COPY

Stan's note

1 November 1990

DRAFT

09:15

Introductions

Ross opened with comments about accelerated process that includes actual restoration in addition to feasibility-type studies

Senner talked about process: report to Management Team, including recommendations, which then must be cleared by Trustee Council, Washington Policy, and State of Alaska. Before document goes public, various policy and other considerations will be factored in.

Reports on damages

Bob: Coastal Habitats -- general insult to intertidal/nearshore flora and fauna, but recovery rate is unclear

Stan:birds -- clearest damages for murres, oystercatchers, harlequins, bald eagles, and birds in the freezers

Chuck: Fish -- clearest damages for pink salmon eggs/juveniles; herring eggs/juveniles; dolly varden/cutthroats, including adults

John/Carol: mammals -- definite impacts: sea otter and harbor seal; possible damage -- killer whales

Sandy: recreation -- discussion about not having NRDA data; does it matter? Must be evidence of injury/lost use, and it is stronger if it is quantitative; no NRDA data on recreation, but lots of anecodotal information. Likely be criticism if recreation not addressed to some degree.

Judy Bittner: archaeological
-two studies: one on radiocarbon dating (contract let last week) and the other is a field assessment survey;
-indications of impacts from clean-up workers; Exxon surveys missed some sites; increased knowledged leading to looting, etc.
-contamination creates data problems, but also may inhibit to learn other types of information (e.g., soil profiles)
-disruption of Native lifestyles

13:30

Policy Issues

Restoration versus NRDA projects/Monitoring/Reimbursability
-Freedman--if you have a restoration program, including monitoring, for a resource for which there is no injury, it won't be reimbursable
-Senner--bird group distinguished between long-term monitoring programs, which might be most important post settlement, from monitoring recovery of damaged resources for which monitoring might lead to opportunity to done restoration work

Documentation by NRDA versus other sources
-some documentation is key, but it need not be from NRDA
-Feds (Wash Policy Group) hope to release NRDA data in December, but Susan doesn't think that they are aware of all the barriers to doing that

Prioritization
-not RPWG role to determine that fish are more important than birds, for example; need to advance proposals necessary to address damages, largely without regard to cost
-concern about making clear to the public that putting a lot of ideas out in a public document could build the expectation that all the projects will be done

Consolidation
-

Cost sharing
-don't know where the money is coming from
-less money coming for NRDA studies, with or without accelerated restoration program

Approach where lack of consensus
-cannot get bogged down debating some intractable issues; may simply have to buck them up the line

Factors/criteria
-concern about duration of projects: will projects that require multiple years have strikes against them?
-questions about geographic scope: in reality, 1991 projects will be in spill area or directly connected to damaged resources
-question of existing management activities and what is justified for funding under restoration? Birds and archaeology are to be monitored anyway.
Nicoll--increased management must be justified by direct need to increase effort to restore injured resources.
-affects/conflicts with NRDA and clean-up activities: Bittner--spotty compliance with historic preservation law.
-need for studies to determine ecological requirements as well as perhaps to look at it from the other end, which is the ecosystem as a whole
-question about applicability of NEPA: Fox--there are real concerns; Nicoll--Justice is looking into it.

Judy Bittner: Archaeology studies/project

Protection
- -protection from vandalism
  - -education about law, value of resources, etc. (Rest)
  - -enforcement and surveillance (Rest)
  - -stewardship, monitoring (ties in w/KANA project) (Rest)
  - -erosion control (Rest)

Data Collection
- -excavation (Rest 1 site; Study 9 sites)
- -inventory of artifact collections that came from spill area (study)

Education
- -popular publications describing cultural history/resources (Rest)
- -oral history of spill effects on village life (Rest)
- -traditional skills, loss of (Rest)
  - -recording "how things were done"; this was disrupted

questions:
- -is inventory project needed in 1991?
- -can law enforcement be increased in 1991?
- -is traditional skills project related to damage assessment?
- -is popular public. project needed in 1991? Should it wait until more information is in.
- -how does excavation project relate to existing NRDA study

2 November

four categories of conclusions (projects and studies):

(A) looks good, we think we can recommend it, write it up
(B) possibly good for 1991, but need more information
(C) work is needed but may be more appropriate as an NRDA study
(D) maybe sometime, but does not meet criteria for 1991; cannot recommend now

Recreation program:

(1) Sport fish improvement (defer to fish section)

(2) Marine debris
- (a) trash removal
  - -linkage to damage? Oil and debris are problem for recreationists and individual marine wildlife
  - Category B: documentation of displacement
- (b) garbage removal
  - -Category D: no immediate link to damage

(3) Education Program Category A, if targeted to recreation

users

(a) interpretive plan

(b) multimedia - video, brochures, etc.

(c) life histories - interpretive information

(4) (a) recreation site restoration Category A-B-C
attempt should be to bill as response
permits on FS land may require restoration to previous land contour

(b) drinking water safety Category D
check water on high quality sites in concert with above

(5) replacement of cabins, etc. Category B
what is nature of damage at specific sites? Caused by clean up; not ready to put new cabins at new sites.

(6) recreational user survey Category B/C
economics studies may cover much of this

(7) management plans
review/rewrite all or sections; probably premature to talk about rewrites at this stage
Category D

but need Phase II of current land status study
Category A

(8) acquisition (defer)

Archaeology

(1) Protection of resources (related to vandalism)

education Category A, if specific sites known
enforcement "
stewardship (enhance KANA program) "

erosion control (at least 5 sites) Category A
needs to interrelate with NRDA field survey
Coastal habitat beach rye project

(2) Data Collection
Excavation Category A
again need to coordinate with NRDA field survey

Inventory of artificat Category D
not in 1991 - no argument for

(3) Education

traditional skills - Category D
popular publications -
Category A, but pick up as component under education
oral history - Category D

Fish and Shellfish

(1) Natural Recovery Monitoring (John)
(a) exposure of juvenile salmon to hydrocarbon contam.
(b) recovery of epibenthic prey populations for juvenile salmon
(c) exposure of groundfish/shellfish to hydrocarbon contamination (sublethal effects included)

all of the above: Category A/C natural recovery monitoring (exposure) fish/shellfish, coastal habitat, etc. (Bob, Chuck, Carol, John)

(2) Restoration
(a) Herring Protection: supplements what is done under damage assessment, but if NRDA project continues, this will be lower priority at this time. Category A/C
(b) Sportfish restoration: Category A (pick up under general education).
(c) Sportfish public access: Category D: Premature until there is overall understanding of restoration program and interrelationships among proposed measures
(d) spawning channel (Piggot Bay), reconstruction of Harrison Creek diversion, and Chalmers River chum reintroduction - Category B

(3) Feasibility/Technical Support
(a) Herring stock ID: Category A
(b) Coded wire tagging: Category A
(c) spawner protection: supplements aerial survey for escapement; the expands existing nonNRDA program; responds to need for intensive post-spill management
(d) PIT tagging: Category A
(e) herring egg transplant: transplant substrate and windrowed herring eggs - Category A
(f) otolith marking - Category A
(g) clam transplant - Category D; wait for more info on damages
(h) rockfish transplant - Category B/D

(4) Monitoring
(a) Dolly Varden (part of hydrocarbon): Category A/C
(b) Rock Fish (ditto) Category: A/C
(c) Herring logging effects: Category D

(5) Monitoring
(a) Herring logging effect: Category D (?)

(6) Sport Fishing

a. Access acquistion: Category D
b. Artificial Reefs: Category D
c. Trout Stream rehabilitation: Category B
d. Coho habitat improvemenet: Category B

Marine Mammals

Sea Otters - Lisa Rotterman

Damage documented, new damage continues to occur. Further damage can be avoided by protecting habitat.

Proposals-see handout

(1) Identification and prioritaization of sea otter critical habitat areas by monitoring adult females and young with radion transmitters: Category__

(2) Monitor population recovery: Category __
a. evaluating physical conditions of pups
b. aerial survey of recolonization
c. evaluation of movement and survival of females and weanlings

(3) Determine certain life history information through monitoring of adult and weanling females: Category __

James Bodkin

(4) Assessment of the effects of, and recovery from the EVOS on the Western Prince William Sound sea otter population (has 7 component studies)
a) population assessment
b) foraging
c) blood
d) tissue toxicology
e) mortality
g) prey selection
h) habitat determination

(defer until peer review later in November; need to make request of Management Team to make peer meeting possible--do next week).

(5) aerial/boat survey proposed by NMFS
(6) aerial/boat survey proposed by USFWS (both birds and mammals)

(above two perhaps combined in one package)

(7) Kathy Frost proposal for harbor seal research

(discuss at marine mammal synthesis meeting in Seattle on 6-7 November)

Restoration Synthesis Meeting:
Proposed 1991 Restoration Program

November 1-2, 1990
Simpson Bldg., Anchorage

DRAFT AGENDA

Thursday, Nov. 1

09:00	Introductions, purpose of meeting	Senner/Ross
09:15	Basis for 1991 Restoration Program: overview of injuries presented at RPWG/PI/PR work sessions	Senner/Ross/Strand Rabinowitch/ Meacham/Spies
10:30	Break	
10:45	Summary: RPWG approach to developing 1991 Restoration Program (incl. discussion of issues list, attached)	Senner/Ross
12:00	Lunch	
13:00	Discussion of agency proposals for 1991 restoration projects	Senner/Ross/Strand Rabinowitch
14:45	Break	
15:00	Discussion of agency proposals for 1991 restoration projects, continued	Senner/Ross/Strand Rabinowitch
17:00	End of day 1	

Restoration Synthesis Meeting:
Proposed 1991 Restoration Program

November 1-2, 1990
Simpson Bldg., Anchorage

DRAFT AGENDA

Friday, Nov. 2

08:30	Discussion of agency proposals for 1991 feasibility studies	Senner/Ross/Strand Rabinowitch
10:00	Break	
10:15	Discussion of agency proposals for 1991 restoration monitoring projects	Senner/Rabinowitch, Strand/Meacham
12:00	Lunch	
13:00	Synthesis discussion: recommendations for 1991 Restoration Program	Senner/Ross
14:30	Break	
14:45	Synthesis discussion, continued	Senner/Ross
16:00	December FR report outline revisions	Ross
16:30	Adjourn	

Restoration Synthesis Meeting:
Proposed 1991 Restoration Program

November 1-2, 1990
Simpson Bldg., Anchorage

RPWG ISSUES FOR DEVELOPMENT OF 1991 RESTORATION PROGRAM

Presented below is a preliminary list of issues relating to RPWG's development of the draft Restoration Work Plan and 1991 Restoration Progran It is proposed that RPWG's approach to addressing these issues be articulated t the Management Team as soon as possible so that any misconceptions can be addressed before the first draft of the document is presented to the Manageme Team on November 28, 1990.

- Definition of Restoration projects versus NRDA projects ("factors")
- Role of natural recovery monitoring in the 1991 Restoration Program
- Likelihood of reimbursement for 1991 restoration projects
- Identification of injuries via NRDA studies versus other sources
- Prioritization of projects (not RPWG role if projects meet "factors")
- Consolidation of projects
- Cost sharing among agencies
- Approach where lack of consensus (elevate to Management Team, etc.)

REVISED OUTLINE FOR DECEMBER FR NOTICE

I. Introduction

Purpose of document

- Primary purpose to present draft Restoration Work Plan and proposed 1991 Restoration Program for public comment
- Secondary purpose, to report on the results of 1990 RPWG activities, including 1990 Feasibility Studies, etc.

Background

- Spill stats, etc. (canned language)
- Incl discussion on NRDA process and its overall goal to provide for restoration of injured resources ...

II. Draft Restoration Work Plan

Chapter Intro

- Relationship to response and damage assessment
- Dynamic process, information still being assessed
- Leads to final restoration plan after settlement of damage claim
- Commitment to public involvement
- Timeline

Work Plan Components

- Determine need for restoration
- NRDA data, feasibility studies, lit. review, etc.
- Develop restoration alternatives and approaches
    - Public involvement, workshops, reports, etc.
    - Summary of restoration alternatives proposed to date
- Evaluation of restoration alternatives and approaches for each injured resource as information becomes available
    - Three types of restoration to be addressed (direct, replacement, acquisition of equivalent resources)
    - Matrix approach, through PI/Peer Review meetings
    - Application of "factors to be considered" (based on DOJ "proofs")
    - Summary of potential restoration actions that may be taken, depending on specific injury to the resource
- Develop and implement restoration projects as necessary prior to settlement
    - Peer review process prior to implementation
    - Public comment prior to implementation
- Develop and implement final Restoration Plan following settlement
    - Peer review process prior to implementation
    - Public comment prior to implementation

REVISED OUTLINE FOR DECEMBER FR NOTICE

III. Proposed 1991 Restoration Program

Proposed 1991 Restoration Project Options*

- Specific proposals for:
  - a) Coastal/Intertidal resources
  - b) Fish/Shellfish
  - c) Birds
  - d) Mammals
  - e) Recreational resources
  - f) Cultural resources

Proposed 1991 Feasibility Projects

Literature Review

- Natural recovery lit. review, etc.

Development of overall restoration monitoring plan

- Measure and provide public accountability for success of restoration actions
- To ensure efficient integration and sharing of agency monitoring data

Opportunities for Public Participation

- Comment on FR notices (draft and final documents)
- Other?

IV. Summary of 1990 Restoration Feasibility Studies

- 1990 Feasibility Study descriptions/preliminary results/status
- 1990 Technical Support Study descriptions/preliminary results/status

* (We need to make it clear that we may do some but not all of these, depending on funds available, though, let's not say it that way)

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Proposed Contents for Restoration Work Plan and 1991 Restoration Program

Executive Summary *3 pgs.*

I. Intro 2.5 pgs.

EPA 1st cut (RPWG edit) 1) Purpose of document

2) Summary of 1990 RPWG activities to date
   - reports/events
   - public participation (comments)

II. 1990 Feasibility Studies Reports 7pgs.

EPA 1st cut (RPWG edit) 1) Description

PI's (RPWG edit) 2) Preliminary results

EPA 1st cut (RPWG edit) 3) Status

III. Methods for Evaluation of Restoration Alternatives ("Criteria") 4pgs.

Brian 1) Introduction (relationship to NRDA, response, LIMITATIONS)

RPWG subcommittee? (group review at meeting to finalize) 2) Restoration projects

1st cut by subcmte (group review at meeting to finalize) 3) Feasibility projects

IV. Proposed 1991 Restoration Program **7 pgs.**

RPWG Members

1) Restoration Projects

2) Feasibility Projects

John

3) Literature Reviews

4) Public Participation
   Comments
   Meetings (proposed)

5) Technical Review/Reporting
   Peer review
   Monitoring

V. Future Restoration Process **3 pgs.**

RPWG 1st cut

1) Timeline

Sandy leads RPWG discussion

2) Public Participation

(do we want to list options, decide on one, or ignore?)

Stan

3) Technical Review

4) Other?

TOTAL ~ **25pgs.**

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1991 Restoration Projects -
Factors to be considered in proposing projects

Agencies have decided to consider appropriate restoration projects for implementation in 1991. This is not contingent on whether any restoration funds become available in the immediate future from the responsible party. Proposed projects will be those that are technically feasible and can be implemented in the 1991 field season. Recovery of an injured resource being the primary goal, projects should also provide, either directly or indirectly, a net environmental benefit. Potential projects will include those that will mitigate known or documented damages and also any actions which will mitigate other sources of environmental disturbance (immediate threats) interfering with the natural recovery of injured resources. Finally, neither the timing nor the magnitude of any potential settlement for damages should be considered when proposing candidate projects. Factors to be considered include:

1) addresses ~~known~~ documented NRDA damage (including intrinsic values); must be restoration of damage resulting from the spill.

2) known technical feasibility.

3) reasonable to implement considering the expectations for natural recovery. do we need to implement <capacity for self-regenerat.>

4) importance of implementing in 1991; examples include:
   - ability to implement project in 1991
   - addresses an existing damage which would likely continue to cause impacts;
   - addresses the threat of additional (cumulative) impacts which, if eliminated, would allow a quicker recovery of an injured resource; i.e. protecting habitat
   - should be implemented immediately by the agencies even if funds from the responsible party are not yet available.

5) net environmental benefit expected. (predictability of what you do)

6) benefits ecosystem/multiple species.

7) reasonable duration of project (multi-year o.k.); results you expect from the project and ability to evaluate and submit results in a reasonable period of time.

8) geographic scope (should not be restricted to PWS, unless that is the only area that damage may be effectively addressed at this time).

9) cost of implementation.

10) extent to which something will be done anyway through routine agency management activities (e.g. restoration funds should not go towards maintenance of USCG navigation lights or ADFG normal fisheries management, etc.).

11) any project should not interfere with cleanup activities or NRDA studies/projects.

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1991 Feasibility Studies -
Factors to be considered in proposing studies

Proposed projects should reflect the need to determine technical feasibility or environmental benefit of candidate restoration approaches or techniques (i.e., those potential restoration projects specifically related to a damaged resource which, if technically feasible, have the likelihood of being realistically considered/implemented as a restoration measure). Besides technical feasibility, projects may also address information necessary to confirm the benefits or enable the implementation of a potential technique otherwise feasible. For example, one of the 1990 studies provided necessary information to confirm the use of upland forested areas as habitat for marbled murrelets and harlequin ducks. Factors to be considered include:

1) must be restoration of damage resulting from the spill; injury documentation; link to NRDA (including intrinsic values).

2) likelihood of project ultimately being proposed as a full-scale restoration measure.

3) probability of successful study.

4) ecological importance of target resource.

5) ability to evaluate success and document ecological value of project.

6) cost of feasibility study.

Restoration Synthesis Meeting:
Proposed 1991 Restoration Program

November 1-2, 1990
Simpson Bldg., Anchorage

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- Approach where lack of consensus (elevate to Management Team, etc.)

Confidential

Fish/Shellfish Summary

Known Damage:

Salmon -

Pink salmon:

- egg and alevin in spawning gravel (>50% increase in mortality in oiled streams).
- stock work still inconclusive - decreased returns for hatchery (AFK) - survival rate less than 1/2 that for Ester Is. hatchery (usually similar).
- reduced growth of juveniles in oiled areas.
- increased HC body burden in '89; not in '90 samples.
- increased MFO induction in fish from oiled areas.
- significant fin erosion in '90 samples (chum?)

Herring

- morphologic & cytogenetic effects shown from eggs exposed to oil, but raised in lab (effects in '89 and '90; more drastic in '89).
- egg mortality surveys - survival decreased in oiled area ('89 and '90, less drastic in '90).
- ocular tumors/spinal ⇒ from larvae taken in eggs from oiled areas

Dolly Varden

- heavy concentration HC in bile (highest of any fish)
- >30% increase in mortality in oiled areas.

Cutthroat Trout

- >30% increase in mortality in oiled areas.
- significant difference in growth.

Rockfish

- first finfish to show mortality due to oil.
- increased HC in bile (showed up in other bottom fish also - flatfish, halibut, pollock).

Nearshore fish

- (field info available in 2 weeks)
- increased levels of blood parasites in fish from oiled areas (153/ml vs 0.3/ml in control, 5/ml in lab exposed fish).
- increased rate of respiration in fish from oiled areas.
- increased MFO levels in oiled areas (DEC study, not NRDA).

Clam use

- highest level of HC in any organism (subsistence use shut down in Windy Bay).

no mortal repo; no grth diff info yet

Subsistence/Recreational uses

Probable Damage:

Ground fish

- some sublethal effects (data not yet available).

Clams

Shrimp

- increase in % spot shrimp with dead eggs in oiled areas (in '89; '90 data not in).

by probably not

1991 Potential Projects:

Public Information (sport fish)

Habitat Rehabilitation

Identify multi-beneficial acquisition/protection

Access (sport fish)

Restoration survey (prioritization)

Continued exposure/sublethal effects monitoring

1990 Recommendations:

Salmon/herring escapement

Salmon/herring tagging

Port sampling

Otolith marking

Herring spawning area catalogue

RPWG

RESTORATION WORK PLAN SCHEDULE

	1991
March 24, 1991	Publish final FR notice
March 15	FR notice to Office of FR
March 1	Complete review of and response to public comment
February 13	Close of public comment period
	1990
December 28, 1990	Publish draft FR notice
December 21	FR notice to Office of FR
December 17-20	Revision of FR notice
December 17	Final comments due from WPG and State of Alaska
December 14	Final draft submitted to WPG
December 13	Trustee Council review and recommendation
December 12	Final draft submitted to Trustee Council through Management Team
December 7	Comments due from the Management Team
November 28	Draft 1991 work plan/1990 status report submitted to Management Team
November 12	Background sections and detailed outline of draft public document submitted to RPWG
October 10-11	RPWG meeting to adjust internal schedule and make assignments
October 5	Teleconference of Trustees and/or Washington Representatives
October 4	Circulate schedule and draft initial FR notice

In Summary:

DAMAGES

1) Selected User Decline
   perception of impacts

2) Loss of Wilderness Values
   a) perception of the public/misinformation
   b) loss of characteristics

3) Potential business thawarted
   a) loss of revenue
      i) local business
      ii) user/permit fees
   b)Restricted Opportunity

4) Loss of natural values
5) Increased pressure in other areas
   a) management problems shift
   b) diversion of users/impacts
   c) Charter/tour service increase

6) Loss of services to Public due to cancelation of existing programs (lost opportunity), possible loss of appropriated funds.

Discussion followed regarding these damages and what types of restoration projects/technical support projects/feasibility studies could be considered. The following list of proposals was generated: (agencies in parentheses indicated that they would try to draw up a proposal by November 15 for consideration into the FR notice)

3

Sport Fish Improvement *(it was agreed that many of these projects would be covered under the Fish/shellfish program)*
- Access acquisition
- Artificial Reefs
- Trout Stream Rehabilitate
- Coho habitat improvement

Marine Litter Pick-up *(USFS, KEFJ Nat. Park)*
- Trash Removal (in untreated areas where Exxon did not remove trash)
- Garbage Barge

Education Program (psychological restoration) *(DNR)*
- Interpretive plan
- Multi-media "campaign"
- Natural History/Environments' response to stress
- Displays/park signs
- Recreational opportunities

Direct Restoration *(DNR)*
- Site Restoration/Rehabilitation
- New site survey
- Water Quality Survey (no giardia in PWS before spill, is this still the case?)

Replacement of Displaced Resources *(USFS)*
- Cabin Construction
- Trail Construction
- Boat Moorings

Survey of Recreation user perceptions *(KEFJ)*

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Restoration Planning Work Group
Synthesis Meeting
November 1-2, 1990
Simpson Bldg.
CONFIDENTIAL

Thursday, Nov. 1, 1990

Introductions

Review of schedule for next two days.

Review of materials distributed.

Senner/Ross outlined process and schedule for decision making for upcoming restoration work plan which will appear as a federal register notice. In general, the draft work plan will be submitted to the Management Team (MT) by Nov. 28; this will include recommendations for feasibility studies and restoration projects for 1991. On Dec. 28, this draft plan will become public in the federal register.

Review of Status of Damages:

Each RPWG representative (or other session representative) briefly summarized damages presented at the recent resource sessions held last week. Meetings were held so far on coastal habitats (10/25), fish and shellfish (10/26), birds (10/30-31), and recreational resources (10/26). Please refer to notes from these meetings for information on damages. Seperate meetings were unable to be held for marine mammals or cultural resources, so a summary of damages will be presented here.

Marine Mammals:

John Strand (NMFS) and Carol Gorbics (USFWS) presented a brief overview of damages to marine mammals. (Note: The senior scientist, B. Spies, expressed concerns that this information may be too preliminary and possibly inconsistent with conclusions drawn to date by the NRDA process):

> Killer Whales - NOAA/Seattle has followed four pods which actually had contact with the oil slick. Although not all of the 1990 data is complete, individuals are still missing from three of these pods (AB pod: seven missing in '89, six additional missing in '90; AE pod: two individuals missing in '89 and still in '90; AT pod: one subgroup [four indiviuals] missing in '89 and still in '90). Three

stranded whales were found and samples were taken from at least one.
Humpback Whales - No short term population impacts apparent (four cow/calf pairings were seen in '89 compared with 8 pairings in '90 - this is a change in reproductive rate from approx. 6.3% to 10%)

Sea lions - declining population in general; reproductive rates continue to be low; hydrocarbons (HC) were found in samples of tissues and in bile.

Sea otters - 1000 were found dead during the spill; surveys done within PWS in '89,'90 showed the population decline continues; blood/semen studies are still ongoing; reproductive rate for rehabilitated otters is very low.

Harbor seals - declining population in general; 38% fewer animals counted in oiled areas in '89; colleted 19 seals that were affected by the oil spill (tissue analysis links illness /mortality to oil)

Cultural Resources:

Judy Bittner (ADNR/SHPO) summarized damages to archaeological resources. Two studies are scheduled to begin within this next year: 1) contamination effects on radiocarbon dating technique, and 2) field assessment survey. Catagories of damages are as follows:

- damage caused by the cleanup itself.
- increased general knowledge of sites and their location causing potential looting.
- contamination affecting dating techniques; also affecting ability to obtain other data, i.e., soil profile, etc.
- disruption of traditional life of natives; vulnerability of heritage.

There is an interagency effort (this winter) to pull together all information from, notes. etc. to determine how much is there and how it relates to damages. It is feared that Exxon's surveys missed some sites.

A question arose as to whether there is a basis to spend public money on sites located on private lands. "Selected" lands are treated by the National Park Service as being public. The USFS, however, has stayed away from surveying native lands; native groups are pursuing their own cases. In summary, restoration proposals on public lands can be considered by the RPWG.

Under the new oil spill legislation, natives can make claim to damages on "selected lands". Native groups would disagree that cultural resources on private lands are publicly-owned resources. It was noted that it is difficult to keep track of land ownership.

B. Spies would agree that studies such as the carbon dating study seems to fit under restoration feasibility.

Discussion of Issues facing RPWG:

The following issues for development of the 1991 restoration work program were discussed:

1. Definition of Restoration projects versus NRDA projects - The issue of monitoring projects, such as monitoring for natural recovery, were discussed. It was noted that natural recovery must be addressed to determine if restoration is needed; and monitoring is still needed even in cases where direct restoration can not be done (i.e., killer whales). Also, monitoring is an important part of a restoration project to determine effectiveness of the restoration effort. Since the PI's have been approaching these types of projects as part of restoration, the question was raised whether some of these projects should be done, or continued, under NRDA. Again, Spies cautioned that certain projects, i.e, markers of continuing exposure, should not fall through the cracks; they need to be flagged.

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November 2, 1990

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Recreational Resources:

Sandy Rabinowitch summarized the proposals received thusfar.

Sport fish improvement: [deferred to fish section]
- access/acquisition
- artificial reef
- trout streams
- coho habitat improvement

Marine litter pickup:
- trash removal- left over from clean-up. Cat. (B) - documentation of displacement.
- garbage barge - to work in heavily used waters; long-term project. Cat. (D) - no immediate link to damage.

Education Program: All Cat. (A), if targeted to recreation:
- Interpretive plan - use user survey to get at this question.
- Multi-media - video, brochures, etc.
- Natural histories - resopnse to oil spill

Recreational Site Restoration:
- restoration of camp sites/recreational sites - reconfiguring disturbed sites, survey of more sites. Cat. (A),(B),(C). (attempt should be made to bill as response; permits on USFS land may require restoration to previous land contour).
- drinking water survey - for oil & Giardia - check water on high quality sites in concert with above. Cat. (D).

Replacement: All Cat. (B)
- cabins
- trails
- moorings, buoys, docks

Recreational User Survey - Cat. (B/C), economics studies may cover.

Management Plans:
- Review/rewrite all sections of exiting plans. Cat. (D)- probably premature.
- Phase II of of Current Land Status Study. Cat. (A).

Acquisition: [defer for later discussion].

- intersection of resources and non-government land.
- see A above.

Comments:

- Regarding replacement, does Exxon have to compensate for the full cost of replacement? May be premature to replace cabin, trails etc.
- Regarding management plans, it is first necessary to determine if management plans need updating (i.e., PWS plan by DNR; Kenai Fjiords plan by NPS).
- Phase II of Current Land Status Study will actually convert information gathered from different sources into the GIS system. Phase I needs to be completed first.
- Regarding acquisition, DOI is looking at several "postage stamp" (size) acquisitions, i.e., Gull Island.

Fish/Shellfish

1) NOAA/NMFS Proposals - John Strand described several proposals which are related to natural recovery monitoring. These all are current NRDA studies, however their likelihood for being continued under the NRDA process is unknown. The projects are as follows:

- Exposure of juvenile salmon to hydrocarbon contamination exposure is estimated through MFO induction, provides information for future management.
- Recovery of epi-benthic prey populations for juvenile salmon (copepods) - to determine if prey base was affected in oiled areas.
- Exposure of groundfish/shellfish to hydrocarbon contamination - indicators include bile, histopath, MFO induction.

All of the above were put in Category (A/C), and a discussion of monitoring in general followed. The following "types" of monitoring were described:

- Monitoring leading to restoration measures (OK as rest'n)
- Monitoring to determine additional damages (damage assmt)
- Monitoring to determine recovery
- Monitoring to determine lost use value (damage assmt)
- Monitoring for information to be used in case of future oil spill, maybe upon settlement.

It was decided that one proposal on Natural Recovery Monitoring for Exposure would be developed. This would combine the exposure monitoring portions of any study into one proposal. B. Spies, C. Meachem, C. Gorbics, and J. Strand will develop this proposal.

2) ADFG Proposals - Chuch Meacham described the proposals from ADFG:

Restoration:

- Herring Protection - stock Id., methodology to monitor population, supplements NRDA - Cat. (A/C).
- Sportfish Restoration - information to public - Cat. (A).
- Sportfish Public Access - access/sanitation proposal - Cat. (D).
- Spawning channel rehabilitation - (USFS projects) - reconstruction of Harrison Creek diversion, Chalmers River chum reintroduction, Piggot Bay spawning channel - Cat. (B).

Feasibility/Technical Support:

- C-W-T Salmon - to identify hatchery and wildstock for better management - Cat (A).
- Spawner Protection - expand existing aerial survey program in PWS, increases escapement information to allow altering harvest patterns - Cat. (A).
- Herring egg transplant - tests feasibility of transplanting spawning substrate and windrowed eggs - Cat. (A).
- Otolith marking - for better stock identification - Cat. (A).
- Adult Pit Tagging - tag a fraction of the C-W-T fish - Cat. (A).
- Clam Transplant - already part of NRDA for growth effects and time for purification - Cat. (D).
- Rockfish Transplant - transplant to "clean areas"; biology uncertain, more information needed - Cat. (B/D).
- Herring Stock Identification - Cat. (A/C).

Monitoring:

- Dolly Varden - hydrocarbon analysis - Cat. (A/C).
- Rockfish - hydrocarbon analysis - Cat. (A/C).
- Herring logging effects - measure rates of sedimentation, water quality, egg survival - Cat. (D).
- Rockfish - Cat. (A/C).

Sport Fishing: (from recreation session)

- Access acquision - Cat. (D).
- Artificial Reefs - Cat. (D).

- Trout stream rehabilitation - Cat. (B).
- Coho habitat improvement - Cat. (B).

Comments:

- B. Freedman: the best package of proposals should go forward; they should include logical candidates for restoration, those having clear link to injury. For example, for pink salmon, where damage has been identified, should determine what is an appropriate restoration measure. If hatchery fish and wild stock are not equivalent, then reducing exploitation is a logical restoration measure; a monitoring project leads to a mitigation measure of harvest control.

Marine Mammals

There was no seperate session bringing together peer reviewers and researchers, due to scheduling problems. Lisa Rotterman and Jim Bodkin (USFWS) presented their proposals. Both expressed the need for a marine mammal workshop.

Sea Otters:

Lisa Rotterman explained that documented damage exists, continuing damage is likely to occur, and recovery can be hastened by preventing further disturbance and by protection of habitat. She provided the following background information:

- good baseline information exists for sea otters; through capture/recapture, can monitor population health for possible population impacts.
- habitat use varies by season, sex, age, reproductive status; critical habitat is identified in eastern PWS, however unknown in oil spill areas in western PWS.
- disturbance greatly affects habitat use by females and pups; human activity has been documented to prevent haulouts.
- habitat quality affects recovery rate; areas emptied during the spill (even heavily oiled areas) are being reoccupied, however animals there are not doing well.
- to get precise information on populations one must understand the causation behind the population curve.
- information gained through proposed feasibility studies is

critical for modelling populations.
- direct rehabilitation through translocation is not practical, recent attempts in California were unsuccessful.
- the goal of the proposals are to make management/regulatory changes so that populations are not moved into less valuable habitat.
- studies on bark deposition affecting food supply are documented; no good studies on general effects of logging.

Proposals were submitted (see handout) and are summarized as follows (these were not catagorized by the RPWG):
- Identification and prioritization of sea otter critical habitat areas by monitoring adult females and young with radio transmitters.
- Monitor population recovery through:
    - evaluating physical condition of pups
    - aerial survey of recolonization
    - evaluation of movement and survival of females and weanlings.
- Determine certain life history information through monitoring of adult and weanling females.

Jim Bodkin provided the following background information:
- direct damages to sea otters has been shown through a decrease in abundance (lower numbers in 1990 than 1989); a difference in blood chemicals (east vs. west PWS).
- increased hydrocarbon levels in shellfish affects prey base.

Proposals were submitted (handout) and are summarized below:

- Assessment of the effects of, and recovery from the oil spill on the Western PWS sea otter population (7 component studies):
    - population assessment
    - foraging
    - blood
    - tissue toxicology
    - mortality
    - prey selection
    - habitat determination

The following monitoring proposals can possibly be combined into one package:
- Aerial/boat survey of marine mammals proposed by NMFS.
- Aerial/boat survey proposed by USFWS (both birds and

mammals)

One proposal was submitted by Kathy Frost (ADFG) regarding the tracking of harbor seals to determine their ecological requirements. This could be classified as a technical support project; it will be discussed at the mammal synthesis meeting in Seattle on 11/6-7.

It was felt that peer reviewers should have the opportunity to identify components of studies needing to be addressed. A meeting should take place before Nov. 28. RPWG will recommend to the MT that this meeting occur.

DRAFT

Restoration Planning Work Group
Synthesis Meeting
November 1-2, 1990
Simpson Bldg.
CONFIDENTIAL

Linda:
Info on whales up-to-date as of 11-16-90
[initials]

Thursday, Nov. 1, 1990

Introductions

Review of schedule for next two days.

Review of materials distributed.

Senner/Ross outlined process and schedule for decision making for upcoming restoration work plan which will appear as a federal register notice. In general, the draft work plan will be submitted to the Management Team (MT) by Nov. 28; this will include recommendations for feasibility studies and restoration projects for 1991. On Dec. 28, this draft plan will become public in the federal register.

Review of Status of Damages:

Each RPWG representative (or other session representative) briefly summarized damages presented at the recent resource sessions held last week. Meetings were held so far on coastal habitats (10/25), fish and shellfish (10/26), birds (10/30-31), and recreational resources (10/26). Please refer to notes from these meetings for information on damages. Seperate meetings were unable to be held for marine mammals or cultural resources, so a summary of damages will be presented here.

Marine Mammals:

John Strand (NMFS) and Carol Gorbics (USFWS) presented a brief overview of damages to marine mammals. (Note: The senior scientist, B. Spies, expressed concerns that this information may be too preliminary and possibly inconsistent with conclusions drawn to date by the NRDA process):

[Margin note: this did not app to Killer whales or seals; B.O.'s questions were raised with regard to others]

Killer Whales - NOAA/Seattle has followed ~~four~~ six pods which ~~actually had contact with the oil slick~~ were observed transiting the oil spill area. Although not all of the 1990 data is complete, individuals are still missing from three of these pods (AB pod: seven missing in '89, six additional missing in '90; AE pod: two individuals missing in '89 and still in '90; AT pod: one subgroup [four indiviuals] missing in '89 and ~~still~~ in '90) six additional missing [comprising second missing subgroup]. Three

last ; AN pod ; 22 individuals missing in '89, 22 comprising wandering subgroup returned to pod in '90.
* will not be counted as missing until 2nd year
general note

(1 was from AT pod)

stranded whales were found and samples were taken from at least one.

Humpback Whales - No short term population impacts apparent (four cow/calf pairings were seen in '89 compared with 8 pairings in '90 - this is a change in reproductive rate from approx. 6.3% to 10%)

Sea lions - declining population in general; reproductive rates continue to be low; hydrocarbons (HC) were found in samples of tissues and in bile.

Sea otters - 1000 were found dead during the spill; surveys done within PWS in '89,'90 showed the population decline continues; blood/semen studies are still ongoing; reproductive rate for rehabilitated otters is very low.

Harbor seals - declining population in general; 38% fewer animals counted in oiled areas in '89; colleted 19 seals that were affected by the oil spill (tissue analysis links illness /mortality to oil)

Cultural Resources:

Judy Bittner (ADNR/SHPO) summarized damages to archaeological resources. Two studies are scheduled to begin within this next year: 1) contamination effects on radiocarbon dating technique, and 2) field assessment survey. Catagories of damages are as follows:

- damage caused by the cleanup itself.
- increased general knowledge of sites and their location causing potential looting.
- contamination affecting dating techniques; also affecting ability to obtain other data, i.e., soil profile, etc.
- disruption of traditional life of natives; vulnerability of heritage.

There is an interagency effort (this winter) to pull together all information from, notes. etc. to determine how much is there and how it relates to damages. It is feared that Exxon's surveys missed some sites.

A question arose as to whether there is a basis to spend public money on sites located on private lands. "Selected" lands are treated by the National Park Service as being public. The USFS, however, has stayed away from surveying native lands; native groups are pursuing their own cases. In summary, restoration proposals on public lands can be considered by the RPWG.

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DRAFT - NOT YET REVIEWED by ~~JJC~~ RPWG

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USFS, however, has stayed away from surveying native lands; native groups are pursuing their own cases. In summary, restoration proposals on public lands can be considered by the RPWG.

Under the new oil spill legislation, natives can make claim to damages on "selected lands". Native groups would disagree that cultural resources on private lands are publicly-owned resources. It was noted that it is difficult to keep track of land ownership.

B. Spies would agree that studies such as the carbon dating study seems to fit under restoration feasibility.

Discussion of Issues facing RPWG:

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Sandy Rabinowitch summarized the proposals received thusfar.

Sport fish improvement: [deferred to fish section]
- access/acquisition
- artificial reef
- trout streams
- coho habitat improvement

Marine litter pickup:
- trash removal- left over from clean-up. Cat. (B) - documentation of displacement.
- garbage barge - to work in heavily used waters; long-term project. Cat. (D) - no immediate link to damage.

Education Program: All Cat. (A), if targeted to recreation:
- Interpretive plan - use user survey to get at this question.
- Multi-media - video, brochures, etc.
- Natural histories - resopnse to oil spill

Recreational Site Restoration:
- restoration of camp sites/recreational sites - reconfiguring disturbed sites, survey of more sites. Cat. (A),(B),(C). (attempt should be made to bill as response; permits on USFS land may require restoration to previous land contour).
- drinking water survey - for oil & Giardia - check water on high quality sites in concert with above. Cat. (D).

Replacement: All Cat. (B)
- cabins
- trails
- moorings, buoys, docks

Recreational User Survey - Cat. (B/C), economics studies may cover.

Management Plans:
- Review/rewrite all sections of exiting plans. Cat. (D)- probably premature.
- Phase II of of Current Land Status Study. Cat. (A).

Acquisition: [defer for later discussion].
- intersection of resources and non-government land.
- see A above.

Comments:

- Regarding replacement, does Exxon have to compensate for the full cost of replacement? May be premature to replace cabin, trails etc.
- Regarding management plans, it is first necessary to determine if management plans need updating (i.e., PWS plan by DNR; Kenai Fjiords plan by NPS).
- Phase II of Current Land Status Study will actually convert information gathered from different sources into the GIS system. Phase I needs to be completed first.
- Regarding acquisition, DOI is looking at several "postage stamp" (size) acquisitions, i.e., Gull Island.

Fish/Shellfish

1) NOAA/NMFS Proposals - John Strand described several proposals which are related to natural recovery monitoring. These all are current NRDA studies, however their likelihood for being continued under the NRDA process is unknown. The projects are as follows:

- Exposure of juvenile salmon to hydrocarbon contamination exposure is estimated through MFO induction, provides information for future management.
- Recovery of epi-benthic prey populations for juvenile salmon (copepods) - to determine if prey base was affected in oiled areas.
- Exposure of groundfish/shellfish to hydrocarbon contamination - indicators include bile, histopath, MFO induction.

All of the above were put in Category (A/C), and a discussion of monitoring in general followed. The following "types" of monitoring were described:

- Monitoring leading to restoration measures (OK as rest'n)
- Monitoring to determine additional damages (damage assmt)
- Monitoring to determine recovery
- Monitoring to determine lost use value (damage assmt)
- Monitoring for information to be used in case of future oil spill, maybe upon settlement.

It was decided that one proposal on Natural Recovery Monitoring for Exposure would be developed. This would combine the exposure monitoring portions of any study into one proposal. B. Spies, C.

Meachem, C. Gorbics, and J. Strand will develop this proposal.

2) ADFG Proposals - Chuch Meacham described the proposals from ADFG:

Restoration:

- Herring Protection - stock Id., methodology to monitor population, supplements NRDA - Cat. (A/C).
- Sportfish Restoration - information to public - Cat. (A).
- Sportfish Public Access - access/sanitation proposal - Cat. (D).
- Spawning channel rehabilitation - (USFS projects) - reconstruction of Harrison Creek diversion, Chalmers River chum reintroduction, Piggot Bay spawning channel - Cat. (B).

Feasibility/Technical Support:

- C-W-T Salmon - to identify hatchery and wildstock for better management - Cat (A).
- Spawner Protection - expand existing aerial survey program in PWS, increases escapement information to allow altering harvest patterns - Cat. (A).
- Herring egg transplant - tests feasibility of transplanting spawning substrate and windrowed eggs - Cat. (A).
- Otolith marking - for better stock identification - Cat. (A).
- Adult Pit Tagging - tag a fraction of the C-W-T fish - Cat. (A).
- Clam Transplant - already part of NRDA for growth effects and time for purification - Cat. (D).
- Rockfish Transplant - transplant to "clean areas"; biology uncertain, more information needed - Cat. (B/D).
- Herring Stock Identification - Cat. (A/C).

Monitoring:

- Dolly Varden - hydrocarbon analysis - Cat. (A/C).
- Rockfish - hydrocarbon analysis - Cat. (A/C).
- Herring logging effects - measure rates of sedimentation, water quality, egg survival - Cat. (D).
- Rockfish - Cat. (A/C).

Sport Fishing: (from recreation session)

- Access acquision - Cat. (D).
- Artificial Reefs - Cat. (D).
- Trout stream rehabilitation - Cat. (B).
- Coho habitat improvement - Cat. (B).

Comments:

- B. Freedman: the best package of proposals should go forward; they should include logical candidates for restoration, those having clear link to injury. For example, for pink salmon, where damage has been identified, should determine what is an appropriate restoration measure. If hatchery fish and wild stock are not equivalent, then reducing exploitation is a logical restoration measure; a monitoring project leads to a mitigation measure of harvest control.

Marine Mammals

There was no seperate session bringing together peer reviewers and researchers, due to scheduling problems. Lisa Rotterman and Jim Bodkin (USFWS) presented their proposals. Both expressed the need for a marine mammal workshop.

Sea Otters:

Lisa Rotterman explained that documented damage exists, continuing damage is likely to occur, and recovery can be hastened by preventing further disturbance and by protection of habitat. She provided the following background information:

- good baseline information exists for sea otters; through capture/recapture, can monitor population health for possible population impacts.
- habitat use varies by season, sex, age, reproductive status; critical habitat is identified in eastern PWS, however unknown in oil spill areas in western PWS.
- disturbance greatly affects habitat use by females and pups; human activity has been documented to prevent haulouts.
- habitat quality affects recovery rate; areas emptied during the spill (even heavily oiled areas) are being reoccupied, however animals there are not doing well.
- to get precise information on populations one must understand the causation behind the population curve.
- information gained through proposed feasibility studies is critical for modelling populations.
- direct rehabilitation through translocation is not practical, recent attempts in California were unsuccessful.
- the goal of the proposals are to make management/regulatory changes so that populations are not moved into less valuable habitat.

- studies on bark deposition affecting food supply are documented; no good studies on general effects of logging.

Proposals were submitted (see handout) and are summarized as follows (these were not catagorized by the RPWG):

- Identification and prioritization of sea otter critical habitat areas by monitoring adult females and young with radio transmitters.
- Monitor population recovery through:
    - evaluating physical condition of pups
    - aerial survey of recolonization
    - evaluation of movement and survival of females and weanlings.
- Determine certain life history information through monitoring of adult and weanling females.

Jim Bodkin provided the following background information:

- direct damages to sea otters has been shown through a decrease in abundance (lower numbers in 1990 than 1989); a difference in blood chemicals (east vs. west PWS).
- increased hydrocarbon levels in shellfish affects prey base.

Proposals were submitted (handout) and are summarized below:

- Assessment of the effects of, and recovery from the oil spill on the Western PWS sea otter population (7 component studies):
    - population assessment
    - foraging
    - blood
    - tissue toxicology
    - mortality
    - prey selection
    - habitat determination

The following monitoring proposals can possibly be combined into one package:

- Aerial/boat survey of marine mammals proposed by NMFS.
- Aerial/boat survey proposed by USFWS (both birds and mammals)

One proposal was submitted by Kathy Frost (ADFG) regarding the tracking of harbor seals to determine their ecological requirements. This could be classified as a technical support project; it will be discussed at the mammal synthesis meeting in Seattle on 11/6-7.

It was felt that peer reviewers should have the opportunity to identify components of studies needing to be addressed. A meeting should take place before Nov. 28. RPWG will recommend to the MT that this meeting occur.

Restoration Planning Work Group
Nov 1, 1990

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RPWG - Nov. 1

introductions

review schedule
review packets

decision making process →
work plan to MT by 11/28; will include
recom's for FS & RP for 1991 (Dec. 28 → will become public)
shld reflect policy judgements
+ other considerations

Coastal Hab   Bob Spies
lesions on polychaetes
↑ parasitism in starfish
monitoring for nat recovery
intertidal →
distr, abund, & settlemt problems
fucus (Herring Bay) → not returned
settling exp's → settlemt of limpets (littorine barnacles)
have been impeded on rocks
cleaned (rocks oiled @ N. Slope crude)
lesions on gills of fish
incr. in rate of bld parasites
saltmarsh → some damaged; small (compared to rocky intertidal)
- rewritten to focus on feasibility

Supratidal →

due to equip mvmt;
damage to vegetat. (rel. small areas)

caged mussels – ↑HC (in 89 samples)

Fish/Shellfish

Church M

- mostly sublethal

Salmon
- ↑HC in tissues
- overwinter mortality of eggs in oiled streams >50% incr. mortal.
- fin erosion in fry
- reduced growth in migrating juveniles (some oil particles in fish stomach)

Herring
- ↑ egg mortal. in ~~eggs~~ oil areas
- diff. in problems in larvae hatched from eggs in oil areas
- [→ 2 yr. old herring shows up in bird diets (∴ '91 will be 2 yr. olds)]
- effects in ~~spawning areas~~ larval abnormalities in '90 (confirmed)

Rockfish
- deaths caused by oil (tarball in stomach)

Nearshore DV & CT trout
- adult → instream (upper area) & stream when oil spill
- tagged fish → diff. in survival btwn. oil/unoiled
- DV → highest [HC]

growth in C.T. (sig diff in oil vs. non oil)
how widespread is damage?

CT is at northern extent of range
↳ expect to see similar effects throughout oil spill areas

tight homing fish; however (ie Eshamy) broke pattern + migrated to other non/oil streams

no work in PWS @ DV + CT prior to spill

Clams → - no data yet on % killed
- ↑ levels of HC (highest)
- reciprocal transplant project done in Spr. 90 →
→ subsist. closure at Windy Bay

Shrimp → - higher % of dead '89 eggs from oiled areas
- 1990 data not in yet

Trawl Study NMFS → variety of fish taken; sampled for HC
pollock - ↑ HC in bile
rock sole - 1989 (Herring Bay) ↓
Problems - skin lesions

[pollock is major compon. of ecosyst]

Herring Bay ↓ in '89; due to anoxic? not determined yet

Birds

Def. Damage:

murres → Barren Is (outer Kenai) reprod. problems continue in 1990

oystercatchers → beach nesting spp. '89 ⇒ prob in chick survival

harlequins → strong indic of HC exposure; reduced fitness; 1990 data → no evid of reprod in WPWS (no broods) (no historical record [broods observ. in EPWS])

eagles → serious hit in '89 ⇒ mortality of adults, subadults; productiv ↓, gone back up in '90 (don't know implic's. of '89)

birds in freezers → many spp.
↳ for some spp → many found in freezers, but no other NRDA data

Probable Damage:

[murrelets → prob. @ baseline data; kittiw. → '89 → ↓ product, '90 ↓ in prod & seen in oil + non oil]

murrelets

guillemonts

kittiwakes

loons

(Clear damage immed work) ↳ all spp. in def. category / + add study as needed

spp in probable category → more info [no nest'g effort in '91]

Marine Mammal

Whales

NOAA / Seattle

all resident pods?

100 looked at dist'n of 4 pods AB AE AN AT

→ killer: actual contact @ oil slick, oil coated Stranded 1 death

humpback

AB pod → '89 seven missing indiv.

'90 → six add'l missing

AN pod → '89 → 22 missing; & showed up this year

baseline data ex 1983

normal mortality is range of 2%

AE pod → 2 missing in '89; Still missing in '90 (not all data in)

migratory patterns/behav. was affected

biologists usually think that missing animals are dead

AT pod → 1 subgp (4 whales) missing in '89

not all '90 data is computed

still missing in '90 (one of these was found stranded & coated)

[3 stranded whales → samples taken from at least one
evid of living oiled whales]

?. on adequacy of surveys →

killer whales turned up in Cook Inlet.; Bristol Bay

'90 data will be complete in next couple wks.

Humpbacks :

'89 → 59 whales in PWS

cow/calf prs (4) → 6.3% reprod rate in '89
↳ low over decade trend

prel. '90 data → #s increased to ~60's
8 cow/calf prs. (~10% repro rate)

∴ no short term pop. impacts

Sea lions — declining pop'n anyway
difficult to make links to spill
reprod rate continues to be low
HC sampling → HC in tissues/bile

Sea Otters — 1000 dead during spill
few more died in aquar.
'89, '90 data → declining pop's.
Continued decline in '90
def. info ~~that~~ oil was cause of death
* bld/semen studies are still ongoing [stern E+W PWS]
tracking several rehab. otters →
reprod rate is very low (only 1 pup 50 %)

only done surveys within PWS

baseline data → '85

~~Harbor~~ Harbor Seals — already declining pop'n. in ~~aff~~ area
1989? → census of oil vs nonoil → 38% fewer animals in oiled areas (based on count)
19 seals collected affected by spill → necropsy/tissue analy → links illness/mortal. to oil (↑ resid. of HC in tissues)

stat. sig decrease in #s in '89, '90

Recreation (not including tourism)

~~[illegible]~~ Rarely any overlap @ Spring wkshp. (only 2)
* no NRDA studies for recreation
Versar Wkshop report

- Selected user decline (ie: different kinds of users)
  in some cases there are clear #s (user #s)
  + been drops (real sketchy)
  lost wilderness values (mandated / legislat)
  2 were not provided in '89, '90

  public perception

- Potential loss of gov't rev's., user fees etc
  → not substantial
  restricted opportunity for public (ie: Charter boats went to Exxon work)

4 - Loss of ~~National~~ Natural values

(5) - Displacement
  often by own choice

(6) Loss of other services to public
also possibly lost $ to specific projects
?

? do we have any quantif of injury w/in or outside to justify any restorat studies?
yes (but weak at best)

e: Sport fish projects can be justified under fisheries

Direct rest'n (e. sites used for recreat where clean-up activ so disturbed beaches ~~because~~ that would not go back to use
→ DNR has some info (but could be due pres. & to clean-up or oil/steel)
↳ feels that they can justify rest'n projects

legal opinion:
(less info to tie to Res. damage)
then lower on list of priorities
(presence of NRDA study is not nec. to look at rest'n; but need to show some types of damage)

DNR ⇒ beaches id'd (not in State parks) used for recreat. purposes & now are affected by oil/cleanup [no #s]
Whittier pub mtgs ⇒ some beaches are oiled still & people will not use them

→ if recreat. project will be reflected by another type of resource project
[e: fisheries; comm value is stronger; but recreat value is (imp.) & can be reflected] e: get stats from fishing lic.

Documentation of linkage to the damage?
both { - rest'n project to injury
- injury to damage

for our purposes; id. key sp. where reasonable evid of injury. *

Sandy ⇒ great risk of being slammed by AKans for not reflecting these types of issues in restoration. [Plan needs to reflect restoration]

Cultural Res

⇒ potential damages

2 studies proposed

① – RC contamination study on effect on dating (contract just let)

② field assessments (to be done this year)

Catagories of Damage ⇒

① Damage done by clean-up itself
sites found in Exxon survey were low,
Some sites in low intertid. were missed

field assmt studies will catch these

② Incr. knowledge of sites [↑ pot. for looting]
one case doc. in PWS ⇒ arrested person ⇒
→ future discomfort by local natives / landowner; value of artifacts

③ Contaminat. effecting dating; does oil mask other features + ↓ inability to collect other data (ie: from soil profile etc)

④ Disruption felt by native residents –
loss of confidence of traditional life (due to expos. vulnerability of heritage (of sites)

? Concern re disruption,
does any pars. of studies address this disruption

Study will not; other grps have studied looting (CAC, Pac Rim)

→ Vandalized sites [PWS → Chugach Forest;
not many; Kodiak (recently vandalized) ⇒ USFWS land
not good baseline]

if site is wholly on private land; is there a basis to spend pub. $?

[Selected lands treated by NPS lands as being public]

Interagency effort (this winter) will pull together all info (from notes, etc) to see det how much is there & how it relates to damage

? under new oil spill legis → natives can make claim to damage on selected land (interim conveyance)

are cultural resources a public-owned resource)
native grps would disagree; esp if they're on private (? Native, a native selected) lands

Archae survey USFS + State ⇒ USFS has stayed away from native lands;
Native corps (& CAC) are pursuing their own cases

* Proposals on public lands → we can consider

difficult to ~~do~~ keep straight who owns what, where. →

(11)

Bob Spies → C_{14} study ⇒ ~~fits~~ Seems to fit under restn/feasibil.

→ any summaries addressing damages should be left in building

rigorous synthesis process → RPWG impress. of damages may be ~~to~~ not as Damage Asmt.

RPWG will need to make sure that informal synthesis is consistent w/ Dam Assmt.

---

after lunch:

see sheet <RPWG Issues>

(1) Def. of Restn projects vs. NRDA projects

new category → "natural recovery monitoring programs"

charter → address nat recov., to determine if restn is needed (barnacles)

- monitoring needed <nat rec.> even if direct restn cannot be done (ie: killer whales)

PIs have been approaching these types of projects <should some of these ongoing studies really be back under D.A.)

even if resource can be restored, would want to monitor to det when/if it was restored (i.e. need monitoring to tell effectiveness of project)

ie: B Spies see certain projects (ie: mothers of continuing exposure) ⇒ these types of projects shld not fall thru the cracks. (these projects need to be flagged)

Stan Bird sp. distinctions of monitoring { long term monitoring (ie: Post settlement plan) part of
monitoring to ~~stick~~ id. oppty's for rest'n measures + natural recovery monitoring

Stopped

Bart F. → resp → d.a. process, + rest'n plan shld be finalized after d.a.

then shld call it a d.a. study { if d.a. studies set rest'n label (= known injury) → decrease the oppty to recover $ from cost

OK ⇒ mgmt. program where known injury, + rest'n is approp

Stan RPWG shld present recommendations to Mgmt team, let them ~~classify~~ categorize

Trustees need to address

RPWG will not specifically address re-imbursability

④ Id of injuries via NRDA a other sources — credibility/validity is more imp than where data came from (ie: NRDA)

* documentation (data) is needed.

{ FR "report" notice will address only that there is an injury (not disclosing NRDA results) but only

? making data avail →

WPG wants NRDA data released to public in Dec.

not ready (tech can't happen ⇒ not QA'd not synthesiz)

"what is data" → raw vs. interpretat.

→ much of data is shared ~~to~~ @ State

→ ~~State home~~ ① follow administrative procedures ⇒ ② all info rest'n plan is based on will be discoverable

* "report" needs to keep any extraneous info
ie: report is not ultimate damages/rest'n plan
it is dynamic; 1st year

~~____~~ public
accelerated time schedule is polit. motiv.

→ { - can not preclude good sci. results later
- think harder/sooner about those injuries we know about.

OMB
State leg. could make a decision to front ~~$~~ $ w/o regard compensability

③ Prioritization of Projects

RPWG does not want to prioritize projects
exc ⇒ ① meeting factors the best w/in category
②

? Mgmt Team → is it acceptable that RPWG does not prioritize (Susan → supplying any ideas you have)
→ keep as many projects as public comment

2 things going on:
① explain thinking & give public as much info as possible
② for budget process, need to make some choices

do not want to do token program ⇒
Shld not worry about cost in absolute terms
but will need to worry a little about gross disproportionality
↳ (may be too preliminary to let.)

⇒ Plan FR Notice needs to make sure that
it is obvious that ~~this~~ is a "wish list"

④ Consolidation of Projects
e.g.: bnd survey work could be combined @ mainrd
? don't know where $ is coming from.
→ state only can set $ for restn. projects
thru 1992 budget
→ fed. prob → fld will need to re-direct
$ to 1991 restn (budget is already set)

- RPWG can not address split of $, i.e.: where its coming from
  - needs to be seriously discussed at mgmt team
- Serious problem:
  - discussed at Trustee Council ⇒
  - Nicol Restn vs. Damage Assmt funding ⇒ some agencies feel that might have to go to Congress to transfer $ from DA to Restn. (may want to charact. as DA to use avail funds)
- RPWG needs guidance for above is end of NOV.
  - this a prob if NRDA $ to Restn Projects; but maybe not for feasib./or tech support
- Lack of Consensus
  - given time line (4 wks); need to have real-time receiving issues; need to be closely responsive to this effort.

Factors -

Brian reviewed factors

Bart Fred. Sci relev. to id. injuries & may be diff
th. sci needed to generate
rest'n projects → concern that
since we've gotten ideas from
D.A. scientists may be appropriate

Conservat. Biol. type questions

Stan → some projects proposed reflect ecology; life history etc

lack of good bckgd info (e: need example model for PWS)

e: for damages → take known injuries & work from
there;
similar approach for rest'n. → how can we
systematically enhance the injured
species

* need to integrate ecosys. info into model/concept
for entire area

damage assmt has been by species approach →
~~need to~~ shortcoming (ecosys. approach)
is known

* don't have much guidance on ecosyst. implications of pot. projects

Systems Ecologist (Peter McCoy)

needs to be remain practical

Susan →

? NEPA

1991 projects → sig ? regarding NEPA

plan itself → is it functional equiv.
(is process being followed funct. equiv.)

DOJ is looking at it on expedited basis

WPG → feels not req'd.

~~Archaeological Resources~~

→

Archaeology

9 projects on the following catagories ⇒
not prioritized:

Protection [from vandalism]: - (9) CAT A Erosion control - Stabilization

CATA (if spec. sites are id) { (1) - Education = what is law; target user grps. (specif to Vandalism Laws)
(2) - Enforcement = ↑enf thru enhancing existing programs ↑Surveillance (ie: NPS)
(3) - Stewardship - (Kodiak Area Native Assn program) [works there, may not in CAC] monitoring local level

Data Collection:

CAT A → (4) - Excavation of sites (#10 sites over 3-5 yr. project) determine more vulnerable sites

combine field data [I.D. + evaluate & maybe do one site] little info on nature of sites in PWS, outer Kenai coast, Kodiak
last comprehen. study in 1930's

CAT D (7) - Inventory of PWS artifact collections (wherever they may be)

Education CAT A (3) - Popular "Layman" Publications on whats known about area cultural rather than enf.
cat D (6) - Oral history → focusing on villagers in area (re: spill event + impacts)
cat D (8) - Traditional Skills → disruption of trad. lifestyles, skills might be interrupted/lost ∴ record

→ Is need in '91, control of erosion, or id. sites where erosion needs to be done? I.D. of sites

several sites have been i.d. by USFS (for planting Beach Wild Rye)

- ~~[struck out]~~
General? →

Protection programs address "risk of ongoing impact"
ie: keeping vandalism, losing data w/o erosion control

legal ⇒ preventing injury to an already injured resource

→ loss of informat. is at risk

sites were exposed to more people; some will come back to dig up site

protection activities fall under sphere that can reasonably be considered; at this stage can look at broader range of things

which of above projects would be proposed under damage assmt?

those dealing with arch. site themselves, not ~~written~~ history

are any subparts of those being covered elsewhere

ie: - Oral history & damage assmt ~~contract~~

? any justific. for studying 9 sites after doing NRDA field assmt.

↳ some sites heavily vandal. already are vulnerable/visible

perfect ex → NRDA/Tech support

- excav. is restn
- study is NRDA/Tech support

artifact inventory → low priority for '91

traditional skills → hard to argue that spill itself caused loss of skills

addressing actual injury or threat:

5 erosion control sites needed to be done in '91 to protect artifact.

Artifact inventory → - could help i.d. future restn.
tech support

Tech feasibility → restn. for all

Net Env. Benefits → ~~[illegible]~~ compensate by gaining ingo; proper Compliance issue (permitting) will cover

how many shld be done anyway as regulatory mgmt duty)
↑'d mgmt need due to spill that can't support (↑ visibility)
if ↑↑ was avail → pay for more enf. control.
work thru KANA (↑ monitoring)

Ui Stewardship Can enhance existing infrastructure
→ 3-5 yrs. ; afterwards can be picked up by others
enf. expertise would be left w/in system

? Trad. skills may not meet damage assmt factn →
need more document.

→ moving ahead @ damage assmt. studies →
esp. artifact inventory

Native (villagers) will resent dropping out educational

Categories { A → looks good
B → more info
C → doesn't meet criteria

~~proposals~~ shld
shld long term be considered

Summary →

Archaeology Review & Options

send all proposals both to state/fed attys.

actual DA study has not begun yet →
unless can specifically document
at site; need that
info 1st
even for sites where injury is known;
but not definitively known →
erosion control/excavat. might hinder DA case.

- native groups will be interested in assisting
- costs have to be reasonable in light of injury

Erosion control → is there a conflict to D.A. legal case →
shld document damage before project;
Excavation → time is such that injury studies would
have already been done → needs coordinat.
could recover some type of data needed to doc. damage
Inventory of Artifacts → could be post settlmt.
Education → ① pop public → could be picked up under educat./recreat.
② Oral history → might be more DA justifiable to do right away while info is fresh

Nov. 2

Process ⇒ 4 categories:

(A) Probable recommendations → write it up

(B) Possibly favorable recommendation (less committed by RPWG to exclude)
<Possible for 1991>

(C) Needed; but better as NRDA

(D) No, not now – does not, or may not meet criteria, current factors.

Rest in Project Study → Feasibility, Tech Support, Monitoring

→ above leaves record for decision making

? { yes – but not now, does meet criteria

still enough questions; needs more linkage to NRDA

⇒ RPWG will reconvene in mid Nov. for final ~~draft~~ decisions as to what get written up.

Archaeology/Cultural

Categories are:

(A) Probable recommendation / write it up

(B) Possible: need info.

(C) Needed but not restoration / Response

(D) Maybe sometime / does not meet current factors

Recreation

1. Sport Fish Improvement
   - A. Access / acquis. — C & D
   - B. Artificial reef — D
   - C. Trout Streams — B
   - D. Coho habitat improvement. — B

↳ may have local interest to do work

↳ no specific proposals in Fish mtg

2. Marine Litter Pickup
   - Cat. B — A. Trash Removal
   - Cat. D — B. Garbage barge (long term project)

- left from clean-up
- work in H_2O
- in heavily used H_2O
- target high value recreation beaches
- use user survey to get to this question

- alternatives to beaches wh. are oil & / displacement
- to the extent that the debris is oil spill related it is a response cost; hard to make a scientific / eco-system connection on a population level, can make an aesthetic argument

3. Education Program
   - Cat. A.
     - A. Interpretive plan
     - B. Multi-media — video, brochures etc
     - C. Natural history — response to EVOS

Even handed info. to recreational user

4. Recreat. Site restorat.
   - CAT A (w/ caveats) ← A. Restoration of camp sites / recreational sites [i) reconfiguring disturbed sites; ii) survey of more sites]
   - B Drinking water survey — oil & Giardia: survey of streams. However, AK & Forest Service warn on all streams. High intensity use & clean-up OK. Hydrocarbons are probably below detection levels.

5. Replacement
   - CAT B & D (& maybe)
     - A. Cabins
     - B. Trails
     - C. Moorings, buoys, docks

6. Rec. User Survey → CAT D

7. Managmt Plan ⟨Phase II & Current Land Status Study⟩
   - CAT. A ← review / rewrite all or sections

8. Aquisition
   - A. intersection of resources & non-govt land
   - B. see A in above

Exxon will not come back to

5 Replacement => some facilities hit by oil/affect. by clean-up

USFS proposal build new cabins, new trails, mooring buoy
↳ no #s. {replacement as opposed to addition

does Exxon have to compensate for full cost of ~~restor~~ replacmt elsewhere

may be premature to do cabin, trails etc.)
restore/replacmt of new cabin site → OK,
but of new site → then may be problem

6 Rec. User Survey
not sure if certain area has been hit
↳ physical users (ie sport fish, kayak owners hiking club)

BK

data is available => from economists
↳ need to find out whats been done

7 Management Plans
→ pick up 1990 DNR study on land status, etc.
⟨possibly agency would then re-write mgmt plans⟩
↳ need to find out if nec. to update mgmt plan ⟨ie: PWS plan done by DNR
ie: NPS - Kenai Fjords
may be premature to talk of actually re-writing

what format
what level of resolut.

1990 => prel. stage of carrying out land ~~status~~ use/mgmt plans

could rec. 2nd gen to land status study =>

to look at what
=> single format to be manipulated into restn planning
~~can~~ => ~~can data sour~~

1990 Study => looking at converting info into GIS; to be done sometime in 1991.

need to have Ph. I done;

(8) Aquisition

access for sportfisheries

{ DOI is looking at several postage stamp acquisitions (ie: Gull Is → privately owned) recreat/resource

→ Save to discuss all at once w/ Acquis.

Bob ⇒ concern that best prg go forward & incorp. best info re: injury
pick obvious, logical candidates for rest'n; those having clear link to injury
i.e: pink sal ⇒ identified damage ⇒ what is appropriate rest'n measure
hatchery fish & native fish are not equivalent
↳ reduce exploitation is logical rest'n. measure
monitoring project leads to mitig. measure of harvest control

Fish

NOAA/NMFS Projects:
* all are current NRDA studies ⇒ likelihood to bec. continued under NRDA?

① ⇒ Exposure of juvenile salmon to [illegible] HC contamination

(margin: all imp. for nat. recovery monit.)

- gaining info useful for future mgmt.
  looking for enzymes (MFO) to see if had exposure in past (1990 data not in yet)
  fry/embryo mortality ⇒ shows effect
- injury is indic. of exposure (MFO presumptive evid)

② Recovery of epi-benthic prey populations for juv. salmon
copepods (food web rel'n)
det. if prey base were effected in oiled areas [1989 data was inconclusive; 1990 - not in yet] (sublethal effects included)

③ Exposure of groundfish/shellfish to HC contamination
- gaining info for future mgmt (det. recovery)
- bile monitoring; further indicators (histopath) ⇒ det effect on long term prod. {DNA adducts, MFO}
markers are good expos. indicator ⇒ hard to link to pop'n. reduction
MFO quantities were higher in PWS; bkgd induction

Monitoring ⇒   State projects ⇒

monit. if leads to rest'n measure, then appropriate
monit. to determine add'l. damages ⇒ D.A.
monit to determine recovery
monit to determine lost use value ⇒ D.A.
monit. for info to be used in case of future oil spill ↳ maybe upon settlmt

- more likely to get funded under Rest'n,

are they to be included on their own merits (i.e: CAT C;
↳ need to be done

* Spies ⇒ info is key to knowing when system recovered (Spies)

CAT A/C

Nat Recovery Mont. for ~~Exposure~~ (not rec. pop'n)

Spec? one proposal written for recov. monitoring
[co: HC in env,
expos. to imp. fish spp.

" those studies that HQ is not forthcoming in D.A. ('91) should be covered in the "Rest in" project

→ useful because it combines

2 types of monitoring { ① what to do to restore damage
② why to do it.

[John, Chuck, Bob Sp., Carol
will work on it.]

timing prob → early Dec → NRDA decisions

Study cat
- Feasib (tech)
- Tech Supp (info; ecol life hist)
- Nat Recov. monitoring

ADF+G Studies: (see other notes following)

ie: could restrict harvest

Restoration:

- Herring Protection (cat A/C) - methodology to carefully monitor pop. → will manage to enhance recov
<best job to protect resource>
① stock id. - feas.
elements are similar to D.A. program <supplements D.A.>
(B. Rothschild will address) have % deformities; need to know about stocks to do something ab. mitigation

- Spotfish Restoration (Cat A) information to public

- Sportfish Public Access (Cat D) - access/sanitation proposal (risch, permitting, land ac. in Cordova/Valdez)
both acquisition/access
BUT → ** sanitat prob shld be dealt @ NOW by ADFG

- [C-W-T Salmon Restoration (Cat A) - { tagging hatch +/or wildstock to allow id of stocks + knowing which can be exploited
prob → mixture of hatch/ws. ← help]

- Spawner Protection (cat A) → $40,000 to expand existing aerial survey prog. in PWS
~~[illegible]~~ supplements an already extensive program
* incr escapmt info. to allow altering harvest patterns → TS A

Tech Support
Feasibility:

- Herring egg transplant (Cat A) ① testing feas. of transplanting spawn. substrate to enhance eggs
② use herring eggs in specially designed trays
→ Substrate is limiting
(ie: to get herring to come back + spawn at other locations?)
TS A → NOW Tech Support

- Otolith marking (cat A) - accomplishes same as CWT, but def. feas.
similar to herring stock i.d.

- Adult Pit Tagging (Cat A) → glass coated electronics <already used in CRB for small fish>
tag a fraction of CWT fish @ Pit tag

- Clam Transplant (cat D) → $ has been requested from DA from OY 3
are doing clam transplants as part of D.A., to det. growth effects, time for purification
~~[illegible]~~ [no solid evid. for damage] 1989 HC results → support control/oil sites

- Rockfish Transplant (cat B/D) - capturing fecund rockfish + transpl. to dam. areas
→ look at lit

- Herring Stock Id* (cat. A/C) - not a D.A. measure;
would be something to do to lead ~~toward~~ ⇒
toward rest'n.
Scale hasn't been tried before →
∴ both feas. + tech study

Monitoring -

Dolly Varden - (A/C)

Salmon escapement

Salmon ground survey

Herring logging effects - (D) measure rates of sed, H2O qual, egg, hatching ~~rate~~
comparing logging areas / non-logging

if study effects of another resource → could be stretching it. ←
but really, another source of mortality to pop'n. (actually studying whether prob. ~~is~~ to imp. ~~control~~ to enhancing pop.)

Rockfish - (A/C)

Rest'n Cont. → (cat 3): (all 3)

USFS projects →
- Reconst. of Harrison Creek
- Chalmas R. Chum reintroduction
- Spawning Channel (Pisget Bay)

Herring Protection →

Stock id ⇒ research ?

herring protection ⇒ part of restn. (know tech.

Categ. C/O ? w/ egg mortality, larval % def.)

prob know more about herring damage than other fish

What is cost to wait a year til better info?

↳ fishing pressure currently

Can you get people to alter fishery when info on pop effects are not yet known.

⇒ mgmt plan can be put in effect in 1991 to make sure no add'l. impact on pop'n.

quality of data has ↑ in harvest

(will be able to know what valleys & peaks are to det. what to chg)

? what mech would be used to make Δs to mgmt? (what NRDA data would be necessary)

⇒ more intensive aerials.

⇒ more careful monitoring of age structure

→ hopefully will see shift in directing effort toward unoiled pop'n.

id. stock level; than achieve that level → id.

Seeing results at egg stage indicative of ~~industry~~ injury ⇒ justifies doing better mgmt. & info.

CWT Study - status of NRDA ⇒ request for for OY 3; however not for (remainder of) OY 2

~~how can support we support just the~~

maybe funding can come from somewhere else.

- Herring egg transport ⇒
  - feas. study leading to direct rest'n
  - not high tech, → if works, implementable
  - easily evaluated

Clam Transplant ?

hard to find good clam beaches in PWS
could be due to larval drift pattern; make it difficult to repop. areas.

would continue transplant under NRDA
→ probably good to wait 1 year & see how nat. recovery goes

Rockfish Proj -

even if recruitment was good, could be 8-10 yrs to home
may return to homes up to 40 miles away in SE
→ may be putting in contaminated env.
? biolog. is uncertain (hi level)

Artificial Reefs ⇒ hab. not limiting in PWS

Trout strm rehab ⇒

Marine Mammals

no mtg; no peer review

would like marine mam. wkshp

Lisa Rotterdam → USFWS

① damage exists

② continuing damage is likely to occur

③ hasten recovery by preventing further disturbance by prot. of habitat

↳ approach based on following bkgd →

① radiotel. to study reprod, mort., mvmt

good baseline exists: ② capture/recapture

since 1984 { 40-130 females ~100 pups captd/rec.

↳ ∴ can monitor pop'n hlth → for possible pop'n impacts [ie: crude oil could cause latent effects]

hab. use varies by season, sex, age, reprod. status

critical habs known in EPWS; unknown in oil spill areas in W.

disturbance greatly affects hab use by ♀ & pups

hab qual affects recovery rate

areas emptied during spill (even heavily oiled) are being reoccupied; animals there are not doing well

Proposing → to prevent further add'l damages from occurring in critical areas:

ie: logging, mariculture fishing activ., floating lodges

Proposing to id. critical hab
priority areas (best weaning, pupping)
& to suggest elim & dest in those areas
monitor level of recovery
→ use PWS animals already implanted
to get precise info on pop.
understand causation behind the pop'n curve
→ same (50♀, 40 pups) in VI PWS → can
id. all critical habs;
then prioritize area
→ capture dep. pups + give close phys. examinations
to confirm that further damage
is occurring in these
re-establ. areas.

monitoring to gain precise info on reprod rates,
monitoring rates /
(or for planning future rest in work)
- use fixed-wing surveys in oil spill zones
(~~cont~~ started 3/24/89 - cont. for
10 mos?) → can det how
densities now compared to densit. during spill

feas. studies →
info. gained is critical info for modelling pop'ns.
(See chart on back of proposal)

direct rehab thru translocation is not practicle
(expect ↑ mortality, other impacts to arising pop)

Recent otter transloc. in Calif →
only 20 surv. (most are missing)

goal → mgmt/regulatory
so not to move populations in less val. hab.

Speculation (destns. are documented to Δ hab. use
in PWS / (human activity has been doc. to prevent haulout)
♀/pups are most sensitive to destn.

Known when fleet comes into Sleepy Bay → ♀/pups leave en masse
(adj. habitat/undist. was good)
↳ in WPWS → no good adjac. habitat

?: take in gillnets (at certain times) (up to 50% can set entangled)

Ocular lesions in eyes, kidney, guts → in oiled areas?

no good studies re: logging
bark depos / shellfish docum. studies → affects food supply
mariculture is direct conflict w/ otters

2nd proposal - Jim Bodkin
direct damages →
↓ abundance (?: lower in '90 th. '89)
sig. in bld chem in samples coll. from E/W
prey base (THC in shellfish)

2 levels:
- Biochem/Physiol level → continue samples ♀ bld/tissue
of dead animals coll. in WPWS
- Monitoring of Pop → link btwn prey base + (sublethal conc in prey base)
otter foraging habitats

monitor pop'n

Objectives listed on p. 3; in order of desc. priority

Now have both studies rel. to NRDA
- adult ♀ study is unlikely to be continued
- pup work in WPWS ⇒ may receive funding

don't have answers as to where all damage is.

PR's shld have oppty to id. components of studies they feel needs to be addressed
↳ mtg shld occur before Nov. 28 (~3rd wk of Nov.)

RPWG shld rec. to MT that mtg. needs to happen

Rest'n might not be appropriate avenue; NRDA might be more appropriate

→ Monit. for recovery is app., esp. if it can lead to rest'n measures (down the road)
→ - Otherwise NRDA

incidental take of sea otters ⇒ pot. to reduce take thru ↑ law enf.
(Native take)
fish net

genetic studies show that there are distinct pops in AK, ∴ eliminating native take in (ei) ATW(?), would not be approp.

in '91 ⇒ hard to justify doing anything outside spill affected area

NOAA Proposals:

Long-Term Monitor other spp. & marine mammals (killer whale, Stellar sea lion, harbor seal)

no strategy under NRDA { dall porpoise, harbor porpoise, etc. } ⇒ Seasonal abund; reprod. success to possibly get mgmt recommendat.

habitat set-aside (i.e. marine preserve) ↓ dest'n } not restorat. measure

how does this proposal match @ USFWS proposal ⇒

* Consolidat. is possible

mgmt/enforcement ↳ i.e.: mgmt budget in fed. sanctuary

ADFG

- K. Faost proposal

- damage link

ecol. regts & harbor seals (also to det. displacement) (PWS, Copper R. Delta, etc.)

transmitter/tracking proposal

* not covered by NRDA

basic bio ?, ⇒ approp. for tech support (maybe instd. of NRDA)

NOT YET REVIEWED by RPWG

RECREATION RESTORATION WORKSHOP 10/26/90

CONFIDENTIAL DRAFT

In Attendance:
Chair: Sandy Rabinowitch, NPS/DOI
Dave Patterson, USFWS
Bud Rice, NPS
Art Weiner, DNR
Rich Thompson, DNR
Ken Rice, USFS
Frank Smedley, USFS
Kirsten Ballard, USEPA
Mike Goodwine, DNR
Mike Mitchel, Preston Thorgrimson
Kent Roth, ADFG

The meeting opened with introductions, background information and a question and answer period.

One of the more significant questions was "Is an 'individual' precluded from restoration action if a proposal is not in by November 15?" Sandy's interpretation of the FR process was that this would not be the case. The document goes out for public comment until February 13, 1991. Therefore, anyone can send in comments until then.

One of the largest obstacles recognized in proposing Recreation projects is the lack of supportive NRDA damage information. Many NRDA studies for recreation were proposed at first, but were denied. Some general statistics presented at the meeting support the fact that there has been an impact on recreation. Fewer campers, hikers, kayakers, and kayak rental businesses who have considerably lower numbers of people going out, have been noted. There was also speculation of businesses that haven't opened because of EVOS. From this discussion, it was agreed that a user survey of potential users of the resource should be performed.

Also stemming from the above discussion was that public perceptions of the spill area, and Alaska in general (relating to the oil

spill), are not correct. Many people view the entire coastline as completely covered with oil, when this is not the case. An education program to change these perceptions--school curriculum, interpretive signs, video/PBS coverage to the lower 48, etc., was proposed. This could be especially important in view of damaging statements made by Governor Cowper regarding the spill (he advised that anyone who might be interested in kayaking in Alaska should avoid Kenai Fjords National Park (KEFJ), which now notes a decrease in kayaker usage by half). Coupled with this could be a "alternate site" survey of areas that were untouched by oil which would still offer a visitor the pristine experience that was expected.

Much of the management which normally goes towards running recreational programs in the state and federal agencies has been diverted to continued EVOS "response". Many programs which would have been done, have not been done because of the diversion of resources. Trails have not been built as planned, other programs have been delayed. This has resulted in the loss of revenue for the recreations departments (the use it or lose it syndrome). Funds and personnel that could go towards restoration of management and lost services was suggested as a restoration option.

The government agencies are charged with providing recreational opportunities to the public, therefore, it was discussed that if businesses did not start because of the spill, then it could possibly be charged that the government failed to provide those opportunities. Even if those opportunities were provided, who can judge the value or the actual quality experienced during those visits. Is a trip any less successful if you only saw 100 vs. 200 birds when you (the public) didn't know how many you would see anyway? Or if you didn't see one species of bird at all, how would you know that it was supposed to be there unless you were told?

To be included in the submittals should be a summary of damages and supporting information regarding those damages.

The issue of public vs. governmental damages was discussed. Mike Mitchell pointed out that a restoration of lost services to the public in general may be justifiable as restoration options. However, a reallocation of resources may be beyond this process (e.g. the state is seeking direct reimbursement of funds through Exxon). Government loss vs. public loss. Can NPS be reimbursed, and/or is it a public loss

because Sandy is doing EVOS restoration rather than planning or reviewing proposals for public facilities?

In Summary:

DAMAGES

1) Selected User Decline
   perception of impacts

2) Loss of Wilderness Values
   a) perception of the public/misinformation
   b) loss of characteristics

3) Potential business thawarted
   a) loss of revenue
      i) local business
      ii) user/permit fees
   b)Restricted Opportunity

4) Loss of natural values
5) Increased pressure in other areas
   a) management problems shift
   b) diversion of users/impacts
   c) Charter/tour service increase

6) Loss of services to Public due to cancelation of existing programs (lost opportunity), possible loss of appropriated funds.

Discussion followed regarding these damages and what types of restoration projects/technical support projects/feasibility studies could be considered. The following list of proposals was generated: (agencies in parentheses indicated that they would try to draw up a proposal by November 15 for consideration into the FR notice)

3

Sport Fish Improvement *(it was agreed that many of these projects would be covered under the Fish/shellfish program)*
- Access acquisition
- Artificial Reefs
- Trout Stream Rehabilitate
- Coho habitat improvement

Marine Litter Pick-up *(USFS, KEFJ Nat. Park)*
- Trash Removal (in untreated areas where Exxon did not remove trash)
- Garbage Barge

Education Program (psychological restoration) *(DNR)*
- Interpretive plan
- Multi-media "campaign"
- Natural History/Environments' response to stress
- Displays/park signs
- Recreational opportunities

Direct Restoration *(DNR)*
- Site Restoration/Rehabilitation
- New site survey
- Water Quality Survey (no giardia in PWS before spill, is this still the case?)

Replacement of Displaced Resources *(USFS)*
- Cabin Construction
- Trail Construction
- Boat Moorings

Survey of Recreation user perceptions *(KEFJ)*

4

DRAFT

PROPOSED 1991 RESTORATION PROJECT DESCRIPTION
NATURAL RECOVERY MONITORING PROJECT

Title: Long - Term Monitoring of Marine Mammals Affected by the Exxon Valdez Oil Spill.

Lead Agency: NOAA, National Marine Mammal Lab

Principal Investigator: Tom Loughlin
Marilyn Dahlheim

Introduction:

Evidence is available suggesting that the oil spill and associated response activities have affected marine mammals in PWS and contiguous waters; particularly killer whales. Other cetaceans as well as pinnipeds may also have been affected. Some species such as Dall porpoise and harbor porpoise, while likely impacted, have not been studied under the inter-agency damage assessment program.

Methods:

Boat/aerial survey to determine:
1) seasonal abundance
2) reproductive success
3) Other (factors influencing the above)

Target species:
1) killer whales
2) harbor porpoise
3) Dall porpoise
4) Steller sea lion (proposed to be coordinated with ADF&G)
5) harbor seal (proposed to be coordinated with ADF&G)

Duration and Scope: 5 years

Expected Results:

This study will determine the status and trends for affected populations and specifically determine estimated times to recovery. It will also provide resource managers with recommendations regarding management strategies to ensure full recovery of affected species.

Alternatives Considered:

This information is vital to monitoring recovery of affected species, particularly killer whales. Not developing this information could delay recovery of the animals.

Cost: ?

USFWS

Restoration Proposals for Sea Otters

(Proposal by Prince William Sound Science Center)

1. Identification and prioritization of sea otter critical habitat areas by monitoring adult females and young with radio transmitters (already in place) during critical life history stages including: (a) movement, (b) reproduction, (c) survival and (d) growth. This information would be needed to establish management guidelines and habitat protection strategies for other restoration projects such as the development of critical habitat areas or marine sanctuaries.

2. Monitor population recovery by (a) evaluating physical conditions of pups, (b) aerial survey of recolonization and (c) evaluation of movement and survival of females and weanlings.

3. Determine certain life history information through monitoring of adult and weanling females including (a) age at first reproduction, (b) reproductive rates (c) mortality rates and survival and (d) movement patterns. This information would be useful to develop meaningful population models permitting evaluation of future restoration programs.

Lisa Rotterman
Charles Monnett

AN OUTLINE OF THE PRINCE WILLIAM SOUND SCIENCE CENTER PROPOSAL FOR A RESTORATION PROGRAM FOR SEA OTTERS IN PRINCE WILLIAM SOUND

The proposed approach to restoration includes activities aimed at hastening the recovery of the Prince William Sound sea otter population (Direct Restoration), at monitoring the recovery, and at providing information about sea otter life history necessary for designing oil spill response and restoration programs in the future (Feasibility Studies). Most of the actual tasks outlined in this proposal are components necessary for all three of the aforementioned areas of a restoration program.

Direct Restoration

An aim of direct restoration measures is to hasten the recovery of the damaged population. Two alternative approaches to direct restoration are: 1. supplementation of the population (e.g., by translocating individuals), and 2. implementing measures to prevent further damage to the population that would otherwise occur. The first approach is not feasible for sea otters, since a low percentage of sea otters stay at the site of release. However, the approach of preventing further damage is one that would be likely to aid in the restoration of the PWS sea otter population. Our premise is that habitat protection could enhance the recovery of sea otters in the oil spill zone and that if habitat is to be protected to aid recovery, the decision of which areas to protect should be based on habitat usage patterns and on information about the outcome of such usage.

We propose to:

1. identify habitats used by sea otters in western PWS during critical life history stages
2. prioritize areas of a given use so that the most productive areas are identified.

Our previous studies in eastern PWS have clearly shown that sea otters use different portions of the total available habitat differently, depending on their age, sex, reproductive status, and season of the year. Preliminary examination of telemetry and capture data from the oil spill zone indicate that this is also true in that region.

Measures that would be taken in order to identify and prioritize such areas include the following:

1. Obtain data on movements of the adult female and young sea otters by monitoring those animals implanted with radio transmitters since the T/V Exxon Valdez oil spill.

2. Obtain data on the reproduction of adult female sea otters and weanling female sea otters by monitoring those animals implanted with radio transmitters since the T/V Exxon Valdez oil spill.

3. Obtain data on the outcome of the adult female sea otters and weanling sea otters in different areas by monitoring those animals implanted with radio transmitters since the T/V Exxon Valdez oil spill.

4. Capture, weigh, measure, closely examine, tag, and obtain blood samples from sea otter pups in the oil spill zone, concentrating on those areas receiving high usage (as identified through the telemetry information) and those areas that were heavily oiled but that are now being recolonized by sea otters (identified through monitoring of radioed animals and surveys (see below)).

Direct benefits of the proposed activities.--The information gained from the activities proposed above will provide very precise information on habitat usage by, and relatedly, habitat requirements of, the most important segments of the sea otter population, the productive females, and the recruitment stage. Thus, pupping, weaning, breeding and overwintering areas can be identified. Moreover, different areas receiving similar use can be ranked. Both survey data from the time of the spill (March 25-Nov 1989) and preliminary examination of the capture data on pups instrumented in September and early October 1990 indicate that certain heavily oiled areas, such as Lower Passage and northwestern Knight Island, are being reoccupied by females and pups, a highly vulnerable and important segment of the sea otter population. Moreover, physical examinations given the pups during the recent capture effort indicate that pups from those heavily oiled areas may be suffering sublethal effects from the spill. Such reoccupation suggests either that the sea otters cannot recognize potentially damaging habitats, or that they are being driven into such areas to avoid disturbance in other areas. If other, possibly less damaged areas of high usage by females and pups are highly disturbed in the future, it is likely that a larger proportion of the remaining females and pups will reoccupy the heavily oiled areas.

There is no other way in which to get such detailed, direct, and accurate information about habitat usage and the relative values of different areas to the sea otter population.

Additional benefits of the proposed activity.--Continuing to monitor the sea otters already implanted has several benefits besides providing the information necessary to identify and prioritize habitats that might receive

temporary or permanent protection in order to hasten recovery: a) The information gained is that necessary in order to design future oil spill recovery and response plans; b) The information gained provides a very direct way to monitor recovery process and, as important for future recovery efforts, to understand why the population is behaving as it is (see below under "Monitoring Recovery"); c) The information is directly applicable to assessment of the extent to which the current population is damaged. Thus, such information is also directly relevant to evaluation of the need for restoration activities and to the evaluation, at some future date, of whether restoration is complete; d) No additional instrumentation of sea otters is likely to be necessary in the near future (such instrumentation would likely receive considerable public opposition).

Monitoring Restoration

Efforts to monitor the course of a population as it recovers from a perturbation are necessary in order to make decisions about whether it would be desirable to take steps to hasten the recovery, and to plan future restoration programs. In order to monitor the recovery of the population of sea otters in PWS, we propose to:

1. As described above, evaluate the physical condition of pups in the oil spill zone, and gain information about the reproduction and survival of implanted females and weanlings to determine whether damage in still occurring

2. Using fixed-wing airplanes, survey selected areas within the oil spill zone to monitor the course of reoccupation. Data from such surveys will be compared to data taken over a 9 month period immediately following the T/V Exxon Valdez oil spill.

3. As discussed above, gain information about the recolonization by monitoring the movements and survival of females and weanlings already implanted with radio-transmitters.

Feasibility Studies

Current understanding of sea otter life history is incomplete, thus complicating the design of future restoration or response programs. Of the tasks discussed above, the monitoring of the adult females and the weanlings already instrumented, provides information most needed for designing future restoration/recovery programs. Specifically, information gained from monitoring the movements of the instrumented male weanlings will provide information about the population structure of sea otters in PWS (e.g., are there distinct subpopulations within PWS, the

population relationship between the Kenai and the southwestern PWS sea otters, etc.). Male weanlings are informative with respect to population structure because they are the dispersing sex in sea otters. Information to be gained from monitoring the adult and weanling females includes: age at first reproduction, reproductive rates, mortality rates and causes, and movement patterns. Such information is crucial to the development of meaningful population models that would permit evaluation of future restoration programs.

Proposed Actitity	Direct Restoration	Monitoring Restoration	Feasibility
Monitor instrumented adult females and weanlings	Identify critical habitats	Obtain information on normalcy of affected population	Provide information for population models important to restoration planning
	Prioritize geographic areas for protection	Provide information relative to causation of course of recovery	
Pup assessments	Prioritize geographic areas for protection	Provide information relative to causation of course of recovery	Provide information for population models important to restoration planning
Surveys	Provide information about whether further active restoration measures are taken	Provide gross information about whether heavily oiled areas being recolonized	

USFWS

DRAFT

SEA OTTER RESTORATION PROGRAM PROPOSAL

Title: Assessment of the effects of, and recovery from, the Exxon Valdez oil spill on the Western Prince William Sound sea otter population

Submitted to: Restoration Planning Work group

Principal Investigators: James L. Bodkin, Brenda Ballachey, Angela Doroff and Daniel Monson

Study period: 1, March 1990 to 1, March 2001

Introduction:

Damages to the sea otter population resulting from the release of hydrocarbons into the environment have resulted from both lethal and sub-lethal levels of direct exposure. Indirect exposure (eg. consumption of contaminated prey) may also affect otter populations and their ability to recover to pre-spill levels. Sea otters, as a top level carnivore, may be accumulating hydrocarbons by consuming prey that are concentrating toxins in their tissues. As a result, the damaged sea otter population may incur additional, possibly increasing damages in the future. Effects on sea otters of prolonged, sub-lethal exposure to hydrocarbons through their prey base may not become evident on a short time scale, but may become evident over a time scale measured in many years or decades. These effects may be accentuated over time as toxin levels in prey increase and are accumulated in sea otter tissues.

Preliminary results of Coastal Habitat and Fish/Shellfish damage assessment studies have identified elevated levels of hydrocarbon concentrations in several sea otter prey species. These prey constitute a major proportion of the sea otter's diet as described by Johnson (unpubl. ms.) and include the bay mussel (Mytilus edulis) and three species of clams (Saxidomus giganteus, Prototheca staminea, and Siliqua patula). Bi-valve mollusks are unable to metabolize hydrocarbons and as a result concentrate these compounds over time. Sediment samples collected throughout the spill zone continue (through summer 1990) to exhibit the presence of hydrocarbons. This would indicate that hydrocarbon levels in bi-valves may be increasing over time. Clam tissues submitted for hydrocarbon analysis have exhibited the highest levels of any tissue samples yet analyzed. These results have been consistent over much of the spill zone, generally coinciding with oiled shoreline. Furthermore, several additional taxa (gastropods, echinoderms and crustacea) of sea otter prey are not currently being collected for toxicological analysis.

Several issues need to be resolved to understand the effects of a contaminated prey base on a sea otter population. First we must

quantify the extent to which sea otters are foraging on contaminated prey and determine the levels of contaminants throughout the prey guild. We have addressed this question under the sea otter foraging study and, alternatively, as a damage assessment proposal. Secondly, we must address the response mechanism of sea otters to a contaminated prey base. Two functional responses exist to this problem. Prey selection may continue as prior to contamination, resulting in assimilation of toxins by sea otters. This may result in damages manifest as reduced growth, survivorship or reproduction (see population assessment study proposal). Alternatively, sea otters may reduce or eliminate, through prey selection, contaminated prey from their diet. This would effectively eliminate a portion of the prey base in Prince William Sound. If sea otter populations are food resource limited in Prince William Sound, as suggested by Johnson (unpubl. ms.), a decline in abundance or a lack of recovery of the sea otter population may result. As mussels and clams may constitute as much as 75% of the sea otters prey base in Prince William Sound, and large scale contamination of these prey have been documented, it is reasonable to assume additional significant damage to the population in either of the functional response scenarios. These damages may occur over a much longer time scale than previous damage assessment studies considered.

Preliminary results of sea otter reproductive success and survivorship in Prince William Sound have not demonstrated a significant treatment effect in these parameters as a result of the spill, yet analysis of blood samples continue to illustrate differences between blood chemistry parameters between treatment and control areas. To address these differences we propose continued monitoring of blood chemistry in live sea otters and collection of tissue samples from dead otters recovered from the spill area.

Our purpose in this program proposal is to provide a conceptual framework for an integration of five separate study plans designed to address the effects of, and recovery from, the Exxon Valdez oil spill on sea otters in Western Prince William Sound. Our approach has been based on documented damages to most of the sea otters prey base in Western Prince William Sound. The program was designed from a multi-disciplinary perspective, incorporating studies of foraging behavior and success, population assessment, blood hematology, tissue toxicology, and mortality. In addition we have proposed two one year studies that will provide a foundation for conducting and analyzing the results of the five long term monitoring studies. We have provided an outline of the objectives of each component of this program along with a comprehensive budget. Individual study plans for each component of this program, with estimated budgets, are attached.

Objectives: (listed by study plan)

1) Sea otter population assessment study

A) To monitor trends in sea otter abundance and distribution in western Prince William Sound through the year 2000 or until complete recovery may be accurately predicted.
B) To monitor reproduction in the sea otter population in western Prince William Sound through the year 2000, or until complete recovery may be accurately predicted.

2) Sea otter foraging study

A) To describe the species composition of sea otter prey and foraging success rates.
B) To describe the species composition and abundance of key sea otter prey.
C) Collect tissue samples of key sea otter prey for toxicological analysis.

3) Sea otter blood study

A) To determine whether alterations in blood parameters (cell counts and chemistry) vary significantly among sea otters living in areas affected by oil.
B) To monitor blood parameters as an index of sea otter health in western Prince William Sound and Kodiak.

4) Sea otter tissue toxicology study

A) To implement a long-term, systematic program to monitor hydrocarbon levels in sea otters and their prey species collected in areas of Western Prince William Sound affected by oil.

5) Sea otter mortality study

A) To determine post-spill trends in mortality (# carcasses/linear kilometer of beach; age-class and sex composition of carcasses).
B) To collect carcasses for necropsy, histological and toxicological studies.

6) Sea otter prey selection study

A) To determine whether wild adult sea otters in containment pens have the ability to select against hydrocarbon contaminated prey species.
B) To determine the ratio of contaminated prey to noncontaminated prey consumed by individual adult sea otters.

7) Sea otter habitat determination study

A) To provide an estimate of the maximum water depth in which sea otters forage.
B) To provide a profile of the distribution of foraging activity between the estimated minimum and maximum water depth which foraging occurs.

Proposed as new NRDA for next yr.

possibility that they can detect HC in prey

Other prey spp/taxa that should be looked at

Components have been incorp. into DA

less costly to Energ. investigations

One-Year (91)

Estimated Total Budget for Sea Otter Restoration Program:

1.	Population Assessment Study	$120,200
2.	Foraging Study	76,600
3.	Blood Study	51,350
4.	Toxicology Study (prey, blood, tissues from carcasses)	10,000
5.	Mortality Study	35,000
6.	Prey Selection Study (Contaminated Prey)[a]	28,500
7.	Habitat Determination Study[a]	137,000
	TOTAL	$458,650

[a]Studies for Spill Year 3 only. Others studies anticipated to continue long-term. Annual budget after Spill Year 3 estimated to be $293,150.

DRAFT

PRELIMINARY STUDY PROPOSAL

Title: Population assessment of the Western Prince William Sound sea otter population, abundance, distribution and reproduction

Submitted to: Restoration Planning Work group

Submitted by: James L. Bodkin, Alaska Fish and Wildlife Research Center

Principal Investigator: James L. Bodkin

Funding requested, year one: $120,200

Study period: 1, March 1990 to 1, March 2001

Introduction:

Preliminary results of Coastal Habitat and Fish/Shellfish damage assessment studies have identified elevated levels of hydrocarbon concentrations in several sea otter prey species. These prey constitute a major proportion of the sea otter's diet as described by Johnson (unpubl. ms.) and include the bay mussel (Mytilus edulis) and three species of clams (Saxidomus giganteus, Prototheca staminea, and Siliqua patula). Bi-valve mollusks are unable to metabolize hydrocarbons and as a result concentrate these compounds over time. Sediment samples collected throughout the spill zone continue (through summer 1990) to exhibit the presence of hydrocarbons. This would indicate that hydrocarbon levels in bi-valves may be increasing over time. Clam tissues submitted for hydrocarbon analysis have exhibited the highest levels of any tissue samples yet analyzed. These results have been consistent over much of the spill zone, generally coinciding with oiled shoreline. Furthermore, several additional taxa (gastropods, echinoderms and crustacea) of sea otter prey are not currently being collected for toxicological analysis. We have under a separate proposal (sea otter foraging study) a study to assess the extent of sea otter foraging on contaminated prey.

The purpose of this proposal is to address the questions of the long term effects of either the consumption of contaminated prey or the selection against contaminated prey on the abundance, distribution and reproduction of the Western Prince William Sound sea otter population. This proposal is dependent on the concurrent proposal regarding prey selection of wild otters and the additional tissue analysis of sea otter prey species for which samples are not currently being collected.

Objectives:

1) To monitor trends in sea otter abundance and distribution in western Prince William Sound through the year 2000 or until complete recovery may be accurately predicted.

2) To monitor reproduction in the sea otter population in western Prince William Sound through the year 2000, or until complete recovery may be accurately predicted.

Methods:

Aerial surveys will be developed to accurately monitor sea otter abundance and distribution in selected portions of the western sound. Surveys will be conducted 3 times/year.

Boat and shore based surveys will be developed and conducted in mid-summer to estimate reproduction rates.

Cost Estimates:

Development of an appropriate aerial survey methodology (first year only).	
200 hr. super-cub time @ 110.00/hr	22,000
Aerial surveys 3 @ 50 hr ea. = 150 hr @ 110.00/hr	16,500
Fuel and fuel cache, 1300 gal.	5,200
Travel	4,000
Boat surveys	
Optical equipment	7,000
Field camp support (2 persons/2 weeks)	1,000
Misc (safety equipment, travel)	4,500
Salaries 1.5 FTE	60,000
Total:	$ 120,200

DRAFT

SEA OTTER RESTORATION PROGRAM

Title: Determination of key sea otter prey species in Western Prince William Sound for enhancement of restored or non-contaminated sea otter habitat.

Submitted by: Angela Doroff and James Bodkin, U.S. Fish and Wildlife Service, Alaska Fish and Wildlife Research Center, Sea Otter Project.

Introduction:

While acute affects of oil contamination have been evident, the sea otter population in Western Prince William Sound may be suffering impacts from secondary exposure to hydrocarbons through contaminated food resources. In damage assessment studies for sea otters, spatial movement patterns, reproductive success, survival of weanling and adult female otters and sublethal physiologic and genetic changes in adult male otters are currently being monitored to address secondary exposure. The result of these studies will address the over all long-term impacts to the sea otter population and will be used in modeling population recovery.

Nearshore benthic invertebrate populations are crucial to the continuance and recovery of the sea otter population in areas impacted by oil. Information from 6 independent coastal habitat damage assessment studies sampling tissues from benthic invertebrates comprising part of the prey guild for sea otters in Prince William Sound has been reviewed. To date, only 5 of 20 potential prey species (A. Johnson unpubl. ms) have had tissue submitted for hydrocarbon analysis. Four major species (3 species of clam and 1 species of mussel) were found to be contaminated. To more directly link contaminated prey species and the recovery and restoration of the sea otter population, we must determine key species being selected for by otters. If these prey items have not been adequately sampled for contamination by other studies, then samples need to be obtained and submitted for toxicological analysis. Ultimately, information on prey contamination and prey selection will provide the restoration working groups with information necessary for the enhancement of key sea otter prey species in non-contaminated or restored sea otter habitat.

Methods:

Prey selection will be determined from shore based observations around Green Island, where we have extensive historical data, and 2 other areas which have yet to be selected. Observations will be made by experienced observers with high resolution 10X binoculars and a 50X Questar telescope. Data recorded will include dive time, surface time, success rate and prey item to lowest taxon. A minimum sample of 500 identifiable prey items will be recorded at each of the three selected geographic areas. Prey item and foraging success can be compared to historic data collected at Green Island (A. Johnson, unpublished ms).

Sea otter prey will be collected from forage areas, and contaminant levels will be determined by standard analytical laboratory procedures.

Objectives:

A) To describe the species composition of sea otter prey and foraging success rates.

B) To describe the species composition and abundance of key sea otter prey.

C) Collect tissue samples of key sea otter prey for toxicological analysis.

Estimated Budget:

Travel and Field Camp:	5,000.00
Boat Fuel:	2,300.00
Equipment	
Dive Gear:	16,000.00
Compressor:	3,000.00
Questar(2):	6,000.00
Binoculars(2):	1,600.00
Analysis:	2,500.00
Misc:	500.00
Toxicological analyses:	
Technical services costs	?
Salaries:	40,000.00
Total:	76,900.00

DRAFT

SEA OTTER RESTORATION PROGRAM

Title: Blood parameters in sea otters living in areas affected by the Exxon Valdez oil spill.

Submitted by: Brenda Ballachey and James L. Bodkin, U.S. Fish and Wildlife Service, Alaska Wildlife Research Center, Sea Otter Project

Introduction:

Sea otters residing from western Prince William Sound to the Kodiak Archipelago were potentially affected by the Exxon Valdez. Degree of oiling and weathering of oil varied among the areas. To date, sea otter damage assessment studies have compared western PWS (oiled area) with eastern PWS (non-oiled control). However, in the sea otter studies, no effort has been made to subdivide the western sound into areas of greater versus lesser oil impact. The Kenai Peninsula and Kodiak Archipelago were also oiled, but no information has been gathered on sea otters presently living in those areas.

Preliminary analyses of blood data collected in the winter of 1989-90 demonstrate differences in certain parameters between sea otters living in WPWS vs EPWS. Furthermore, there appears to be variation in blood parameters among otters living in different areas of western PWS but the extent and significance of this variation is not known.

The primary objective of this of this study is to monitor blood parameters of sea otters living in oiled areas as a means of assessing animal health. A secondary objective is to determine whether alterations in blood parameters vary significantly among sea otters living in areas affected by oil in relation to the severity of the oiling. Blood is a relatively easy tissue to collect, and veterinary panels (to determine complete blood counts and blood chemistry) are an effective means of monitoring animal health. A data base with blood from approximately 400 individuals has been established.

Methods:

Initially, existing blood data from sea otters in western PWS will be further analyzed and categorized by capture location of the otters. Comparisons can be made among otters from various locations in the WPWS. Because these otters have been implanted with radio transmitters, their movements can be related to their capture locations and blood data. Information in degree of oiling for these locations will also be related to the blood data.

To monitor animal health and to verify differences in impact among

otters residing in different areas, further blood samples will be obtained from otters living in three areas: 2 oiled areas in Western Prince William Sound and the Kodiak Archipelago.

Proposed Budget:

Computer analysis		$6,000
Misc. equipment and supplies		$2,000
Capture		
Western Prince William Sound		$10,000
Kodiak		$5,000
Travel & per diem		$3,000
Blood analysis		$1,350
Salaries (8 person months @ $3,000/mo)		$24,000
	Total	$51,350

DRAFT

SEA OTTER RESTORATION PROGRAM

Title: Toxicological analyses for monitoring sea otter populations in western Prince William Sound

Submitted by: Brenda Ballachey and James L. Bodkin, U.S. Fish and Wildlife Service, Alaska Wildlife Research Center, Sea Otter Project

Introduction:
Following the Exxon Valdez oil spill, hydrocarbon contamination persists in the environment. These hydrocarbons are accumulating in various organisms, and relatively high concentrations have been found in sea otter prey species. This in turn presents the potential for chronic exposure and accumulation of hydrocarbons in sea otters. An extensive data base on hydrocarbon contamination is currently being compiled in the damage assessment studies. This includes information on sea otter prey species and sea otter tissues from surviving animals and from carcasses collected in the spill zone. Control samples are also available. The ability to compare samples collected over a long-term period to numerous samples collected early post-spill period provides a unique opportunity to evaluate persistence of toxins.

The objective of this study is to implement a long-term, systematic program to monitor hydrocarbon levels in sea otters and their prey species in areas of western Prince William Sound (WPWS) affected by oil.

Methods:
1. Prey Species. Observations will be made on selection of prey species in WPWS as part of the sea otter restoration studies (see Foraging Study). Based on these observations and depending on the extent of sampling in other studies on fish and shellfish (damage assessment and/or restoration), prey species will be collected and submitted for toxicological evaluation.

2. Sea otter carcasses. Carcasses will be collected during annual beach walks (see Mortality Study). It is also anticipated that carcasses from various parts of PWS will be found and turned in to the USFWS by research and cleanup crews. Of the recovered carcasses, some will be relatively recent mortalities and be sent in for necropsy and collection of tissues for histopathological and toxicological analyses.

3. Sea otter blood samples. Blood will be collected from wild captured animals for the primary purpose of monitoring blood hemograms and chemistry (see Hematology Study). Concurrently, blood samples will be taken for toxicological analyses to enable monitoring of hydrocarbon levels in live animals.

Estimated budget:
(Assumes cost of tox analyses are covered from other sources)

Necropsies (20 @ 150.00)	$3,000.
Histology	4,000.
Miscellaneous supplies	3,000.
Total	10,000.

DRAFT

SEA OTTER RESTORATION PROGRAM

Title: Sea Otter Mortality in Western Prince William Sound Following the Exxon Valdez Oil Spill

Submitted by: Daniel Monson, Brenda Ballachey and James Bodkin
U.S. Fish and Wildlife Service, Alaska Wildlife Research Center, Sea Otter Project.

Introduction:
Chronic exposure to hydrocarbon residues in the environment may have long-term effects on sea otters residing in oiled areas. Changes in the characteristics of mortality (ie. mortality rates, age-class and sex composition of mortality) from pre to post spill time periods may be indicative of exposure to hydrocarbons in the environment compromising the health of the otters.

Work by Kenyon (1969) and Johnson (1987) documented patterns of mortality for sea otter populations within areas at various stages of reoccupation. Extremely low levels of mortality were noted for prime age otters. Levels of mortality for young of the year and old animals increase with length of occupation of an area indicating a stable population (Johnson, unpubl. ms). These studies are based on information gained from carcasses collected on beaches and while they do not provide mortality rates, they do provide a indication of annual changes and regional differences in mortality characteristics.

The Green Island area in western Prince William Sound has a well established otter population and is within the oil spill zone. It was also the site of much of Johnson's work, and thus there are 10 years of base line mortality data for this area. Data on mortality was also obtained post-spill, in the spring of 1990. Using similar beach survey methods in the same area as Johnson (1987), the overall characteristics of mortality can be monitored long-term and compared to pre-spill levels.

Objectives:
Bimonthly beach surveys will be carried out in the Green Island area for the purposes of: 1) determining post-spill trends in mortality (# carcasses/linear kilometer of beach; age-class and sex composition of carcasses), and 2) collecting carcasses for necropsy, histological and toxicological studies.

Methods:
Beaches to be surveyed will include those on Green Island, Little Green Island, Channel Island, and the barrier islands northwest of Gibbon Anchorage on Green Island. These beaches will be walked bimonthly.

Skulls will be taken from carcasses and a tooth extracted for aging (Garshelis 1984). Fresh carcasses will be necropsied as soon as possible and tissue samples for toxicology and histopathology collected. Badly decomposed carcasses or partial remains may have no evidence indicating the sex of the individual. In these cases, if a canine is present and the carcass is that of an adult, sex may be determined by canine diameter (Johnson 1987, Lensink 1962).

All teeth will be sectioned and prepared according to standard procedures. Readings of age will done by two qualified individuals. Necropsies will be performed by personnel at the University of Fairbanks, Institute of Arctic Biology, and histological samples will be sent to the Armed Forces Institute of Pathology (AFIP). Tissue samples will be collected for toxicological analysis.

Budget:

Salaries (6 months @ 3000/month)	18,000
Travel	2,400
Tooth preparation and reading	5,000
Miscellaneous supplies and equipment	10,000
	35,000

Literature cited:

Garshelis, D. L. 1983. Age estimation of living otters. J. Wildlife Manage. 48(2):456-463.

Johnson, A. M. 1987. Sea otters of Prince William Sound, Alaska Unpublished Report, U.S. Fish and Wildlife Service, Alaska Fish and Wildlife Research Center, Anchorage, AK.

Kenyon, K. W. 1969. The sea otter in the eastern Pacific Ocean. North Amer. Fauna 68. 352 pp.

Lensink, C. J. 1962. The history and status of sea otters in Alaska. Ph.D. Thesis, Purdue Univ. 188 pp.

DRAFT

SEA OTTER RESTORATION PROGRAM

Title: Consumption of contaminated prey by sea otters in Prince William Sound

Submitted by: Brenda Ballachey, James Bodkin and Daniel Monson, U.S. Fish and Wildlife Service, Alaska Wildlife Research Center, Sea Otter Project.

Introduction:

Principal prey species of sea otters include crabs, mussels, urchins and clams (Estes et al. 1981, Estes et al. 1982). As a result the Exxon Valdez oil spill sea otters, as well as their prey were subjected to oil contamination. While external exposure by oil was relatively short lived, continued exposure to contaminants may result from consumption of prey, some of which may accumulate and concentrate contaminants.

Previous work by DeGange and Vacca (1989) and DeGange et al. (unpubl. ms.), suggests sea otters may have the ability to discriminate between prey (clams) containing paralytic shellfish poisoning (PSP) and those that did not, preferentially consuming clams without PSP. Alternately, mink have been unable to distinguish between oiled and non-oiled prey (J. Blake pers. comm.) If sea otters are able to discriminate between prey species based on the presence of hydrocarbons, otters living in areas containing patchy distributions of contaminated prey may avoid the consumption of hydrocarbons in prey. If extensive geographic areas of prey are contaminated and are selected against by foraging sea otters, the result will in affect be a reduction of the prey base available. The prespill otter population in Western Prince William Sound was considered to have been at carrying capacity and thus food limited prior to the spill. Otters may not recover to pre-spill levels due to reduced food resources. It is also conceivable that a food limited population may resort to the less desirable, contaminated prey when noncontaminated prey is not available.

The objectives of this study are to determine if sea otters demonstrate the ability to select prey based on the presence or absence of contaminants.

Methods:

Sea otters will be captured from the wild and held in floating, temporary pens for several days. Animals will be offered both contaminated and non-contaminated prey of the same species. Methods of will follow those of DeGange et al. (unpubl ms.).

Estimated Budget:

Sea otter capture		$6,000
Sea otter prey		$4,000
Equipment (holding pens, generator, refrigerator)		$6,500
Salaries (4 person months @ $3,000/mo)		$12,000
	Total	$28,500

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SEA OTTER RESTORATION PROGRAM

Title: Determination of sea otter foraging depths in Western Prince William Sound for population and habitat restoration.

Submitted by: James L. Bodkin, U.S. Fish and Wildlife Service, Alaska Wildlife Research Center, Sea Otter Project.

Introduction:

Sea otter restoration efforts will consider the effects of the Exxon Valdez oil spill on sea otters, both directly, and indirectly as a result of foraging on contaminated prey. Enhancement of restored or non-contaminated sea otter habitat should consider the extent of habitat use based on bathymetric discrimination. Restoration of habitat should be most effective if concentrated in areas of greatest sea otter use.

The abundance of sea otters may ultimately be determined by the quantity and quality of available habitat. Sea otter habitat may be defined by two primary components, the sea floor where prey are gathered and the sea surface where resting, feeding, grooming and social interactions occur. Foraging habitat may be further defined as a band of sea floor extending seaward from the high intertidal to a depth beyond which otters do not forage. Maximum dive depths and therefore the width of this habitat band remain undefined. Additionally, the distribution of foraging within this band is unknown.

The objectives of this study are to provide an estimate of the maximum depth of sea otter foraging and a profile of the distribution of foraging activity within this defined band. This information will aid in defining habitat and prey species that may be best suited in restoration of sea otter populations and habitat.

Methods:

Time/depth recorders will be deployed on one externally attached flipper tag (Temple Tag Co.). An external radio transmitter will be attached on the opposing flipper tag. Radio transmitters will facilitate monitoring movements of active time/depth recorders and recapture of instrumented animals. Up to 40 recorders and radios will be deployed with an anticipated return of 20 instruments. Capture methods will include tangle nets, dip nets and underwater capture methods.

Estimated Budget:

Sea otter capture equipment		
Rebreathers 3 @ $6,000		$18,000
Underwater traps and Tangle nets		$4,000
Time/depth recorders 30 @ $1,400		$42,000
Radio transmitters, external 30 @ $200		$6,000
Dive gear		$9,000
Capture and recapture (fuel,food, vessel support)		$10,000
Travel		$6,000
Aerial radio tracking		$6,000
Salaries (4 persons @ $3,000/mo x 3 months)		$36,000
	TOTAL	$137,000

MEMORANDUM

DEPARTMENT OF NATURAL RESOURCES
OIL SPILL PROJECT OFFICE

State of Alaska

DIVISION OF LAND & WATER MANAGEMENT
SOUTHCENTRAL REGION

TO: Distribution

DATE: October 31, 1990

FILE NO:

TELEPHONE NO: 762-2515

FROM: Rick Thompson Rick
Project Manager

SUBJECT: Recreation
Restoration
Proposals

As promised, here are Art Weiner's three draft proposals for recreation restoration projects. Included in this package are: Environmental Education Program; Potable Water Quality Study: and Recreation Site Restoration/Rehabilitation.

Please review and add your comments/suggestions either directly on the proposals, or separately, and return to Art as soon as you possibly can. To be useful, your comments should be received no later than November 5, 1990. If you have questions, or wish to discuss any aspect of these proposals with Art, please do not hesitate to call. Our number is listed above.

The Oil Spill Project Office's Fax number is 762-2290.

Thank you for your prompt attention to these proposals.

Environmental Education Program

Background

The public's perception of the condition of the area affected by the *Exxon Valdez* oil spill has been determined, to a very great extent, by media reports that date from March 24, 1989 and the following summer. Much of this information is outdated and somewhat misleading leaving the viewer/reader without a clear understanding of the extent of the impact, the actual damage inflicted upon natural resources nor the outcome of cleanup activities and natural recovery processes. Consequently, there is a huge gap between the public's perception of the current condition of the affected area and the reality of the existing conditions. The ramifications of this misapprehension are both widespread and profound.

Users of the affected area and its resources must be made aware of the reality of the current situation in order to restore their confidence in the health of its fisheries and aesthetic amenities. If the prevailing perception that the affected area remains oiled and its fisheries are tainted, the repercussions to the economy of southcentral Alaska will long outlive the actual effects of the spill.

By the time the field season of 1991 is over, three years of impact surveys, damage assessment studies and cleanup activities will have been completed. Moreover, natural processes will have been at work for this period healing the damage. Thus, an enormous amount of unequivocal information will be available to document the actual condition of the affected area.

Objectives

- To restore the public's confidence in the health of the affected area.
- To provide background natural history information on the affected area.
- To present empirically objective information on the impact of the spill.
- To present a description of the cleanup activities and an unbiased evaluation of their efficacy.
- To visually depict the existing condition of the affected area.
- To present the data, in laymen's terms, that predicts the anticipated future condition of the affected area.
- To pass on "the lessons learned".

Scope of Work

The first step in this feasibility process would be to contact private sector and government producers of documentaries and interpretive programs. The rationale for these contacts would be to work up agreements for joint production of the desired products. Several of these outfits have already produced programs on the spill. The basic strategy would be to have one or more of these experienced professionals design and carry out the production of the desired products with guidance from RPWG and others most familiar with the spill and the affected environment. Organizations to be contacted would include:

1. The Discovery Channel
2. The Public Broadcast System [PBS]
3. National Public Radio [NPR]
4. NOVA
5. USFWS
6. NPS
7. ADNR Division of Parks and Outdoor Recreation
8. Environmental education consultants

Once relationships between one or more of these groups is established product details would be defined and RFP's would be worked up. The most desirable scenario would be one in which production costs of the desired products would be underwritten by the producer as a public service.

Products

Detailed descriptions and cost estimates for production of the following:

- ❑ Video that depicts:
  - a) Initial impacts,
  - b) Cleanup techniques
  - c) Existing conditions of the affected area and its resources.
- ❑ Educational curriculum package for grades 6 through 12.
- ❑ Interpretive programs at strategically located State and Federal visitor centers.
- ❑ Kiosk-type displays at:
  - a) Sport fishing access point,
  - b) Ferry terminals,
  - c) Airports.
- ❑ Brochure for dissemination to tourists through travel agencies, hotels and visitor centers.

Responsible Agency

A subgroup of RPWG should carry out this study with consulting guidance from resource agency media experts and PIO offices.

Period of Performance

One month should be necessary to make the necessary contacts and ascertain the potential for joint agreements.

Two additional months should be required to work up product design and detail and write RFP's.

Budget

The budget should include estimates of time, travel and communication costs for the RPWG subgroup to contact producers and collaborate with them on RFP particulars.

DRAFT
Feasibility Study Proposal

Potable Water Quality Study

Background

A number of recreational pursuits that take place within the affected area involve time periods ranging from hours to several days or even weeks. These types of activities include: camping, kayaking, sailing and sport fishing. Due to the size of the area and the difficulty of logistics supply from distant sources, recreationalists are often forced to utilize local sources of potable water, i.e., freshwater streams. The quality of the water within these streams is often suspect due to the possible presence of pathogens. The most common is *Giardia lamblia* a protozoan that causes an infection of the intestinal tract known as giardiasis. The protozoan can be transmitted by wild mammals and by man through cysts in fecal material that are deposited in water reservoirs. Potable water sources are also now possibly contaminated by petroleum hydrocarbons.

Although *Giardia* possibly occurred in the affected area prior to the spill, individual streams had never been surveyed for its presence. During the several seasons of cleanup, thousands of people worked on the beaches and ventured into the uplands. It is not unreasonable to assume that human fecal material was deposited in or adjacent to streams that are sources of potable water. This raises the possibility that the protozoan was introduced into these areas even by people who were non-symptomatic[1]. Once established in wild mammal populations it will undoubtable be persistent and represent a threat to recreationalists.

Objectives

- ☐ To determine feasibility of identifying potable water sources in high use recreation areas within the affected area.
- ☐ To determine feasibility of carrying out microbiological water quality analyses of potable water sources within the affected area.
- ☐ To determine whether potable water sources are affected by the presence of petroleum hydrocarbons from the EVOS.

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[1] "They are found in stools of many normal persons in the cyst form." Fuerst, Robert, 1983. Microbiology in Health and Disease, W.B. Saunders Co., Philadelphia, p. 399.

Scope of Work

1. Contact local water testing labs to determine feasibility of testing fresh water for the presence of *Giardia* and cysts both in the field and in the lab.

2. Evaluate practicality of collection and testing procedures.

3. Utilizing existing data bases, determine feasibility of identifying potable water sources in high use recreation sites within the affected area.

Period of Performance

Winter, 1991.

Budget

To be determined.

Responsible Agency

ADNR

DRAFT
Restoration Project Proposal

Recreation Site Restoration/Rehabilitation

Background

An undefined number of recreation sites in the spill impact area have been adversely affected by the oil and/or cleanup. These include camping areas, potable water sources and small boat haul outs. These sites were identified during the 1990 spring and summer assessment surveys. The observed damage to these sites includes: heavy equipment impacts to tent sites, oil in streams that are used as potable water sources, and recalcitrant deposits of oil in areas used for kayak and canoe haul outs. In some of these areas, surface oil in the form of covers and coats represent an aesthetic eyesore to users and diminish the areas' value for recreation wilderness experience. Based upon the cleanup experience of the last two seasons, it is not anticipated that these oiling and cleanup impacts will be addressed during the 1991 season.

Objectives

- ☐ To recontour/rehabilitate impacted tent sites to their historic condition.
- ☐ To remove all sources of oil from and around fresh water streams used as potable water sources.
- ☐ To remove all oil that could be transferred on to boats or camping gear.
- ☐ To remove all oil that represents an aesthetic eyesore or which diminishes the wilderness experience.
- ☐ To remove all man-made debris from high use recreation areas.

Scope of Work

1. Review digital data bases and hard copy reports to locate high use recreational sites that require restoration.

2. Survey these sites as part of the 1991 spring shoreline assessment to provide details on extent of cleanup/rehabilitation required.

3. Work up site specific restoration plans.

4. Contract out and carry out restoration.

Period of Performance

Spring/summer 1991.

Budget

- Cost of data base review and survey could be incorporated in response planning for the spring survey.

- Restoration planning should take several weeks and possibly require consultation with an engineering contractor for ground work design.

- Actual restoration time and costs estimates will require completion of the above-listed items.

Responsible Agency

ADNR

Coastal/Hab DNR/DEC

Restoration of the Beach Wildrye Community

The Problem–The high intertidal–supratidal Beach Wildrye (Elymus arenarius, E. mollis) communities show signs of localized damage as a result of the Exxon Valdez spill and the resultant clean–up. The damage appears to result primarily from the stress of mechanical abrasion and removal by clean–up workers and equipment. Beach Wildrye is a major component of maintaining natural beach stability. Damage to this community could result in accelerated erosion of the beaches and adjacent upland communities. Also apparently at risk from increased erosion are several nearshore archeological sites.

Recovery Rates–Once the root mass of Beach Wildrye is drastically disturbed, natural recovery may be slow and take years to accomplish. Wildrye recolonizes primarily by spreading outward from undamaged plants. This process can be stopped altogether if the rate of erosion is too great. Once a beach is destabilized, the rate of destabilization often increased until a new point of stabilization is established. This can result in a significant loss of intertidal and supratidal area. Restoration intervention can often restabilize a beach in one growing season.

The Solution–Replanting Beach Wildrye for stabilization is a proven technology. Healthy stocks of Beach Wildrye can usually be found nearby which can be used as a source of donor material. After replanting, a heavy application of 20–20–10 fertilizer (800 pounds per acre) is used to help the transplanted Beach Wildrye to recolonize its former niche. At some locations fertilizer alone is sufficient to encourage existing damaged plant communities to recover without transplanting new stock.

Site Identification–Some preliminary work has been done to identify sites that would benefit from restoration during the 1991 growing season. A determination of the actual number and location of sites to be restored will be done after the 1991 spring shoreline assessment program is conducted. The 1991 assessment will identify additional sites and also disclose the effects of 1990 winter storms.

Budget–Preliminary indications are that a maximum of 15 sites will need work. Approximately 10 man days will be needed per site. Each site is approximately 2 acres in size.

Labor – 15 sites X 10 man days/site X $250/man day =	**$37,500**
Technical assistance	**5,000**
Fertilizer	**15,000**
Vessel Support – 45 days @ $4000/day	**180,000**
Aircraft	**30,000**

Some permits (for cleanup) req. this type of work be done by permittee

COASTAL HABITAT RECOVERY PROGRAM

TITLE: Monitoring recovery of intertidal seaweeds using remote sensing.

PRINCIPAL INVESTIGATOR: Kimbal A. Sundberg, Alaska Department of Fish and Game.

INTRODUCTION AND PURPOSE: Damage assessment studies including the Coastal Habitat Injury Assessment (CHIA) have documented injury to intertidal seaweeds, primarily *Fucus* resulting from the oil spill and subsequent clean up activities. Injuries have been most prevalent in the upper two meters of tidal elevation where persistent oiling and the majority of clean up activities have occurred. Injuries have resulted in significant bare patches in the intertidal zone which are devoid or sparsely populated with algae and associated invertebrates. Intertidal seaweeds are a key component of coastal habitats, providing basic food and shelter for invertebrates and fishes, substrate for herring spawning, and food for deer. Recovery of coastal habitats to the pre-spill condition will depend, in large part, on the recovery of intertidal seaweeds. Recovery rates for intertidal seaweeds in the spill area are not known but it is thought that they will be slow, particularly on sites that are stressed by additional factors including persistent oiling, desiccation, and seasonal ice.

Remote sensing techniques with high spatial and spectral resolution can provide a cost effective means to quantify and monitor bare patches and the recovery of intertidal seaweeds in the spill area. The Compact Airborne Spectrographic Imager (CASI) is a state-of-the-art multispectral scanner designed for applications which require very fine spatial resolution and high spectral selectivity. Tests in 1990 using the CASI in Prince William Sound successfully delineated the distribution of intertidal seaweeds and measured reductions in algal cover at three pairs of oiled and control CHIA study sites. The purpose of this study is to quantify and monitor the distribution and abundance of intertidal seaweeds in the spill area using remote sensing to support the injury assessment studies and to determine rates of recovery.

METHODS: Monitoring will occur at CHIA study sites which are classified as exposed rocky and sheltered rocky habitats. In addition, those sites classified as coarse textured habitat which support significant intertidal algae will also be included. Approximately 40 sites (paired oiled and control sites) will be monitored throughout the spill area, distributed approximately as follows: PWS-20, CIK-8, and KAP-12. A sufficient number of randomly selected CHIA sites will be included to allow statistically robust inferences to be made about other spill affected shorelines.

A digital terrain map (DTM) will be prepared for each site with elevation contours of 1 ft. plus-or-minus 0.5 ft. The DTM will be

prepared using 1:1,200 stereo-pair airphotos obtained for each site, and standard photogrametric modeling techniques. CASI images will be obtained during April-May when *Fucus* growth is at a maximum and red algae are easiest to identify. Both the DTM and CASI images will be registered to ground control markers which will be placed at permanent monuments (metal tags) which currently mark measured transects at CHIA sites. Both DTM and CASI images will be obtained during minus tide series, whenever possible. CASI images will be field processed and ground truthed to classify pixels and to verify their validity. Based on 1990 tests, we expect to achieve a pixel resolution of approximately 0.5 square meters.

The CASI images will be overlaid on the DTM using a raster-based GIS image processing and modeling software (ERDAS) to derive percent cover, distribution, and abundance estimates. This GIS software will work with the ArcInfo GIS software used under Technical Services Study Number 3 to support the Coastal Habitat program. Seaweeds will be classified and mapped at the lowest achievable taxonomic level.

DURATION AND SCOPE: CASI images will be acquired annually until recovery is complete.

EXPECTED RESULTS: This study will produce precise annual measurements of percent cover, distribution and abundance of intertidal seaweeds at oiled and unoiled shorelines. This information will be used to determine duration of injury (loss of services) and recovery rates.

ALTERNATIVES CONSIDERED:
NO ACTION - The measurements of seaweed cover are derived from statistical extrapolation of a limited number of CHIA quadrats.
CASI W/O DTM - Measurements of are limited to two dimensions. This is less precise than three dimensional modeling and generally under estimates total surface area.

COSTS: Costs for acquiring the DTM and image processing hardware/ software are one-time expenses. Monitoring in subsequent years will be limited to the costs of acquiring and processing CASI data.

Line Item		Costs($ thousands)
100	Personnel	38.7
200	Travel	4.0
300	Contractual	
	DTM and control	100.0
	CASI	150.0
	Aircraft	40.0
	UA-SE(ground truth)	21.2
400	Supplies	4.0
500	Equipment	
	Sun Workstation/ERDAS	55.0
	TOTAL	**412.9**

Proposed 1991 Restoration Project Description

Title: Prince William Sound Herring Stock Management Accuracy

Lead Agency: Alaska Department of Fish and Game

Principal Investigator(s): Evelyn Biggs, Tim Baker and Fritz Funk

Introduction: Prince William Sound adult herring spawning migration timing coincided with the Exxon Valdez spill disaster and as a result, over 40% of the spawning area was oiled before and during egg deposition. Significant sublethal effects and resulting damage was measured on herring eggs and larvae and there is evidence from data collected in 1990, as well as from historic literature, that second and third year affects are and will occur due to direct and indirect oiling of herring roe, deposited eggs, and hatched larvae. Damage resulting from 1989 and subsequent years will affect recruiting herring spawning as early as 1992 (as partially recruited 3 year olds) and beyond (as fully recruited 4 year olds and older). An extremely effective restoration tool, that is relatively low cost (since logistics are already partially in place), is accurate fisheries management. Accuracy in management enables managers to make fine-tuned adjustments in fishing quotas which could more effectively result in measurable rehabilitation for PWS herring stocks. Ecosystem damage (to every thing from mammals and birds to other species of fish and invertebrates) resulting from herring prey contamination and decline (herring being an integral and major part of the food chain biomass in the Sound) would therefore be partially rehabilitated as well.

The following goals and objectives have been identified that will add accuracy to fisheries management of Prince William Sound herring:

1) Maintain strict accuracy in the spawn deposition (ground) survey estimate which is used to estimate the total herring escapement biomass.

2) Continue an egg loss study, as the egg loss component is a direct multiplier in the spawner escapement biomass estimate model.

3) Improve biomass forecasting model with extended biometric review and analysis.

4) Stock identification and tagging study to establish and define the management unit(s) of the PWS stock.

Methods: The following methods will be employed to complete the objectives listed above:

1) The spawn deposition survey estimate is improved through increased sample size (more transects), employing third year calibrated divers, by conducting sufficient AWL sampling in all the spawn areas, and by sampling for fecundity from the AWL samples.

2) Egg loss data has been collected in 1990 in Prince William Sound and in 1982 in Togiak; similar methods can be employed for two additional seasons and analyzed to assist in fine-tuning the multiplier. In addition, a literature review would be conducted. This study would be subcontracted to the University of Alaska as a graduate student project.

3) Staff biometricians would reanalyze historic and current data to improve population models used to predict future herring stock sizes, age compositions, and recruitment. Standard fisheries management and population statistics will be employed and developed.

4) Fish will be subsampled from the regular herring AWL program in place for examination of genetic, meristic and morphologic, or otolithic differences (all stock identification methods currently being used) to help define the PWS management units. In addition a tagging program will be instigated to help describe the area utilized by the PWS stock(s) or unit(s) and define the degree of stock mixing.

Duration and Scope: The scope of project will be include all coastal areas in Prince William Sound, and the outer cape areas westward past Seward to Gore Point and eastward to Cape Suckling.

Various phases of the project will last from three to five years in duration.

Expected Results: Increased accuracy in fisheries management is expected to result in a more rapid and complete rehabilitation of damaged herring stocks and affected ecosystem components. Individual stocks or management units having been identified that may have been damaged disproportionately due to oil exposure, compared to other undamaged individual stocks, can more easily be protected from additional damage due to fishing mortality; fishing pressure can be shifted to undamaged units.

Alternatives Considered: No action. Results would include inability to conclusively identify individual stocks, that may be affected differently, losing the ability to direct fishing pressure to known, undamaged stocks. In addition, without an increase in accuracy of forecasting and quota setting, fishing pressure

could counteract other rehabilitation measures; conversely, unjustified conservative fishery management could add increased damage due to overescapement and could result in large losses to the commercial industry and fish tax dollars (net loss to the State).

Cost: For 1991 the four objective components would cost approximately:

1) $50,000

2) $40,000

3) $15,000

4) $225,000 for phase I

Total projected 1991 costs are $330,000. Cost/Benefit analysis would be relatively easy to construct for this project.

Proposed 1991 Restoration Project Description,
Natural Recovery Monitoring Project

Title: Prince William Sound Ecosystem Damage Affects

Lead Agency: Alaska Department of Fish and Game

Principal Investigator(s): James Brady and Evelyn Biggs

Introduction: Prince William Sound adult herring spawning migration timing coincided with the Exxon Valdez spill disaster and as a result, over 40% of the spawning area was oiled before and during egg deposition. Significant sublethal effects and resulting damage was measured on herring eggs and larvae and there is evidence from data collected in 1990, as well as from historic literature, that second and third year affects are and will occur due to direct and indirect oiling of herring roe, deposited eggs, and hatched larvae. Damage resulting from 1989 and subsequent years will affect recruiting herring spawning as early as 1992 (as partially recruited 3 year olds) and beyond (as fully recruited 4 year olds and older). Effects on herring stocks of further damage to the ecosystem, for example by upland timber harvest and log storage, are virtually unknown; these effects would compound the damage done by the spill. Therefore, it is proposed that possible damage from upland timber and log storage be examined in areas currently used for timber harvest that overlap herring spawning areas. In this way an evaluation could be made, in terms of the herring resource alone, of acquisition of upland timber and marine sanctuary creation as a restoration tool that prevents further stock damage by protecting further ecosystem damage.

The following goals and objectives have been identified that will add monitor effects of upland timber resources on herring spawn:

1) Measure rates of sedimentation, water quality, herring egg survival, and hatching success in sites selected directly adjacent to active logging areas. Compare these rates to nearby sites with comparable spawn densities that are pristine.

2) Expand the normal aerial survey program to enable daily monitoring of schools of spawning herring near timber harvest areas and document their behavior and movement.

Methods: The following methods will be employed to complete the objectives listed above:

1) Methods would be employed similar to those already utilized in the spawn deposition survey and herring egg mortality

projects that are well in place. ADFG Habitat Division data and possibly DEC water quality sampling would be incorporated to evaluate changes in the water column and ecosystem affects.

2) Standard aerial survey methods would be employed to follow and enumerate herring schools; these methods have been in place for over ten years; additional staff time and training would be required.

Duration and Scope: The scope of project will be include all coastal areas in and near Prince William Sound where timber harvest activities coincide with herring spawn. It is expected that a one year scope will be sufficient to evaluate the effects of upland use on herring spawn.

Expected Results: Knowledge of effects of upland ecosystem activity and damage will be revealed through this study. The results gained may help in evaluating upland timber resource acquisition as a restoration tool.

Alternatives Considered: No action. Effects of logging and timber storage on herring spawn will remain unknown.

Cost: For 1991 the monitoring would cost approximately $15,000.

Proposed 1991 Feasibility Study Description

Title: Herring Spawn Substrate and Herring Egg Transplant

Lead Agency: Alaska Department of Fish and Game

Principal Investigator(s): Evelyn Biggs

Introduction: Prince William Sound adult herring spawning migration timing coincided with the Exxon Valdez spill disaster and as a result, over 40% of the spawning area was oiled before and during egg deposition. Significant sublethal effects and resulting damage was measured on herring eggs and larvae and there is evidence from data collected in 1990, as well as from historic literature, that second and third year affects are and will occur due to direct and indirect oiling of herring roe, deposited eggs, and hatched larvae. Damage resulting from 1989 and subsequent years will affect recruiting herring spawning as early as 1992 (as partially recruited 3 year olds) and beyond (as fully recruited 4 year olds and older). Enhancing and increasing natural larval production from a spawning area would be one approach to mitigating any damage to the Prince William Sound stock(s).

A direct restoration tool that deserves evaluation is transplantation of spawning substrate (certain kelp species or artificial substrates) and transplantation of loose egg windrows transported to shore following storms (normally these eggs die unless resubmerged in seawater). There is evidence that herring egg survival and hatching success is variable with the type of kelp substrate utilized for spawning and with the number of egg layers deposited. Generally, species with large interstitial spaces (e.g. hair kelps and fern kelps) promote better oxygen exchange and spacing between eggs, which enhances survival of the eggs and hatching success, that other species of leafy kelps (such as the Laminarians). In addition, the greater the number of egg layers deposited, the poorer the total egg survival, fertilization rate, and hatching success; therefore increasing spawning substrate in an area being utilized by spawners should decrease overall egg density per area unit.

In some years when storms coincide with egg incubation, wave action transports a significant (at times measurable in tons) amount of herring eggs pulled loose from spawning substrate to the upper limit of the high tide line. Normally, these eggs remain exposed to predation and air, rotting in place. Canadians measured a degree of success in transplanting these eggs to underutilized areas (Hay and Marliance, 1988); success was measured in observed larvae hatching from the resubmerged eggs and measuring remaining egg mortality.

The following goals and objectives have been identified that will test the feasibility of this type of technique to assist in stock rehabilitation:

1) Test the feasibility of spawn substrate transplant in a single area, typically utilized by spawners and representing the oiled spawning areas; success will be measured by comparing egg survival, hatching success, and larval densities from a transplant area versus a control area with similar total egg density.

2) Test the survival and success of hatch in transplanted, windrowed eggs moved to specially designed containment trays submerged in nearshore areas.

Methods: The following methods will be employed to complete the objectives listed above:

1) Sites will be selected in Rocky Bay and western beaches of northern Montague Island; 3 control and 3 test sites will be identified; hair kelps, other species of red kelps, and possibly artificial substrates will be cut from areas south on Montague and reanchored nearshore the test sites; after spawning the sites will be surveyed, egg densities measured, and they will be monitored every 4-5 days until hatch; egg survival and % hatch will be measured from each monitor period and after hatch, larval trawls (designed after sampling devices used by Finnish researchers) will be employed to measure larval density.

2) After storm events in areas near those sites listed above, egg left on the beach will be carefully shovelled to holding trays, transported to skiff, kept moist by periodically spraying with seawater, and deposited in two meter square small mesh trays suspended one to two meters from the surface. When the kelp transplant sites are checked, suspended trays will be sampled for egg survival, % hatch, and after hatch, total eggs remaining will be measured, revealing overall success.

Duration and Scope: The scope of project will be include the northern and western portions of Montague Island; the time frame is April to mid-May, 1991. The project will last for one year; feasibility will be analyzed by the fall of 1991.

Expected Results: Exact cost versus benefit are unknown at this time, but can hopefully be formulated once the success of the venture is measured. The feasibility study will measure the level of enhancement and increase in productivity possible with this kind of venture.

Alternatives Considered: None were proposed that seemed feasible without a considerable amount of expense and exploratory

research (i.e. a herring hatchery).

Cost: For 1991, both study objectives could be completed at a cost of approximately $40,000.

Literature Cited:

Hay, D.E. and J.B. Marliave. 1988. Transplanting Pacific herring eggs in British Columbia: a stocking experiment. AFS Symposium 5:49-59.

PROPOSED 1991 RESTORATION PROJECT DESCRIPTION

Title: Public Access

Lead Agency: Alaska Department of Fish and Game

Principal Investigator: Kent J. Roth

Introduction:

Prince William Sound (PWS) supports a significant recreational fishery for salmon, trout, char, and bottomfish. Additional sportfishing opportunities have been created in recent years with the enhancement of salmon in Valdez and Cordova. The 1989 oil spill impacted the native populations of fish in PWS and has increased public awareness and use of the recreational resources of PWS. While public use of access sites in PWS have been increasing in recent years, activity levels have increased dramatically as a direct result of the spill. There has been an increase in pressure placed on both impacted and nonimpacted fish stocks, increased demand and competition for parking areas, and a shortage of proper sanitation facilities on already crowded existing sites. The increased activity levels are a result of both increased awareness and recreational use by the public as well as increased use by transients working both directly and indirectly with spill cleanup and restoration programs.

The goals of the access restoration project is improve access, parking and sanitation facilities in the Cordova and Valdez areas which have resulted from the large influx of people to PWS as a result of the oil spill.

Methods:

Parking areas, access sites, and sanitation facilities would be expanded and upgraded in Cordova at Flemming Spit and in Valdez in the area near Allison Point; two areas impacted from increased awareness and activity as a result of the oil spill.

Duration and Scope:

The program would initially run from June 1, 1991 through May 30, 1992. Program completion would depend on the time frame required to obtain any permits, designs, and bids required for the program. The scope of the program will include the research, permitting, land acquisition, design, and construction of the facilities and parking areas in Cordova and Valdez.

Expected Results:

The improvements to parking and access would help relieve the problems of congestion, overcrowding, sanitation, and accessibility in Cordova and Valdez. This would help restore these fisheries back to the previous levels of a quality fishing experience for the recreational angler. In addition, a reduction of ground litter and erosion is expected.

Alternatives Considered:

No action. Not implementing this program in 1991 will result in the continued access, crowding, and sanitation problems observed at these sites during 1989 and 1990. A second alternative considered was the use of Dingall-Johnson (DJ) funds for these improvements. Although access and facility improvements at these sites were expected to be needed in the future, the oil spill has resulted in these developments being required much sooner than they would have had the spill not occurred. The appropriation of access funds from DJ monies for these programs at this time would eliminate the much needed access and development projects scheduled for other sites from the current and near-future DJ appropriations.

Cost:

No cost estimates have been formulated to date. Evaluation of project scope, engineering and design costs, and materials and labor will need to be completed before a final cost estimate can be provided.

PROPOSED 1991 RESTORATION PROJECT DESCRIPTION

Title: Public Information

Lead Agency: Alaska Department of Fish and Game

Principal Investigator: Kent J. Roth

Introduction:

Prince William Sound (PWS) supports both anadromous and resident populations of cutthroat trout and Dolly Varden char as well as stocks of demersal and pelagic rockfish. The trout in PWS are at the upper limits of their native range and populations are generally small site specific with complex migratory behavior. Many of the rockfish species are relatively stationary, long lived, and late to mature resulting in their increased susceptibility to over exploitation. Little is presently known on the numbers and species of rockfish harvested by the charter boat operators in PWS.

Fish and Shellfish Studies No. 5 and 17 have documented injury to rockfish, cutthroat trout, and Dolly Varden char in PWS as a result of the 1989 oil spill. In addition, increased awareness of fishing opportunities by sport anglers due to the increased activity and publicity in PWS as a result of the spill is expected to increase effort and harvest levels for selected stocks. Management concerns are that, due to injury from the spill, selected stocks may now be biologically depressed such that continued sport and/or commercial targeting of these species may further reduce these populations below naturally sustainable levels.

The goals of the organization and dissemination of information to the commercial and sport users in PWS is to redistribute the effort and harvest away from stocks for which there is known or anticipated biological concerns for their management. In addition to protecting these stocks, an objective of the program would include inform anglers of other fishing opportunities within PWS to allow them to continue to utilize PWS for recreational fishing.

Methods:

Stocks of biological or management concern would be presented in brochures and publications on fishing opportunities in PWS and alternative angling sites and/or species would be suggested. In addition, a logbook survey would be initiated with the charter boat fishing operators working in the major ports in areas affected by the spill to document the numbers, species, and location of rockfish harvested by their clients. No conflicts are expected with other programs or ongoing clean-up efforts as a result of this program.

Duration and Scope:

The program would run from June 1, 1991 through May 30, 1992. The scope of the program will include the research, design, printing, and dissemination

of the brochures and logbooks to anglers and supporting organizations, businesses, and charter boat operators. Data collected from the proposed rockfish and cutthrouat trout/Dolly Varden char studies would be incorporated

Expected Results:

The brochures and information dissemination will assist in redistributing effort and harvest in PWS resulting in the a reduction in pressure on selected stocks and providing protection to the selected species and stocks from over exploitation. At the same time, anglers will be provided information on the other angling opportunities available in PWS so that a diversity of continued recreational opportunities remain available. The long-term result will be the rebuilding of the selected stocks allowing the eventual return of these angling opportunities. The charter boat logbooks will assist in providing the data necessary to evaluate and protect the rockfish in PWS through and increase in the precision of management strategies.

Alternatives Considered:

No action. Not implementing this program in 1991 may result in the over exploitation of specific stocks of cutthroat trout, Dolly Varden char, and rockfish beyond the point of natural recover to pre-spill levels. A second approach to achieving the goal of stock protection is the closure of fisheries known or suspected to be injured. However, this approach would restrict angling opportunities without providing information on other available opportunities. The program proposed for 1991 would be the most cost-effective approach to protect injured stocks while maintaining recreational diversity and opportunity.

Cost:

Line 100	6 man-months at $3,000/month for research, design, and distribution	$18,000
Line 200	Travel-distribution of brochures	1,000
Line 300	Printing	4,000
Line 400	Miscellaneous supplies	600
Line 500	No expenditures anticipated	0
	TOTAL	$23,600

RESTORATION EFFORTS FOR MONITORING CONTAMINATION AND SUB-LETHAL EFFECT ON ROCKFISH AND SHALLOW REEF HABITAT IN THE AREAS AFFECTED BY THE EXXON VALDEZ OILSPILL

We know that there were lethal effects to rockfish, as shown by the recovery of dead and dying rockfish immediately after the spill, and that there was some level of sub-lethal effects, based on bile samples taken later in 1989. The results of the 1990 field studies will help in determining the long term persistence of the sub-lethal effects and to what extent the shallow reef habitats and food sources were affected. If the presence of hydrocarbons is detected in the tissue, food samples, or sediment samples collected in 1990; or the histopathological examination or enzyme activity indicates persistent sub-lethal effects of the oil, then studies similar to Fish/Shellfish Study 17 conducted in 1990 would be warranted under restoration in order to determine the long term persistence of these sub-lethal effects.

Studies should be directed toward collecting samples to determine the continued presence of hydrocarbons in the reef habitats through analysis of sediments, sessile organisms and food organisms. In addition samples of rockfish tissue should be collected for analysis for hydrocarbons and histopathological examinations to determine the presence of long term sub-lethal effects. The 1989 and 1990 studies were limited in geographic scope to Prince William Sound and the lower Kenai Peninsula. This study could encompass the entire geographic area impacted by the oil spill.

RESTORATION OF ROCKFISH AND OTHER BOTTOM FISH POPULATIONS IN PRINCE WILLIAM SOUND

Lead Agency: Alaska Department of Fish Game
Principal Investigator: Kelly Hepler

The lethal and sub-lethal effects of the oil spill have added a major factor in the potential decline of rockfish, an increasingly popular sport and commercial fish. Additionally, there were sub-lethal effects to pollack and possible sub-lethal effects to select prey species. Nearshore areas which are used as nursery grounds for some species of bottom fish were also impacted by the oil spill. The results of the 1990 field studies will help in determining the long term persistence of the sub-lethal effects and to what extent the shallow reef habitats and food sources were affected.

Current information indicate that select stocks of bottom fish, including rockfish, are depressed. Rockfish are long lived fish (with maximum age approaching 100 years) and exhibit relatively slow recruitment making restoration a long term, very difficult process; for lost or damaged resources. This project should logically transition toward continued evaluation of stocks of rockfish with emphasis on stock status and population dynamics of these fish.

There is a paucity of population dynamics and catch information for these stocks and there is an immediate need to collect these data in order improve the precision of the management of these stocks. An examination of historical commercial fisheries data coupled with a port sampling program evaluating sport and commercial harvests would provide a database of harvest levels and the basic age and size composition information for these fish providing a basis for assessing sustainable yields of these stocks. In addition, the age structure data would permit cohort analysis to determine if specific age groups are weak. It is also necessary to assess the distribution and abundance of these stocks within the area affected by the spill in order to manage these stocks geographically. A stock inventory program could be initiated to determine the distribution and species composition of these fish. This would be accomplished by divers, hook and line or trawl type surveys. Diving techniques are preferred in order to avoid mortality associated with destructive sampling techniques in areas of low stock density. The data collected during this project would also allow us to possibly redirect fishing effort and catch from impacted populations to other healthier populations of fish and therefore provide alternative harvest opportunities for fishermen who were displaced due to management actions taken to ameliorate impacts of the oil spill. These studies will also serve to expand our database in preparation for future spills.

RESTORATION OF DOLLY VARDEN CHAR AND CUTTHROAT TROUT POPULATIONS IN PRINCE WILLIAM SOUND

Lead Agency: Alaska Department of Fish and Game
Principle Investigator: Kelly Hepler

Information collected by NRDA programs has documented that there were significant differences in the survival of Dolly Varden char and cutthroat trout and growth of cutthroat trout between oiled and control sites in PWS. Additionally, analysis of bile from Dolly Varden char have shown elevated levels of hydrocarbon metabolites in both Oil Year 1 and 2. A study would be warranted under restoration in order to determine long term persistence of these lethal and sub-lethal effects and to provide a greater resolution of management strategies.

Many of the field activities associated with this project could be integrated into the field programs proposed for the restoration of pink salmon stocks in PWS. This would increase the cost effectiveness of the both programs. The feasibility for this type of project is well established and the project can be readily established for the 1991 field season.

We feel that collecting the necessary data to increase the precision of the management of affected stocks is the most effective method available at the present time to enhance the recovery of char and trout in PWS and should be undertaken immediately. A greater resolution in our management approach will allow the Department to restrict the catch of fish on a site specific basis instead of enacting area wide restrictions which would greatly reduce the opportunities available to anglers. It will also be necessary to study populations of char and trout outside of impacted areas. This will allow us to possibly redirect angling effort from impacted populations to other healthier populations of fish and therefore providing alternative fishing opportunities for anglers who were displaced due to management actions taken to ameliorate impacts of the oil spill. Additionally, data collected from this program could be used to identify further restoration methods for these stocks such as identifying possible sites for the placement of fish passes or critical habitat areas that could be protected through the purchase of private inholdings or mineral rights.

The Department of Fish and Game did not have any programs on the ground in PWS before the oil spill to study the char and trout populations. Our only source of data on these stocks before the oil spill was a statewide harvest survey which provided us basic catch data. The harvest survey was expanded after the oil spill to provide a greater resolution of catch statistics. We also know through tag recoveries in 1990 that there is fishing mortality attributed to the incidental catch of char and trout in the commercial fishery although the full extent of the incidental catch is not known. These harvests plus a known mortality associated with oil have caused concern that some of the impacted stocks could be below levels that are necessary to maintain the populations on a sustained yield basis.

Title: Development of Pink salmon Stock Separation Techniques Through the Application of Otolith Mass Marking Technology.

Principal Investigators: Larry Peltz, FRED Division; Dr. Jim Hasbrouck, FRED Division; Karen Crandall, FRED Division; Hal Geiger, Division of Comm Fisheries.

Introduction: Link to known NRDA injury, Goals and Objectives

Pink salmon populations in oil impacted areas of coastal Alaska demonstrate signs of physical exposure to oil, and populations of some small stocks may have been damaged. As such, these natural stocks may respond to rehabilitation. Managers propose to restore these stocks population numbers by allowing for increased escapement to respective streams of origin. In the process of reducing exploitation to small stocks of salmon that have been stressed, exploitation may be reduced on larger and unimpacted populations. This could create biological and economic feedbacks. Biological feedbacks could occur, in that stronger stocks may over-escape, causing decreased production. Economic feedbacks could occur, in that the harvest of some hatchery stocks may be reduced or restricted to terminal areas with reduced quality and decreased value.

The ability to separate all discrete stock components is important for management of the Pink Salmon fishery and for evaluating the consequences of specific restoration alternatives in Prince William Sound, as well as Lower Cook Inlet and Kodiak.

Methods

Existing studies in the NRDA process intend to gain a better understanding pink salmon fishery interactions. Some of the new studies proposed below could be combined with the tasks that would be continuing under the existing pink salmon damage assessment studies.

The spacial and temporal distribution of enhanced, and wild stocks in oil impacted areas will be determined through coded wire tagging in a related study. In this study, otolith marking will be tested as potential alternative to coded-wire tagging.

1. Coded-wire tagging is assumed to continue at the same locations and levels of tag application as in NRDA study #3. Additional wild stock sites may be added if deemed necessary.

2. Otolith marking will be attempted at one or more hatcheries. Catch contributions will be compared to results obtained from coded-wire tagging. The presence of naturally occurring otolith marks will be investigated at wild stock sites.

3. The use of scale pattern analysis (in this study or as part of conventional marking studies) to differentiate wild and hatchery stocks of fish may also be investigated.

4. This project would be linked with a population modeling effort which may occur as part of this study or could be contained in a related study.

Duration and Scope:
This study could commence in FY 91, and would be expected to continue for at least 3 years. Useful data for restoration could be obtained as early as the second year.

Expected Results.

Application of CWT's and associated recovery programs to enhanced and selected wild stocks will, on its own, provide new knowledge of stock composition of harvests. Thus, probability of success is close to 100 %. New quantitative marking tools (proposed in this study) are promising, and may provide reliable and affordable stock separation techniques. A breakthrough in this area is deemed likely, because of the success with this identification technique in the enhancement of sockeye salmon.

Cost of study.

Additional coordination required with other tagging and evaluation work will be required to project costs.

Title: Salmon Otolith Marking Studies in Prince William Sound

Lead Agency: Alaska Department of Fish and Game

Principal Investigator: Sam Sharr

Introduction:

Salmon stocks in Prince William Sound which were impacted by the Exxon Valdez Oil Spill (EVOS) are also heavily exploited in commercial, sport, and subsistence fisheries and can most effectively be restored through stock specific management practices designed to reduce exploitation on impacted stocks. The stocks in areas heavily impacted by the EVOS occur in mixed stock fisheries dominated by hatchery stocks and wild stocks from unaffected areas of the Sound. Restoration premised on stock specific management of the commercial fishery for reduced exploitation of impacted stocks will require accurate inseason estimates of the escapements of impacted and unimpacted wild stocks.

This project is designed to test the feasibility of using thermal or stress marks on otoliths to identify stocks in the fisheries of PWS and make time and area specific catch contribution estimates for those stocks. Otolith marking has a proven track record as a stock identification tool and has advantages over existing coded-wire tag stock identification procedures because it allows researchers to effectively tag every fish in the population instead of a relatively small random subsample. Otolith marking has never been done on the scale which will be necessary in PWS. This project will begin by testing the feasibility of applying thermal marks on the otoliths of fish in the massive hatchery releases in PWS. If otolith marking can be adapted to the large scale of the hatchery releases in PWS it may provide much more accurate and reliable option to existing the existing coded-wire tag technology. This program will also investigate that stressed wild stocks (ie. oil impacted) may also exhibit unique otolith patterns. If this is so, the technique may also be used to estimate contribution rates of oil impacted stocks to fisheries. Accurate inseason stock specific contribution estimates will enable fisheries managers to identify exploitation rates which are too high for impacted stocks and alter fishing patterns to reduce or eliminate exploitation of those stocks. The manager will also be able to identify any under exploitation of hatchery stocks or unimpacted wild stocks and direct very localized fishing effort on those stocks to harvest the surplus fish. Post season analyses of the coded-wire tagging project together with results from proposed escapement enumeration projects will provide stock specific estimates of total return and enable managers to assess the effectiveness of their stock specific management strategies.

In the absence of the improved stock specific management capabilities afforded by this project, salmon stocks in western PWS which have already badly stressed and depleted by the impacts of oil will potentially be over exploited in the commercial, sport and subsistence fisheries. Population levels may be reduced below those consistent with rapid recovery of the resource and in some instances may result in virtual elimination of impacted stocks.

Methods:

The technology and methodology for stock identification based on otolith marking studies is well established on a smaller scale for hatchery stocks of salmon in Washington and the technique has been used for sockeye salmon in Alaska. The Alaska Department of Fish and Game and PWS area aquaculture associations have begun testing the procedure for hatchery stocks of pink salmon. The existing NRDA projects have greatly enlarged the scope of the pre-spill coded-wire tag projects. If feasible otolith marking could provide a reliable, accurate and more cost effective alternative to expensive CWT technology and would be a logical extension of CWT studies as part of restoration through improved fisheries management.

Duration and Scope:

The restoration of impacted odd and even year pink salmon stocks will require selective management over a minimum of two generations for each cycle. Chum and sockeye salmon require three to five years to mature and will require more time for full restoration of impacted stocks.

Expected Results:

Because salmon are a major vehicle for the transport of energy and nutrients from the high seas environment to the nearshore and upland ecosystems, restoration of impacted stocks will have important ramifications for plant and animal communities in those areas.

Alternatives Considered:

Failure to implement a package of programs designed to improve stock specific management capabilities may result immediate and serious exploitation of stocks already seriously stressed by the impacts of oil. Long term disastrous declines in those populations may be the result of such an option.

An alternative to no action would be to impose extremely conservative harvest strategies upon all stocks in the PWS fisheries. This would probably achieve the desired effect of providing protection for impacted stocks but could mean that a harvestable surplus of several million hatchery fish and fish from unimpacted wild stocks would not be utilized. From an economic stand point this could have disastrous immediate as well as long term effects on the highly capitalized fishing industry in PWS. From a resource management point of view it could also be deleterious. For some species of salmon which rear in freshwater (ie. sockeye) the effects of putting too many spawners in the systems utilized by unimpacted stocks could lead to serious overpopulation of available rearing area and subsequent major declines in fry populations and future adult returns. The effects of over escapement of unimpacted pink salmon stocks is still a hotly debated subject but it is clear that there is no biological benefit in exceeding the carrying capacity of the spawning grounds and there may be serious deleterious effects such as superimposition or excessive egg deposition and subsequent oxygen starvation.

Title: Ground Enumeration of Salmon Escapements in Prince William Sound

Lead Agency: Alaska Department of Fish and Game

Principal Investigator: Sam Sharr

Introduction:

Salmon stocks in Prince William Sound which were impacted by the Exxon Valdez Oil Spill (EVOS) are also heavily exploited in commercial, sport, and subsistence fisheries can most effectively be restored through stock specific management practices designed to reduce exploitation on impacted stocks. The stocks in areas heavily impacted by the EVOS occur in mixed stock fisheries dominated by hatchery stocks and wild stocks from unaffected areas of the Sound. Restoration premised on stock specific management of the commercial fishery for reduced exploitation of impacted stocks will require accurate inseason estimates of the escapements of impacted and unimpacted wild stocks.

This project is designed to greatly improve the accuracy of real time, escapement estimates for salmon stocks of Prince William Sound. The project will allow fisheries managers to adjust escapement estimates based on and aerial survey program by correlating the aerial counts with counts from a systematic ground survey program on a subset of the same streams. Ground surveys are considerably more accurate than aerial surveys but cannot be done with nearly the frequency nor can they be done as efficiently on as many streams. They are not a replacement for aerial counts but are an important means of checking and calibrating aerial counts. Accurate inseason escapement estimates will enable fisheries managers to identify shortfalls in the numbers of fish spawning in impacted streams and impose fisheries restriction to reduce harvest rates on those stocks. The manager will also be able to identify any excesses in escapement in unimpacted stocks and direct very localized fishing effort on those stocks to harvest the surplus fish. Post season analyses of the escapement enumeration project together with results from the proposed Coded-Wire Tagging project will provide stock specific estimates of total return and enable managers to assess the effectiveness of their stock specific management strategies.

In the absence of the improved stock specific management capabilities afforded by this project, salmon stocks in western PWS which have already badly stressed and depleted by the impacts of oil will potentially be over exploited in the commercial, sport and subsistence fisheries. Population levels may be reduced below those consistent with rapid recovery of the resource and in some instances may result in virtual elimination of impacted stocks.

Methods:

The technology and methodology for escapement enumeration by coupling ground counts with an extensive systematic aerial survey program are well established and have a long history of success in Alaska. The historic aerial and ground survey data base for Prince William Sound is the best in Alaska and will provide important base line data for restoration efforts. The existing NRDA projects greatly enlarged the scope of the pre-spill escapement enumeration projects and the proposed salmon escapement

enumeration projects to be used for restoration through improved fisheries management are a logical extension the NRDA process.

Duration and Scope:

The restoration of impacted odd and even year pink salmon stocks may require selective management over several generations and may take eight to ten years. Species such as chum and sockeye salmon require three to five years to mature and this longer life history will require as long or longer for full restoration of impacted stocks.

Expected Results:

Because salmon are a major vehicle for the transport of energy and nutrients from the high seas environment to the nearshore and upland ecosystems, restoration of impacted stocks will have important ramifications for plant and animal communities in those areas.

Alternatives Considered:

Failure to implement a package of programs designed to improve stock specific management capabilities may result immediate and serious exploitation of stocks already seriously stressed by the impacts of oil. Long term disastrous declines in those populations may be the result of such an option.

An alternative to no action would be to impose extremely conservative harvest strategies upon all stocks in the PWS fisheries. This would probably achieve the desired effect of providing protection for impacted stocks but could mean that a harvestable surplus of several million hatchery fish and fish from unimpacted wild stocks would not be utilized. From an economic stand point this could have disastrous immediate as well as long term effects on the highly capitalized fishing industry in PWS. From a resource management point of view it could also be deleterious. For some species of salmon which rear in freshwater (ie. sockeye) the effects of putting too many spawners in the systems utilized by unimpacted stocks could lead to serious overpopulation of available rearing area and subsequent major declines in fry populations and future adult returns. The effects of over escapement of unimpacted pink salmon stocks is still a hotly debated subject but it is clear that there is no biological benefit in exceeding the carrying capacity of the spawning grounds and there may be serious harmful effects such as superimposition or excessive egg deposition and subsequent oxygen starvation.

Cost:

Ground Survey Program: $280,000

Title: Aerial Enumeration of Salmon Escapements in Prince William Sound

Lead Agency: Alaska Department of Fish and Game

Principal Investigator: Sam Sharr

Introduction:

Salmon stocks in Prince William Sound (PWS) which were impacted by the Exxon Valdez Oil Spill (EVOS) are also heavily exploited in commercial, sport, and subsistence fisheries can most effectively be restored through stock specific management practices designed to reduce exploitation on impacted stocks. The stocks in areas heavily impacted by the EVOS occur in mixed stock fisheries dominated by hatchery stocks and wild stocks from unaffected areas of the Sound. Restoration premised on stock specific management of the commercial fishery for reduced exploitation of impacted stocks will require accurate inseason estimates of the escapements of impacted and unimpacted wild stocks.

This project is designed to provide accurate, real time, escapement estimates for salmon stocks of Prince William Sound. Accurate inseason escapement estimates will enable fisheries managers to identify shortfalls in the numbers of fish spawning in impacted streams and impose fisheries restriction to reduce harvest rates on those stocks. The manager will also be able to identify any excesses in escapement in unimpacted stocks and direct very localized fishing effort on those stocks to harvest the surplus fish. Post season analyses of the escapement enumeration project together with results from the proposed Coded-Wire Tagging project will provide stock specific estimates of total return and enable managers to assess the effectiveness of their stock specific management strategies.

In the absence of the improved stock specific management capabilities afforded by this project, salmon stocks in western PWS which have already badly stressed and depleted by the impacts of oil will potentially be over exploited in the commercial, sport and subsistence fisheries. Population levels may be reduced below those consistent with rapid recovery of the resource and in some instances may result in virtual elimination of impacted stocks.

Methods:

The technology and methodology for escapement enumeration by using data from a systematic aerial survey program are all well established and have a long history of success in Alaska. The historic aerial survey data base for Prince William Sound is the best in Alaska and will provide important base line data for restoration efforts. An expanded aerial survey program would compliment existing NRDA projects for salmon. Aerial surveys impose no impact on the resource and would result in no impact on cleanup activities.

Scope:

The restoration of impacted odd and even year pink salmon stocks may require selective management at over an minimum of two generations for each cycle. Chum and sockeye salmon require three to five years to mature will require more time for full restoration of impacted stocks.

Expected Results:

Because salmon are a major vehicle for the transport of energy and nutrients from the high seas environment to the nearshore and upland ecosystems, restoration of impacted stocks will have important ramifications for plant and animal communities in those areas.

Alternatives Considered:

Failure to implement a package of programs designed to improve stock specific management capabilities may result immediate and serious exploitation of stocks already seriously stressed by the impacts of oil. Long term disastrous declines in those populations may be the result of such an option.

An alternative to no action would be to impose extremely conservative harvest strategies upon all stocks in the PWS fisheries. This would probably achieve the desired effect of providing protection for impacted stocks but could mean that a harvestable surplus of several million hatchery fish and fish from unimpacted wild stocks would not be utilized. From an economic stand point this could have disastrous immediate as well as long term effects on the highly capitalized fishing industry in PWS. From a resource management point of view it could also be deleterious. For some species of salmon which rear in freshwater (ie. sockeye) the effects of putting too many spawners in the systems utilized by unimpacted stocks could lead to serious overpopulation of available rearing area and subsequent major declines in fry populations and future adult returns. The effects of over escapement of unimpacted pink salmon stocks is still a hotly debated subject but it is clear that there is no biological benefit in exceeding the carrying capacity of the spawning grounds and there may be serious harmful effects such as superimposition or excessive egg deposition and subsequent oxygen starvation.

Cost:

Expansion of existing aerial survey program: $40,000

Title: Salmon Coded-Wire Tag Studies in Prince William Sound

Lead Agency: Alaska Department of Fish and Game

Principal Investigator: Sam Sharr

Introduction:

Salmon stocks in Prince William Sound which were impacted by the Exxon Valdez Oil Spill (EVOS) are also heavily exploited in commercial, sport, and subsistence fisheries and can most effectively be restored through stock specific management practices designed to reduce exploitation on impacted stocks. The stocks in areas heavily impacted by the EVOS occur in mixed stock fisheries dominated by hatchery stocks and migrant wild stocks from unimpacted areas of the Sound. Restoration premised on stock specific management of the commercial fishery for reduced exploitation of impacted stocks will require accurate inseason estimates of the stock composition of the commercial catch by time and area.

This project is designed to provide accurate, real time, estimates of hatchery and wild stock contributions to the fisheries of PWS. The project will also provide some contribution estimates for impacted versus unimpacted wild stocks. Accurate inseason stock specific contribution estimates will enable fisheries managers to identify exploitation rates which are too high for impacted stocks and alter fishing patterns to reduce or eliminate exploitation of those stocks. The manager will also be able to identify any under exploitation of hatchery stocks or unimpacted wild stocks and direct very localized fishing effort on those stocks to harvest the surplus fish. Post season analyses of the coded-wire tagging project together with results from proposed escapement enumeration projects will provide stock specific estimates of total return and enable managers to assess the effectiveness of their stock specific management strategies.

In the absence of the improved stock specific management capabilities afforded by this project, salmon stocks in western PWS which have already badly stressed and depleted by the impacts of oil will potentially be over exploited in the commercial, sport and subsistence fisheries. Population levels may be reduced below those consistent with rapid recovery of the resource and in some instances may result in virtual elimination of impacted stocks.

Methods:

The technology and methodology for stock identification based on coded-wire tagging studies is well established for all species of salmon. The Alaska Department of Fish and Game and private non-profit aquaculture associations in PWS pioneered the use of half length coded-wire tags in pink salmon. The existing NRDA projects have greatly enlarged the scope of the pre-spill coded-wire tag projects and the proposed salmon coded-wire tag project to be used for restoration through improved, stock specific fisheries management practices is a logical extension the NRDA process.

Duration and Scope:

The restoration of impacted odd and even year pink salmon stocks may require selective management over at least two generations for each cycle

(ie. a minimum 4 years beginning in 1991). Chum and sockeye salmon require three to five years to mature and restoration will take longer for those species.

Expected Results:

Because salmon are a major vehicle for the transport of energy and nutrients from the high seas environment to the nearshore and upland ecosystems, restoration of impacted stocks will have important ramifications for all recovering plant and animal communities in those areas.

Alternatives Considered:

Failure to implement a package of programs designed to improve stock specific management capabilities may result immediate and serious exploitation of stocks already seriously stressed by the impacts of oil. Long term disastrous declines in those populations may be the result of such an option.

An alternative to no action would be to impose extremely conservative harvest strategies upon all stocks in the PWS fisheries. This would probably achieve the desired effect of providing protection for impacted stocks but could mean that a harvestable surplus of several million hatchery fish and millions of fish from unimpacted wild stocks would not be utilized. From an economic stand point this could have disastrous immediate as well as long term effects on the highly capitalized fishing industry in PWS. From a resource management point of view it could also be deleterious. For some species of salmon which rear in freshwater (ie. sockeye) the effects of allowing too many spawners in the systems utilized by unimpacted stocks could lead to serious overpopulation of available rearing area and subsequent major declines in fry populations. The effects of over escapement of unimpacted pink salmon stocks is still a hotly debated subject but it is clear that there is no biological benefit in exceeding the carrying capacity of the spawning grounds and there may be serious harmful effects such as superimposition or excessive egg deposition and subsequent oxygen starvation.

Cost:

Tagging Hatchery Stocks $250,000
Tag Recovery of Hatchery Stocks: $550,000
Tagging Wild Stocks: $200,000
Tag Recovery of Wild Stocks: $180,000
(If the proposed adult enumeration weirs are funded it makes sense to put those weirs on wild stock streams where tags were applied in 1990. In that case the weir crews could do the recovery and the wild stock recovery budget shown here could be very greatly reduced.)

Title: Weir Enumeration of Salmon Escapements in Prince William Sound

Lead Agency: Alaska Department of Fish and Game

Principal Investigator: Sam Sharr

Introduction:

Salmon stocks in Prince William Sound which were impacted by the Exxon Valdez Oil Spill (EVOS) are also heavily exploited in commercial, sport, and subsistence fisheries can most effectively be restored through stock specific management practices designed to reduce exploitation on impacted stocks. The stocks in areas heavily impacted by the EVOS occur in mixed stock fisheries dominated by hatchery stocks and wild stocks from unaffected areas of the Sound. Restoration premised on stock specific management of the commercial fishery for reduced exploitation of impacted stocks will require accurate inseason estimates of the escapements of impacted and unimpacted wild stocks.

This project is designed to provide accurate, real time, escapement estimates for salmon stocks of Prince William Sound. Accurate inseason escapement estimates will enable fisheries managers to identify shortfalls in the numbers of fish spawning in impacted streams and impose fisheries restriction to reduce harvest rates on those stocks. The manager will also be able to identify any excesses in escapement in unimpacted stocks and direct very localized fishing effort on those stocks to harvest the surplus fish. Post season analyses of the escapement enumeration project together with results from the proposed Coded-Wire Tagging project will provide stock specific estimates of total return and enable managers to assess the effectiveness of their stock specific management strategies.

In the absence of the improved stock specific management capabilities afforded by this project, salmon stocks in western PWS which have already badly stressed and depleted by the impacts of oil will potentially be over exploited in the commercial, sport and subsistence fisheries. Population levels may be reduced below those consistent with rapid recovery of the resource and in some instances may result in virtual elimination of impacted stocks.

Methods:

The method of enumerating the total escapement for individual streams by counting the fish as they pass through a weir (fence) in route to upstream spawning areas is widely used and well established. Weirs are very accurate but cannot feasibly be installed on the hundreds of salmon streams in PWS. On the other hand a few weirs on selected streams can play an extremely important validation and calibration role in aerial escapement estimating procedures used for 211 streams in PWS.

In addition to providing accurate counts on selected streams weired streams can also be used for gathering very important instream residence time (stream life) data for salmon. Stream life is typically estimated through tagging studies on spawning fish and requires extensive daily surveys of the spawning grounds. Weired streams are logical candidates for such studies. Accurate estimates of stream life are critical to any escapement estimate based on systematic aerial observations because of the

necessity to account for duplicate observations between surveys. Improved estimates of stream residence time can also be applied to historic data. The historic aerial and ground survey data base for Prince William Sound is the best in Alaska and will provide important base line data for restoration efforts when complimented by the improved stream life estimates. The existing NRDA projects greatly enlarged the scope of the pre-spill escapement enumeration projects. This proposed salmon escapement enumeration project to be used for restoration through improved fisheries management is a logical extension the NRDA process. The weirs in this project can also compliment NRDA Study #3 by acting as a means for recovering wild stock fish bearing coded-wire tags applied in the spring of 1990.

Duration and Scope:

The restoration of impacted odd and even year pink salmon stocks will require selective management a minimum of two generations for each cycle. Chum and sockeye salmon require three to five years to mature and will require longer for full restoration of impacted stocks.

Expected Results:

Because salmon are a major vehicle for the transport of energy and nutrients from the high seas environment to the nearshore and upland ecosystems, restoration of impacted stocks will have important ramifications for plant and animal communities in those areas.

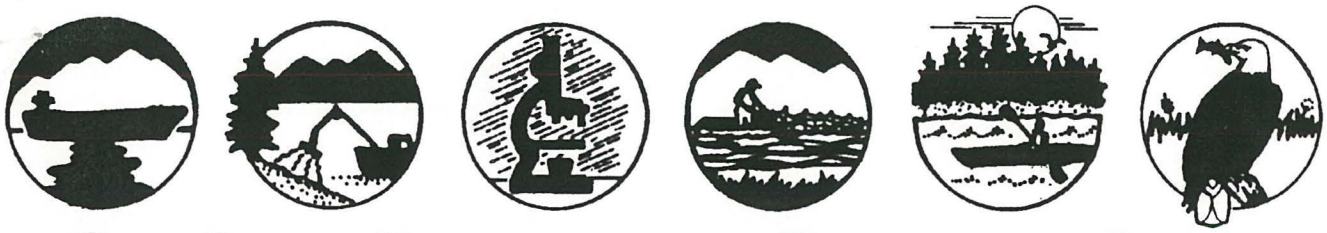
Alternatives Considered:

Failure to implement a package of programs designed to improve stock specific management capabilities may result immediate and serious exploitation of stocks already seriously stressed by the impacts of oil. Long term disastrous declines in those populations may be the result of such an option.

An alternative to no action would be to impose extremely conservative harvest strategies upon all stocks in the PWS fisheries. This would probably achieve the desired effect of providing protection for impacted stocks but could mean that a harvestable surplus of several million hatchery fish and fish from unimpacted wild stocks would not be utilized. From an economic stand point this could have disastrous immediate as well as long term effects on the highly capitalized fishing industry in PWS. From a resource management point of view it could also be deleterious. For some species of salmon which rear in freshwater (ie. sockeye) the effects of putting too many spawners in the systems utilized by unimpacted stocks could lead to serious overpopulation of available rearing area and subsequent major declines in fry populations and future adult returns. The effects of over escapement of unimpacted pink salmon stocks is still a hotly debated subject but it is clear that there is no biological benefit in exceeding the carrying capacity of the spawning grounds and there may be serious harmful effects such as superimposition or excessive egg deposition and subsequent oxygen starvation.

Cost:

Weir Program and Stream Life Studies: $230,000



OIL SPILL RESTORATION PLANNING OFFICE

437 E Street, Suite 301 Anchorage, Alaska 99501
(907) 271-2461 FAX: (907) 271-2467

October 30, 1990

MEMORANDUM

SUBJECT: Formats for submitting 1991 restoration project or feasibility study proposals

FROM: Brian Ross, John Strand
Restoration Planning Work Group

TO: Principal investigators, peer reviewers, and other restoration worksession participants

Attached you will find formats to be followed when submitting proposals to this office for 1991 restoration projects, feasibility studies, or natural recovery monitoring projects. Your write-ups will be used as the basis for describing potential 1991 projects in the draft Restoration Work Plan and 1991 Restoration Program to be published in the Federal Register in late December, 1990. Because this document will be distributed specifically for public review and comment, descriptions of injuries must remain brief and general in your initial write-ups. (The Legal Team will be reviewing all descriptions prior to publication, so it is safe to err for now on the side of describing injuries in somewhat more detail, rather than less.)

Overall, we are looking for 1-2 page project descriptions at this time. These write-ups must be submitted no later than November 14 in order for them to be considered for the 1991 program. We will be asking for detailed study plans at approximately the first of the year for those proposals that the Management and Legal Teams direct us to move forward with. The detailed study plans will not be for public distribution, and should contain more specific linkages to known injuries as part of their justifications.

We recognize that the time frame for developing these proposals is short. If we can be of any assistance or if there are any questions, don't hesitate to call your RPWG member, or contact me directly at this office. We look forward to receiving your proposals!

Format :

Proposed 1991 Restoration Project Description

Title:

Lead Agency:

Principal Investigator:

Introduction:

- Background
  (including: link to known injury)
- Goal and Objectives
  (Incl.: reasonable to implement considering expectations for natural recovery; importance of implementing or beginning to implement in 1991)

Methods:

- Including known technical feasibility
- Will not interfere with cleanup activities or ongoing NRDA studies

Duration and Scope:

Expected Results:

- Anticipation of net environmental benefits

Alternatives Considered:

- No Action: consequences of not implementing in 1991
- Other potential approaches to Goal and Objectives (why proposal is best approach currently available)

Cost:

Format:
Proposed 1991 Feasibility Study Description

Title:

Lead Agency:

Principal Investigator:

Introduction:
- Background
  (Including: link to known or reasonably expected injury; importance of target resource)
- Goal and Objectives
  Incl.: likelihood of approach being applied as a full-scale restoration measure if successful; importance of implementing in 1991)

Methods:
- Ability to evaluate success of study
- Ability to reasonably determine feasibility after one year of study
- Will not interfere with cleanup activities or ongoing NRDA studies

Duration and Scope:

Expected Results:
- Applicability of approach if successful

Cost of study:

Format :

Proposed 1991 Restoration Project Description,
Natural Recovery Monitoring Project

Title:

Lead Agency:

Principal Investigator:

Introduction:
- Background
  (Including: link to known or reasonably expected injury; importance of target resource)
- Goal and Objectives
  (Incl.: importance of continuing to monitor the indicator of injury/ongoing exposure; importance of implementing in 1991)

Methods:

Duration and Scope:

Expected Results:

Alternatives Considered:
- No Action: consequences of not implementing in 1991

Cost: