and Ecosystem Effects
- Environmental Risk/Environmental Systems Modeling
- Environmental Toxicology of Pesticides
- Integration of Research in Environmental Toxicology and Risk Assessment
- Interspecific Relationships in Toxicology
- Measurement and Interpretation of Community Effects
- Methods in Environmental Toxicology
- Microcosms, Mesocosms, and Extrapolation to Field Predictions
- Movement of Pollutants through Ecosystems
- Physiological Indicators of Toxic Stress (Biomarkers)
- Population Biology and Predictions in Environmental Toxicology
- Sediment Toxicity and Bioavailability
- Structure Activity Relationships
- Toxicology of Vascular Plants

Prospective authors are requested to submit a title, a 200-400 word abstract, and the ASTM Paper Submittal Form below by ~~**August 31, 1992**~~ September 30, 1992 to Dorothy Savini, Symposia Operations, ASTM, 1916 Race Street, Philadelphia, PA 19103-1187, 215/299-5413. Additional Paper Submittal Forms are available from Ms. Savini or from the symposium chairman.

Authors will be notified of their paper's acceptance for presentation by October 15, 1992 by the symposium chairman. ASTM may print and distribute abstracts with the approval of the symposium chairman.

A Special Technical Publication (STP) based on the symposium proceedings is anticipated by ASTM. Papers presented at the symposium will be included in the STP if they are approved through the ASTM peer review process. Please check the appropriate box below to indicate whether you will prepare your paper for presentation only or for presentation and publication. Authors who indicate their intention to publish are expected to prepare manuscripts as described below. Main authors will receive a complimentary copy of the volume(s) containing their papers. The main author is the author corresponding with the ASTM publications staff. All published authors may purchase reprints of the papers at cost.

Final manuscripts in ASTM camera-ready format for the STP based on this symposium are due by **February 28, 1993.** This deadline will be rigidly enforced. **Absolutely no papers will be accepted after the last day of the symposium.**

More information is available from Symposium Chairman Jane Hughes, Malcolm Pirnie, Inc., 126 Cobblestone Drive, Chapel Hill, NC 27516, 919/942-3985, FAX: 919/942-4042 or the Symposium Co-Chairmen Dr. Gregory Biddinger, Exxon Biomedical, P.O. Box 235, East Millstone, NJ 08873, 908/873-6030, FAX: 908/873-6306 and Dr. Eugene Mones, Unilever Research U.S., 45 River Road, Edgewater, NJ 07020, 201/943-7100, ext. 2372, FAX: 302/943-5653.

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ASTM Paper Submittal Form

(Abstracts to be Attached)

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Authors _____

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Reference to any previous publication of the substance of your paper:_____

ABSTRACT SHOULD COVER: Objective and significance of the research; brief description of the procedures; and results and their significance.

ACCEPTANCE OF PAPERS FOR PUBLICATION: The acceptance of this Submittal Form does not constitute an acceptance of your paper for publication. Acceptance for publication is contingent upon peer review and approval by the ASTM Committee on Publications.

All papers not submitted to ASTM by the deadline will not be accepted for the STP. If a paper is submitted after the deadline, it may be forwarded to the appropriate ASTM journal to be considered for publication. Please contact **Kathy Dernoga** (215/299-5581) or the Symposium Chairperson if you cannot meet the deadline.

KRWG I

Date: September 29, 1992

To: Distribution

From: John Strand

Subject: 1993 International Oil Spill Conference

I have just received word form the IOSC Program Committee that our paper has been accepted for both presentation and publication. However, the IOSC Program Committee did ask that we consider reducing the length of our paper by about one page. They thought that we could do some condensation of the material found on pages 6, 14, and 16. The only comment of a technical nature pertained to our definition of recovery (see page 5). They suggested that we might revise the second sentence of the first paragraph in the section entitled Recovery Concept to read as follows; "A fully recovered ecosystem is one which provides the same functions and services as were provided by the pre-spill, uninjured system, within the limits and constraints of natural variability and statistical significance.

There were some last minute comments that Ken and Art made that I did not receive before forwarding the paper to the IOSC on September 3rd. I can consider these when I consider the above comments. The due date for final submission is October 16th to the editor of IOSC. This means an express mailing no later then October 14th. If you have any further comments, or if you want to reflect on the IOSC review, please FAX any input to my Juneau number (907 789-6608). Thanks.

Distribution:

Mark Brodersen
Karen Klinge
Susan MacMullin
Sandy Rabinowitch
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RPWG
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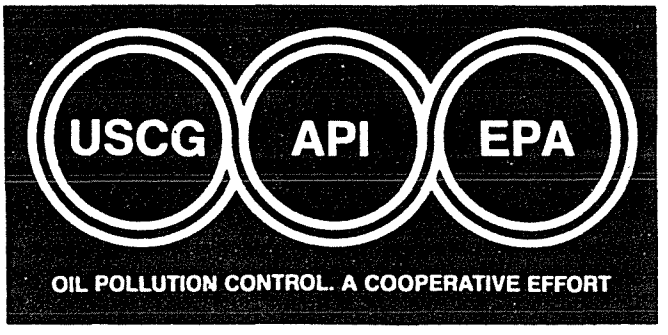
Proceedings

1993 International Oil Spill Conference

(Prevention, Preparedness, Response)

March 29–April 1, 1993
Tampa, Florida

Sponsored by: United States Coast Guard, American Petroleum Institute, and U.S. Environmental Protection Agency



PROCESS TO IDENTIFY AND EVALUATE RESTORATION OPTIONS

John Strand, Stanley Senner, Arthur Weiner, Sanford Rabinowitch, Mark Brodersen, Kenneth Rice, Karen Klinge, Susan MacMullin, Ruth Yender, Raymond Thompson
Exxon Valdez *Oil Spill Restoration Planning Work Group*
645 "G" Street
Anchorage, Alaska 99501

ABSTRACT: *The restoration planning process has yielded a number of possible alternatives for restoring resources and services injured by the* Exxon Valdez *oil spill. They were developed by resource managers, scientists, and the public, taking into consideration the results of damage assessment and restoration studies and information from the scientific literature. The alternatives thus far identified include no action natural recovery, management of human uses, manipulation of resources, habitat protection and acquisition, acquisition of equivalent resources, and combinations of the above. Each alternative consists of a different mix of resource- or service-specific restoration options.*

To decide whether it was appropriate to spend restoration funds on a particular resource or service, first criteria had to be developed that evaluated available evidence for consequential injury and the adequacy and rate of natural recovery. Then, recognizing the range of effective restoration options, a second set of criteria was applied to determine which restoration options were the most beneficial. These criteria included technical feasibility, potential to improve the rate or degree of recovery, the relationship of expected costs to benefits, cost effectiveness, and the potential to restore the ecosystem as a whole. The restoration options considered to be most beneficial will be grouped together in several or more of the above alternatives and presented in a draft restoration plan. They will be further evaluated in a companion draft environmental impact statement.

The restoration planning process following the *Exxon Valdez* oil spill has focused on identifying, evaluating, and integrating information about the nature, extent, and persistence of injuries to natural resources and services, the rate and adequacy of natural recovery, and the opportunities for restoration. This process changes as new information is received, but will culminate in the publication of a restoration plan in 1993. Damage-assessment and restoration-science studies are the primary sources of information on injuries; other sources include data collected during the oil spill cleanup, public comments, and scientific literature.

This paper reviews the initial planning approach taken by the *Exxon Valdez* Oil Spill Restoration Planning Work Group (RPWG) on behalf of the *Exxon Valdez* oil spill trustees to identify and evaluate restoration options. We also look at special problems encountered during restoration planning and how they were addressed. We hope that insights developed during this planning process may be useful to others faced with similar tasks.

Exxon Valdez oil spill trustee organization

After the oil spill on March 24, 1989, but before the settlement with Exxon Corporation and Exxon Shipping Company on October 8, 1991, natural resource damage assessment and restoration activities were largely guided by a verbal, nonbinding agreement among the six (three federal and three State of Alaska) trustees. Since the settlement, these activities have been guided by a Memorandum of Agreement and Consent Decree (hereafter referred to as the Memorandum of Agreement), filed in the U.S. District Court for the District of Alaska in civil action A91-081 (*United States* v. *State of Alaska*). The federal trustees are: secretary of the U.S. Department of the Interior, secretary of the U.S. Department of Agriculture, and administrator of the National Oceanic and Atmospheric Administration, U.S. Department of Commerce. The State of Alaska trustees include: commissioner of the Department of Environmental Conservation, commissioner of the Department of Fish and Game, and the Alaska attorney general, Department of Law. The trustees have appointed representatives to an Alaska-based trustee council. The trustee council has appointed a restoration team and has formed various other subgroups from agency staff to work on components of the restoration program, such as finance, public participation, restoration planning, and habitat evaluation and protection. The Restoration Planning Work Group is one of these subgroups (Figure 1).

Development of injury criteria and identification of resources and services that warrant restoration

The Memorandum of Agreement specifies that use of the restoration trust fund must be linked to injuries resulting from the *Exxon Valdez* oil spill. Specifically, the Memorandum of Agreement requires that funds recovered for damages to natural resources be spent to restore, replace, enhance, rehabilitate, or acquire the equivalent of "natural resources injured as a result of the oil spill and the reduced or lost services provided by such resources." Evidence of consequential injury and adequacy and rate of natural recovery were proposed as criteria to help determine which natural resources and services warrant restoration.

In the context of natural resources, "consequential injury" indicates a loss attributable to exposure to *Exxon Valdez* oil, or otherwise attributable to the oil spill and cleanup. "Loss" for injured natural resources is defined as: significant direct mortality, significant declines in population size or productivity, significant chronic and sublethal effects, or degradation of habitat due to contamination by oil or cleanup. Examples of resources injured during the spill include sea otters; harbor seals; common murres; bald eagles; sea ducks; marbled murrelets; pink salmon; sockeye salmon, cutthroat and Dolly Varden trout; coastal habitat consisting of supratidal, intertidal, and subtidal habitats; and archaeology.

A natural-resource service has experienced "consequential injury" if the oil spill or associated cleanup has significantly reduced the physical or biological functions performed by natural resources; or significantly reduced aesthetic, intrinsic, or other indirect uses provided by natural resources; or, in combination with either of these, resulted in the continued presence of oil on lands integral to the use of special-purpose lands (i.e., parks and refuges designated by the State

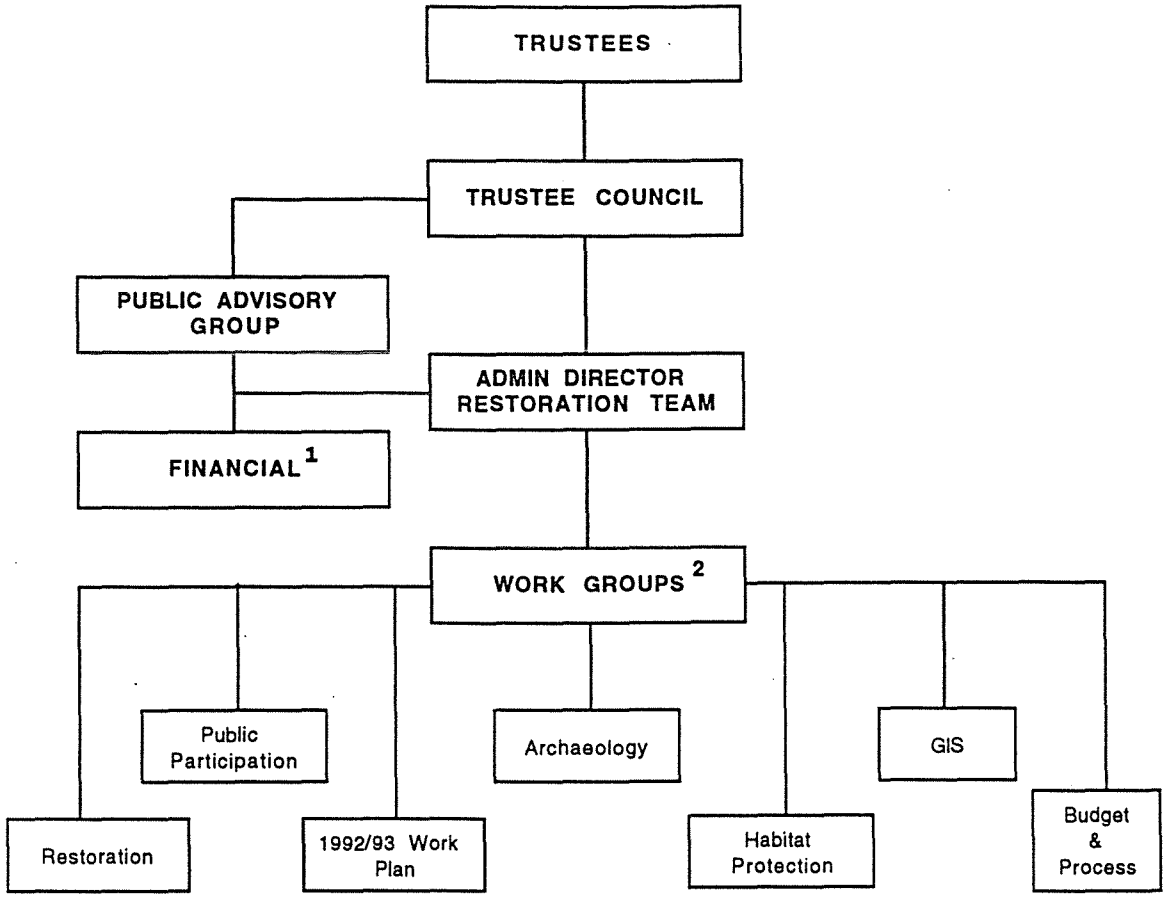


Figure 1. Trustee organization—1. Does not include audit function, a proposal for this function will be developed; 2. Groups will be formed and disbanded as appropriate.

of Alaska or federal government for the protection and conservation of natural resources and services). Services injured during the spill include commercial fishing; subsistence hunting, fishing, and gathering; wildlife viewing; sport fishing; and tourism. Recreation and wilderness-use, which include such activities as kayaking, boating, backcountry camping, and hiking, are other examples. Intrinsic or nonuse values such as aesthetics or appreciation of wilderness also have been affected by the spill.

To maximize the benefits of restoration expenditures, the trustees may consider the effects of natural recovery before investing restoration dollars. In a scientific sense, full ecological recovery has occurred when the pre-spill flora and fauna are again present, healthy, and productive, and there is a full complement of age classes. A fully recovered ecosystem is one that provides the same functions and services as were provided by the pre-spill, uninjured system.

For each injured resource and service, an estimation of the rate of recovery will be made based on the best information available from damage assessment and restoration-science studies, scientific literature, and other sources. If it appears that recovery will be nearly complete before the benefits of a restoration study or project can be realized, then the trustees may determine that spending restoration funds is not justified. However, if it appears that the recovery time will be prolonged, it may be worth implementing technically feasible, cost-effective restoration options.

Identification of restoration options

The restoration planning process has identified the widest possible range of restoration ideas, based on suggestions from a public symposium,[5] public "scoping" meetings,[6] and a technical workshop (because of pending litigation, the workshop was closed to the public and a proceedings was not published). Restoration ideas have been organized into restoration options, and data bases necessary for their evaluation are being assembled. Thirty-five candidate restoration options have been identified and presented to the public in *Exxon Valdez* Oil Spill Restoration, Volume 1—Restoration Framework[3] (hereafter referred to as the Restoration Framework) for review and comment (Table 1).

Evaluation of restoration options

To help determine which of the many restoration options are most appropriate and beneficial, criteria were developed based on the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (42 U.S.C. 9601).

- The effects of any other actual or planned response or restoration actions: Could other actions, such as additional cleanup, affect recovery?
- Potential to improve recovery rate: Will implementation of the restoration option assist the recovery of the injured resource or service?
- Technical feasibility: Are technology and management skills available to implement the restoration option successfully?
- Potential effects of the action on human health and safety: Are hazards or adverse impacts associated with implementation of the restoration option?
- The relationship of expected costs to expected benefits: Do benefits equal or exceed costs? This is not intended to be a straight cost/benefit analysis, but a broad consideration of direct and indirect costs, including lost uses and both primary and secondary benefits resulting from the action.
- Cost effectiveness: Does the action achieve the desired objective at the least cost?

Table 1. Proposed options for restoring resources and services injured by the *Exxon Valdez* oil spill

Management of human uses
1. protect archaeological resources
2. intensify management of fish and shellfish
3. increase management for fish and shellfish that did not previously require intensive management
4. reduce disturbance at marine bird colonies and marine mammal haul-out sites and rubbing beaches
5. reduce harvest by redirecting sport-fishing pressure
6. redesignate a portion of the Chugach National Forest as a national recreation area or wilderness area
7. increase management in parks and refuges
8. restrict or eliminate legal harvests of marine and terrestrial mammals and sea ducks
9. minimize incidental take of marine birds by commercial fisheries
Manipulation of resources
10. preserve archaeological sites and artifacts
11. improve or supplement stream and lake spawning and rearing habitats
12. create new recreation facilities
13. eliminate intertidal sources of contaminated spawning substrates and prey
14. accelerate recovery of upper intertidal (*Fucus*) zone
15. supplement intertidal substrates (algal and other) for spawning herring
16. test feasibility of enhancing murre productivity
17. eliminate introduced foxes and other predators from islands important to nesting marine birds
18. replace fisheries harvest opportunities by establishing alternate salmon runs
Habitat protection and acquisition
19. update and expand the state's Anadromous Fish Stream Catalog
20. establish an *Exxon Valdez* oil-spill special management area
21. acquire tidelands
22. designate protected marine areas
23. acquire additional marine bird habitats
24. acquire "inholdings" within parks and refuges
25. protect and acquire upland forests and watersheds
26. acquire extended buffer strips adjacent to anadromous fish streams
27. designate and protect benchmark monitoring sites
28. acquire access to sport-fishing streams
29. establish or extend buffer zones for nesting birds
Other Options
30. test subsistence foods for hydrocarbon contamination
31. develop comprehensive and integrated monitoring program
32. endow a fund to support restoration activities
33. develop integrated public information and education program
34. establish a marine environmental institute
35. replace (return) archaeological artifacts

- Consistency with applicable laws: Is the option consistent with the directives and policies with which the trustee agencies must comply?
- Potential for additional injury resulting from the option: Will implementation further injure target or nontarget resources or services?
- Degree to which the restoration option enhances the resource or service: Would the option improve or create additional resources or services?
- Degree to which the option benefits more than one resource or service: Would the option benefit multiple injured resources or services?
- Importance of implementing the option within the first year: Would delay in restoring a resource or service result in further injury or would we forgo a restoration opportunity (applies only to implementation started before a restoration plan is completed)?

These criteria have been used throughout the planning process. All ideas developed from the initial public meetings also were screened against these criteria during a preliminary evaluation. Ideas which did not meet the terms of the Memorandum of Agreement, which were technically infeasible, or which could produce significant additional injury upon implementation were rejected.

Since review of public comment on the 35 proposed restoration options, including suggestions for additional options, each option is being reviewed in more detail using the above criteria and reviewing the data bases for each injured resource and service. Data bases are derived from the scientific literature, geographic information systems files, and the reports of cleanup, damage assessment, and restoration-science studies. Subject areas will include the nature and severity of injury, the rate of natural recovery, life history requirements, factors limiting recovery, persistence of contaminants, opportunities to accelerate the recovery rate, costs and environmental impacts of accelerating recovery, and land status (ownership) and existing management practices.

For some injured resources and services, many of these data are on hand; in other cases, substantial deficiencies in the data bases could impede evaluation. To remedy this, additional fieldwork and other studies may be recommended in annual work plans, which should be developed in consultation with scientists representing the trustee agencies, the private sector, and outside peer reviewers.

Evaluation of restoration options for marine and upland habitats

All proposed restoration options will be evaluated using the basic criteria described above. However, additional steps will be needed to evaluate properly habitat protection and acquisition options. Of all candidate options listed in Table 1, habitat protection and acquisition options have received the most public attention and comment.

In the Environmental Protection Agency's Draft 1991 Restoration Work Plan,[2] the trustees set forth a preliminary sequence of steps for identifying and protecting strategic fish and wildlife habitats and recreational sites. Although these habitats, primarily in uplands, were not directly affected by the oil, the trustees recognized that their protection may prevent additional injury to recovering populations. While a final process for evaluating habitat protection options has not been developed, the trustees have issued a Restoration Framework Supplement[4] that proposes a detailed habitat protection and acquisition process for public review and comment. The steps in this process include:

1. identification of key upland habitats that scientific data or other relevant information link to the recovery of injured resources and services. This includes an analysis of imminent threat from development (e.g., logging or mining), that recognizes the need to respond to a proposed change in land use that could foreclose habitat protection or other restoration opportunities.
2. characterization and evaluation of potential impacts from changed land use relative to their effects on recovery of the injured ecosystem and its components; comparative evaluation of recovery strategies not involving acquisition of property rights (e.g., redesignation of land-use classification), including an assessment of protection afforded by existing laws, regulations, or other alternatives.
3. evaluation of cost-effective strategies to achieve restoration objectives for key upland habitats identified through steps one and two above. Restoration alternatives for resource injuries would be evaluated.
4. willing seller-buyer negotiations with private landowners for property rights.
5. public management of acquired property rights.

Development of preferred and other restoration alternatives

A key element in the forthcoming restoration plan will be a description of a preferred alternative and inclusion of a reasonable range of other restoration alternatives, based on the National Environmental Policy Act of 1969 (40 CFR 1500–1508). The consequences and im-

pacts of each alternative must be analyzed in an environmental impact statement (EIS).[1] A programmatic EIS will be published simultaneously with the restoration plan.

Each restoration alternative will consist of several (a set) of the restoration options listed in Table 1. More than one restoration option can be used to restore any one injured resource or service. One option also could address the restoration of multiple injured resources and services. Each alternative, then, will achieve restoration through a different mix of options. Six possible restoration alternatives (sets of options) have been identified in the Restoration Framework.[3,4] They are presented here for discussion only and do not at this time indicate any preference of the trustees.

To undertake no active restoration but to rely on natural recovery to restore the injured ecosystem and its associated services is one alternative. This assumes that cognizant State of Alaska and federal authorities will maintain existing (pre-spill) levels of management for injured resources and services. Monitoring, however, would be conducted to assess whether natural recovery is proceeding as anticipated.

Management of human uses of injured resources or services involves existing State of Alaska and federal management authorities. Examples include to restrict or eliminate legal harvests of sea ducks (Table 1, Option 8) and cutthroat trout (Table 1, Option 5), and to intensify management of fish and shellfish (Table 1, Option 2).

Manipulation of resources or services focuses on measures taken directly (usually on site) to rehabilitate or replace an injured species, restore a damaged habitat, or enhance services provided by a damaged resource. Examples include to improve or supplement stream and lake habitats for spawning and rearing of wild pink and sockeye salmon (Table 1, Option 11), and to accelerate recovery of the upper intertidal *Fucus* communities (Table 1, Option 14).

Habitat protection and acquisition includes changes in management practices on private and public lands and the creation of protected areas on existing public lands and on marine waters to prevent further damage to injured resources. Beyond land management practices, damaged habitats or property rights can be acquired short of fee-simple title, e.g., purchase of timber rights. Examples include designation of a National Marine Sanctuary or Alaska State Refuge, Sanctuary or Critical Habitat Area (Table 1, Option 22), and acquisition and designation of additional marine bird habitat for inclusion in the Alaska Maritime National Wildlife Refuge (Table 1, Option 23).

Acquisition of equivalent resources does not attempt directly to restore or rehabilitate injured resources and services. Acquisition of equivalent resources means to compensate for an injured resource by substituting another resource that provides the same or substantially similar service as the injured resource or service.[3,4] However, direct restoration approaches (manipulation of resources and services, and habitat protection and acquisition) also can be implemented on an equivalent-resource basis. Examples: are to create new recreational facilities (Table 1, Option 12), and to acquire tidelands (Table 1, Option 21).

Each alternative above may be considered by itself or mixed in a number of ways, depending on priorities and approach. For example, Figure 2 presents a hierarchical analysis scheme through which one could consider habitat protection and acquisition only after determining that options under management of human uses and manipulation of resources or services were inadequate to achieve restoration. In this model, one would not necessarily have to try all higher options before proceeding to the next; one would only need to make some evaluation of their effectiveness before proceeding to the next. In the concurrent analysis scheme (Figure 3), one could weigh all approaches equally,

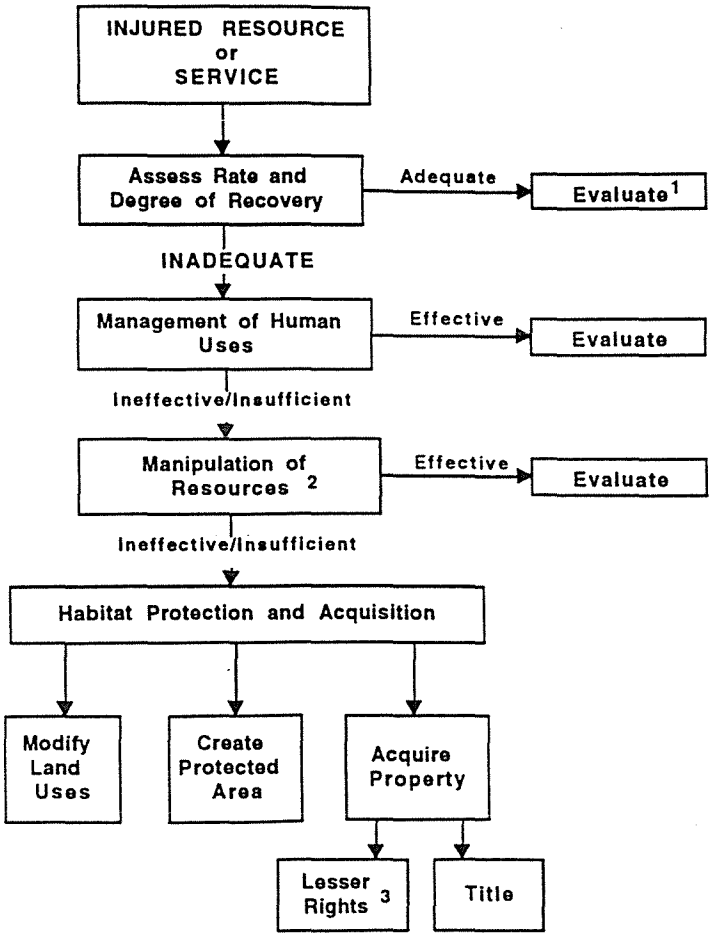


Figure 2. Possible conceptual approach to the analysis of restoration options considers options hierarchically—1. All restoration actions will be evaluated as to their effectiveness on the recovery rate of the target injured resource; 2. Approaches can be implemented on a direct-restoration or equivalent-resource basis; 3. Lesser rights (partial interests) include conservation easement, timber rights, and access rights.

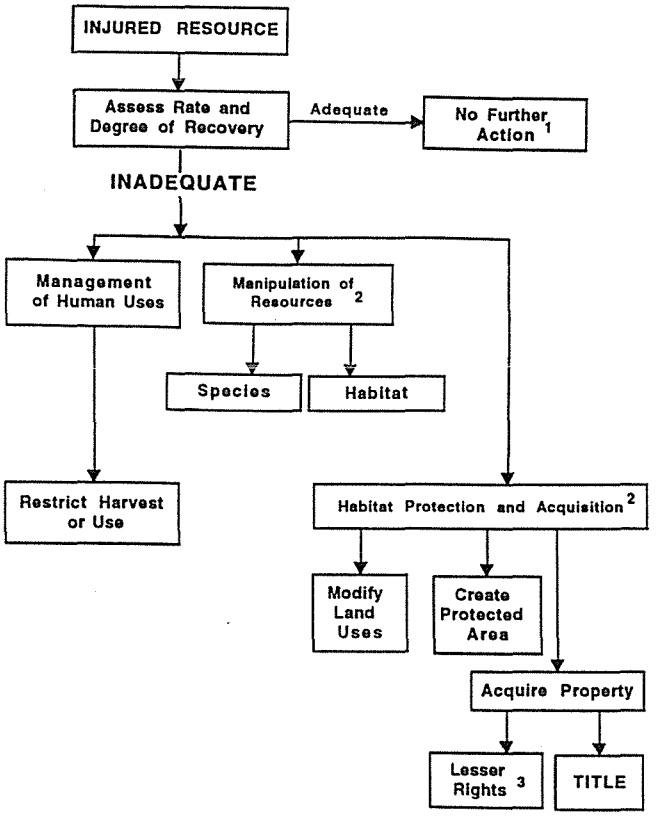


Figure 3. Possible conceptual approach to analysis of restoration options considers all approaches concurrently—1. All restoration actions will be evaluated to assess their effectiveness on the recovery rate of the target injured resource; 2. Approaches can be implemented on a direct-restoration or equivalent-resource basis; 3. Lesser rights (partial interests) include conservation easement, timber rights, and access rights.

proceeding to those options deemed most desirable based on professional and scientific judgment and the public's values. Each analysis scheme should be viewed as an evaluation process.

Problems encountered and lessons learned

Coming this far was not always easy. Numerous problems encountered along the way greatly influenced the planning process, especially our ability to make timely decisions and recommendations. For some problems, we can provide insight into possible solutions; for others, we have yet to find a lasting solution. Even so, it may be of value to forewarn the reader faced with a similar planning task. Problems encountered by RPWG follow.

Imperfect data base. In most cases, knowledge of the nature and severity of injury is imperfect. This is due to the lack of pre-spill (baseline) data, the time required to assess injury meaningfully (3 to 5 years for certain species), and the extremely large area affected by the spill (portions of 1200 miles of coastline were oiled). Also, for logistical, financial, and other reasons, all injured species and services were not studied in detail, e.g., loons, pigeon guillemots, recreation. Where data are imperfect, one has to judge injuries to natural resources and services by the weight of available evidence and best professional opinion. The restoration plan needs to be flexible and receptive to newly generated information.

After the oil spill, monitoring studies in support of cleanup were conducted and managed separately from damage assessment studies, even though some of the same agencies participated in both efforts. No one seriously attempted to integrate these studies. For most of the cleanup and damage assessment studies, it was often impossible to differentiate the effects of oiling from the effects of various treatment technologies, e.g., high-pressure hot-water wash, bioremediation. Because different survey objectives and designs were used, results were often contradictory or could not be rigorously compared, thus increasing the problem of an imperfect data base upon which decisions had to be made. Unfortunately, the planning process could not be delayed until a better data base became available. Again, RPWG made decisions on the best available information and on their collective professional judgment.

Different agency perspectives. Early in the planning process, the RPWG recognized that each trustee agency came to the planning table with different perspectives and legal mandates. The fact that each agency also conducted cleanup, damage-assessment, and restoration-science studies complicated RPWG's task. While this problem will never disappear completely, it has been greatly mitigated by adopting a consensus process for making decisions. Few decisions have been made by RPWG using traditional majority-minority opinions; most were made by group agreement when everyone could support a proposal with no objections or vetoes expressed. This has slowed our process at times but also has strengthened the recommendations and decisions made.

References

1. Council on Environmental Quality, 1986. Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act. Reprint 40 CFR Parts 1500–1508 (as of July 1, 1986). Council of Environmental Quality, Executive Office of the President, Washington, D.C. 45pp
2. Environmental Protection Agency, 1991. Prince William Sound and Gulf of Alaska restoration. *Federal Register* v56, n41, pp8898–8903
3. *Exxon Valdez* Oil Spill Trustees, 1992a. *Exxon Valdez* Oil Spill Restoration, Volume I. Restoration Framework. *Exxon Valdez* Oil Spill Trustees, Anchorage, Alaska. 52pp
4. *Exxon Valdez* Oil Spill Trustees, 1992b. *Exxon Valdez* Oil Spill Restoration, Restoration Framework Supplement. *Exxon Valdez* Oil Spill Trustees, Anchorage, Alaska. 54pp
5. Restoration Planning Work Group, 1990a. Restoration following the *Exxon Valdez* oil spill. *Proceedings of the Public Symposium*. Restoration Planning Work Group, Anchorage, Alaska. 174pp
6. Restoration Planning Work Group, 1990b. Restoration Planning Following the *Exxon Valdez* Oil Spill. August 1990 progress report. Restoration Planning Work Group, Anchorage, Alaska. 80pp

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ALTERNATIVES INFORMATION PACKAGE (BROCHURE)

SCHEDULE FOR COMPLETION

Date	Activity
02/26/93	Complete draft of brochure; RPWG/RT review begins
03/03/93	End of RPWG/RT review; revision begins
03/05/93	Revision completed; submit brochure text to Editor and Trustee Council
03/10/93	End of Trustee Council review; RPWG/RT revision begins
03/12/93	Revision completed; submit Trustee Council changes to Editor
03/15/93	Edited text returned from Editor; final RPWG/RT revision begins
03/19/93	Final revision completed; preparation of camera-ready copy begins
03/24/93	Camera-ready copy completed and approved by RPWG/RT; forwarded to printer
03/31/93	Brochure released to the public

Comments! Bring to Feb 23rd meeting.

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Restoration Planning Working Group

EXXON VALDEZ OIL SPILL RESTORATION OFFICE
645 "G" Street
Anchorage, Alaska 99501

TO: RPWG

DATE: February 24, 1993

FROM: Bob Loeffler

TELE: 278-8012
FAX: 276-7178

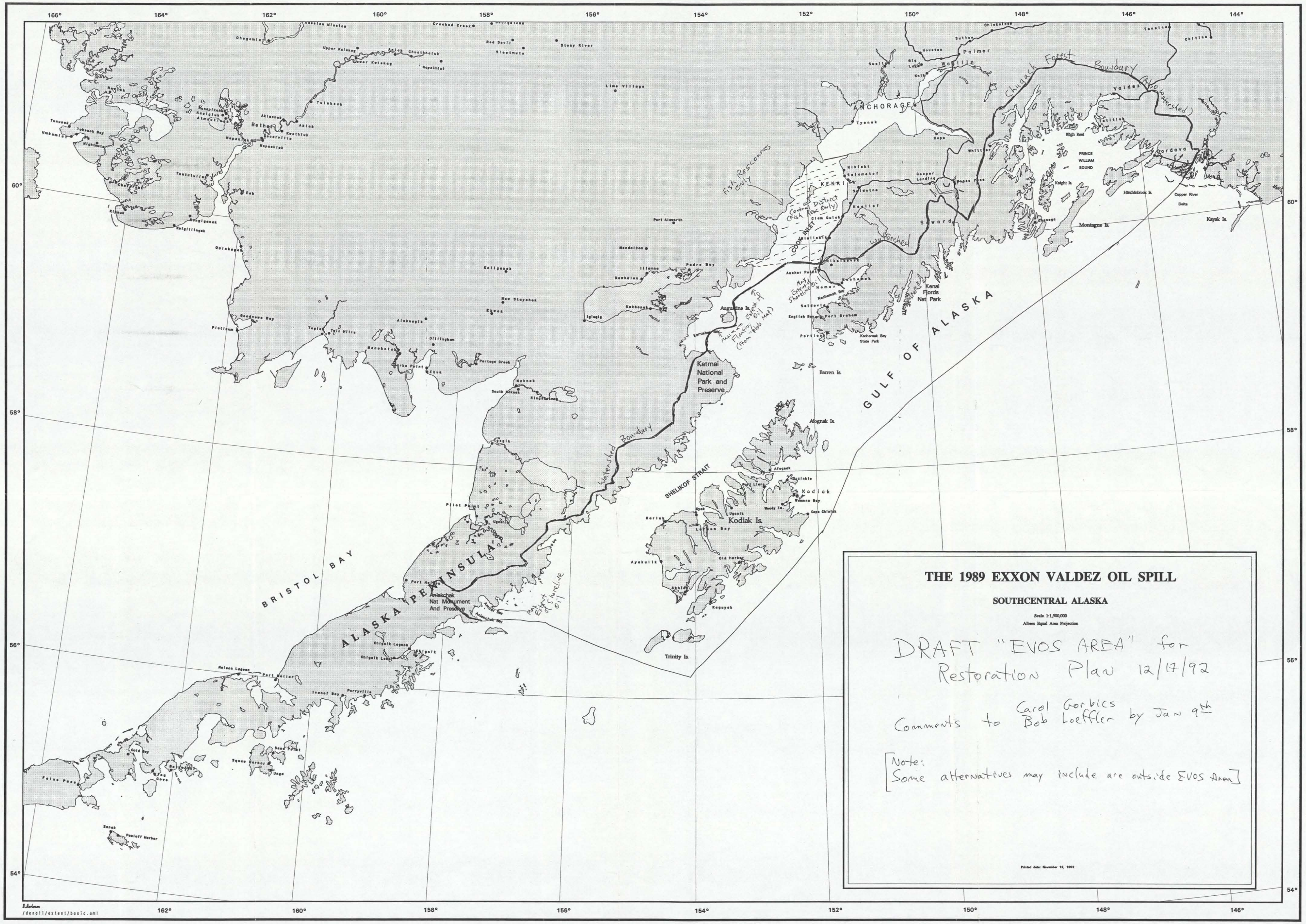
SUBJECT: Planning Peer Review

Just a note: As we discussed at one of the recent RPWG meetings, I am scheduling planning peer review of the brochure. The date is not set, but I assume it will be next week during the RT's review of the brochure.

The people I have contacted are:

Jon Issacs, Jon Issacs & Associates
Marty Welbourn, DNR
Jack Kruse, University of Alaska; Institute for Social and Economic Research
Mike Strunk (not yet contacted), NPS

If you have other suggestions or problems, please let me know. I assume we will schedule the meeting on Monday.


THE 1989 EXXON VALDEZ OIL SPILL
SOUTHCENTRAL ALASKA
Scale 1:1,500,000
Albers Equal Area Projection
DRAFT "EVOS AREA" for Restoration Plan 12/17/92
Comments to Carol Gorbics / Bob Loeffler by Jan 9th
[Note: Some alternatives may include are outside EVOS Area]
Printed date: November 12, 1992
Chugach Forest Boundary (Also watershed)
Fish Resources Only
Central District (Fish Resc Only)
watershed
May Extent of Shoreline Oil
Maximum Extent of Floating Oil (From "Blob Map")
Watershed Boundary
ANCHORAGE
Palmer
Wasilla
Valdez
Cordova
Seward
KENAI
COOK INLET
PRINCE WILLIAM SOUND
Knight Is.
Hinchinbrook Is.
Montague Is.
Kayak Is.
Copper River Delta
Kenai Fjords Nat Park
Kachemak Bay State Park
Augustine Is.
Barren Is.
Katmai National Park and Preserve
GULF OF ALASKA
SHELIKOF STRAIT
Afognak Is.
Kodiak
Kodiak Is.
Trinity Is.
Aniakchak Nat Monument And Preserve
ALASKA PENINSULA
BRISTOL BAY
Bethel
Homer
166°
164°
162°
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156°
154°
152°
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