Notes/Summaries

Tech. Workshop

3/30/90
RPWO
AA

TECHNICAL WORKSHOP (1-A) ON RESTORATION ALTERNATIVES
1-A: ECOLOGICAL RESOURCES

April 3-4, 1990
(If necessary, workshop will continue April 5)

CONFIDENTIAL

PURPOSE:

To provide technical input to the decision-making process to enable scientifically valid decisions regarding restoration alternatives.

Following the workshop, information discussed will provide the basis for a written report. Note that outputs and objectives listed below refer only to the workshop itself.

OUTPUTS:

1. List of broad scientific guidelines suggested for use in selecting restoration alternatives.

2. Broadly-inclusive matrix of restoration alternatives that warrant further evaluation.

3. Information needs and/or feasibility studies which will be needed to evaluate candidate restoration alternatives.

OBJECTIVES:

1. Review initial damage assessment results with respect to potential restoration alternatives.

2. Describe the state of the art in restoration technology and the feasibility of applying these technologies to Prince William Sound and the Gulf of Alaska.

3. Develop broad scientific guidelines for evaluating restoration technologies.

4. Develop a broadly-inclusive matrix of restoration alternatives (including restoration, replacement, and acquisition of equivalent resources) that warrant further evaluation.

5. Based on broad scientific guidelines, identify information needs and/or feasibility studies necessary to evaluate candidate restoration alternatives.

3/30/90

PROPOSED DRAFT AGENDA

Tuesday, April 3

8:30 Restoration Planning Process
Expectations of Workshop

9:00 Fate and Status of Oil

9:30 Summary of Natural Resource Damage Assessment Results

12:00 Break for Lunch

1:00 Work Group Assignments

1:30 Work Groups convene concurrently
(Coastal Habitat, Fish/Shellfish, Mammals, Birds)

Tasks:

Review state of the art in restoration technology and the feasibility of applying these technologies to Prince William Sound and the Gulf of Alaska.

Develop broad scientific guidelines for evaluating restoration alternatives.

Discuss initial damage assessment results with respect to potential restoration alternatives.

5:00 Break for Dinner

7:00 Session chairs meet to review progress and develop overall scientific guidelines which can be applied across all work groups.

3/30/90

Wednesday, April 4

8:00 Plenary Session: Summary of Day 1

8:30 Reconvene Work Groups

Task:

Develop broadly-inclusive matrix of restoration alternatives (including restoration, replacement, and acquisition of equivalent resources) that warrant further evaluation.

12:00 Break for Lunch

1:00 Reconvene Work Groups

Task:

Based on broad scientific guidelines, identify information needs and/or feasibility studies necessary to evaluate candidate restoration alternatives.

4:00 Plenary Session: Summary Reports

5:00 Break for Dinner

7:00 Session chairs meet to discuss work products

Thursday, April 5

8:30 If necessary, key individuals may meet to continue discussion of work products.

TECHNICAL WORKSHOP NO. 1-A 3-4 April 1990

GROUP (mark one): (A) Fish and Shellfish
Coastal Habitats/Air & Water XX
Mammals
Birds

(B) Cultural
Recreation

DRAFT

PARTICIPANTS BY CATEGORY:

Summary Scientist for Damage Assessment Results: D. Gibbons, USFS

Group Chairman: F. Pillifant, ADNR

Principal Investigators: J. Lindstrom, ADEC
D. Wolfe, NOAA
S. Jewett, UAF
R. Highsmith, UAF-?
Schimel, ?
K. Sundberg, ADFG

Peer Reviewers: C. Peterson

"Outside" Experts: H. Sanders, Woods Hole
M. Foster, Moss Landing

Agency Representatives: L. Trasky, ADFG
A. Weiner, ADEC
___?___, ADNR
J. Clark, USEPA
J. Ford, USEP
___?___, USFS
___?___, NPS
R. Slothower, USFWS

[03-29-90]

TECHNICAL WORKSHOP NO. 1-A 3-4 April 1990 (5th, if necessary)

GROUP (mark one): (A) Fish and Shellfish XX
Coastal Habitats/Air & Water
Mammals
Birds

(B) Cultural
Recreation

DRAFT

PARTICIPANTS BY CATEGORY:

Summary Scientist for Damage Assessment Results: C. Meacham, ADFG

Group Chairman: B. Ross, USEPA

Principal Investigators: K. Hepler, ADFG
J. Hillsinger, ADFG
S. Sharr, ADFG
A. Wertheimer, NOAA
C. O'Clair, NOAA
H. Feder, UAF/ADFG

Peer Reviewers: P. Mundy, independent

"Outside" Experts: W. Barber, UAF

Agency Representatives:
D. McBride, ADFG
C. Manen, NOAA
G. Chapman, USEPA
?-B. Meehar, USFS
E. Wilson, USFWS

[03-29-90]

TECHNICAL WORKSHOP NO. 1-A 3-4 April 1990 (5th, if necessary)

GROUP (mark one): (A) Fish and Shellfish
Coastal Habitats/Air & Water
Mammals XX
Birds

(B) Cultural
Recreation

DRAFT

PARTICIPANTS BY CATEGORY:

Summary Scientist for Damage Assessment Results: R. Nowlin, ADFG

Group Chairman: R. Nowlin, ADFG

Principal Investigators: K. Frost,ADFG
?-W. Testa, UAF/ADFG
T. DeGange, USFWS
D. Burn, USFWS

Peer Reviewers: ?-D. Siniff, Univ. MN

"Outside" Experts: A. Johnson, retired USFWS

Agency Representatives: W. Regelin, ADFG
R. Gould, USFWS
?-J. Sease, NOAA
M. Habler, USEPA
M. Wheeler, ADEC

[03-29-90]

TECHNICAL WORKSHOP NO. 1-A 3-4 April 1990 (5th if necessary)

GROUP (mark one): (A) Fish and Shellfish
Coastal Habitats/Air & Water
Mammals
Birds XX

(B) Cultural
Recreation

DRAFT

PARTICIPANTS BY CATEGORY:

Summary Scientist for Damage Assessment Results: K. Wohl/B. Leedy
USFWS

Group Chairman: S. Senner, ADFG

Principal Investigators: S. Patten, ADFG
L. Denlinger, USFWS
K. Oakley, USFWS
D. Irons, USFWS
K. Kuletz, USFWS
P. Schempf, USFWS (part-time)
D. Nysewander, USFWS "

Peer Reviewers: ?-M. Fry, UC-Davis

"Outside" Experts: N. Snyder, independent (AZ)
P. Mickelson, PWSC (Cordova)

Agency Representatives: T. Rothe or D. Rosenberg, ADFG
P. Gertler, USFWS
J. Parker, USFWS
A. Fairbrother, USEPA

[03-29-90]

3/30/90

TECHNICAL WORKSHOP (1-B) ON RESTORATION ALTERNATIVES
1-B: CULTURAL AND RECREATIONAL RESOURCES

April 5, 1990
(If necessary, workshop will continue April 6.)

PURPOSE:

To provide technical input to the decision-making process to enable scientifically valid decisions regarding restoration alternatives.

This workshop (1-B) closely parallels technical workshop 1-A (Ecological Resources). There are, however, important differences. Since there are almost no results to report from the formal Natural Resources Damage Assessment, information on damages will be largely anecdotal. Further, restoration of recreational resources does not require the same degree of technical considerations as restoration of ecological resources. As a result, primary emphasis here will be on development of a matrix of restoration alternatives and identifying information needed to evaluate those alternatives. Primary participants will be agency personnel with management responsibilities.

Following the workshop, information discussed will provide the basis for a written report. Note that outputs and objectives listed below refer only to the workshop itself.

OUTPUTS:

1. List of broad scientific guidelines suggested for use in selecting restoration alternatives.

2. Broadly-inclusive matrix of restoration alternatives that warrant further evaluation.

3. Information needs and/or feasibility studies which will be needed to evaluate candidate restoration alternatives.

OBJECTIVES:

1. Review initial damage assessment results with respect to potential restoration alternatives.

2. Describe the state of the art in restoration technology and the feasibility of applying these technologies to Prince William Sound and the Gulf of Alaska.

3. Develop broad scientific guidelines for evaluating restoration technologies.

4. Develop a broadly-inclusive matrix of restoration alternatives (including restoration, replacement, and acquisition of equivalent resources) that warrant further evaluation.

5. Based on broad scientific guidelines, identify information needs and/or feasibility studies necessary to evaluate candidate restoration alternatives.

3/30/90

PROPOSED DRAFT AGENDA

Thursday, April 5

8:30 Restoration Planning Process
Expectations of Workshop

9:00 Fate and Status of Oil

9:30 Summary of Site Damages

10:30 Work Group Assignments

11:00 Work Groups convene concurrently
(Cultural, Recreational)

Tasks:

Review state of the art in restoration technology and the feasibility of applying these tecnhologies to Prince William Sound and the western Gulf of Alaska.

Develop broad guidelines for evaluating restoration alternatives

12:00 Break for Lunch

1:00 Work Groups convene concurrently

Tasks:

Develop broadly-inclusive matrix of restoration alternatives (including restoration, replacement, and acquisition of equivalent resources) that warrant further evaluation.

Based on guidelines, identify information needs and/or feasibility studies necessary to evaluate candidate restoration alternatives.

4:00 Plenary Session: Summary Reports

5:00 Session chairs meet to discuss work products

Friday, April 6 (morning only)

8:30 If necessary, key individuals may meet to continue discussion of work products.

TECHNICAL WORKSHOP NO. 1-B 5 April 1990

GROUP (mark one): (A) Fish and Shellfish
Coastal Habitats
Mammals
Birds

(B) Cultural
Recreation XX

DRAFT

PARTICIPANTS BY CATEGORY:

Summary Scientist for Damage Assessment Results: Ann Castellino (sp.-?), NPS
A. Meiners, ADNR

Group Chairman: G. Ahlstrand or S. Rabinowitz, NPS

Principal Investigators: None

Peer Reviewers: None

"Outside" Experts: T. Gasbarro or A. Jubenville, UAF

Agency Representatives: ?-D. Patterson, FWS
A. Meiners, ADNR
K. Kurtz, USFS
J. Maxwell, ADFG
____?____, ADFG (someone from Sport Fish)

TECHNICAL WORKSHOP NO. 1

GROUP (mark one): (A) Fish and Shellfish
Coastal Habitats
Mammals
Birds

DRAFT

(B) Cultural XX
Recreation

PARTICIPANTS BY CATEGORY:

Summary Scientist for Damage Assessment Results: R. Shaw, SHPO
?-Jean Schafe, NPS

[redacted]

Group Chairman: ____?____, DNR

Principal Investigators: none

Peer Reviewers: none

"Outside" Experts: R. Thorn, Univ. MS

Agency Representatives: C. Holmes, ADNR
T. Birkadal, NPS
J. Mattson, USFS
C. Diters, USFWS
J. Fall, ADFG (Subsistence Division)

[03-29-90]

3/30/90

Principal Investigators:

The following are questions you should take into account as you prepare for the work group discussions at the technical workshop, April 3-4. We are most interested in your thoughts regarding possible restoration activities.

1. What is the importance of the resource to the ecology and/or human services of Prince William Sound and the western Gulf of Alaska?

2. What is the nature, severity, and extent of the damage?

   a. What is the pattern of the damage? (The purpose of this question is to determine how the pattern of damage might influence natural recovery of damaged resources.)

   b. What is planned for the future? How long will it take to determine additional damage?

3. How was the damage determined? (What studies, approaches, etc.)

4. What is known about what caused the damage?

5. How long do you think natural recovery will take? What is the basis of your estimate?

6. What, if any, restoration activities do you think should be undertaken to restore the resource? How long will it take to see results?

Damage Assessment Questions -

Habitat Loss:

1. What is the importance of the resource to the ecology of Prince William Sound?

2. What is the nature of the damage? (acute toxicity, scouring, etc)

3. What is the extent of the areal extent of damage?

4 What is the pattern of the damage?

5. What is the areal extent of undamaged resource?

6. How did you determine the damage?
   a. Direct measurement of lost area
   b. Comparison with undamaged area

7. What caused the damage? (Oil toxicity, cleanup or ?)

8. How long do you think natural recovery will take?

9. What if any Restoration activity do you think should be undertaken to restore the resource?

Population Loss:

1. What is the ecological and/or economic importance of the population?

2. What is the nature of the damage direct mortality, sublethal chronic effect e.g. lesions etc

3. What percentage of the population was effected?

4 How did you determine the damage?
   a. Body counts
   b. Comparison with undamaged areas (If this method what is natural spatial variability in population?)

5. What caused the damage?

6. Based on previous experience how long do you feel natural recovery will take?

7. What, if any restoration activity do you recommend?

Cultural:

1. What was damaged?

2. How did damage occur?

3. What historical or other records were lost?

4. What restoration options do you recommend?

REVISED (3/22/90) DRAFT OUTLINE
EXXON VALDEZ OIL SPILL
RESTORATION REPORT

I. INTRODUCTION

A. Purpose and goals of the restoration planning effort

B. Definition of restoration for this report

C. Overview

1. Nature of report (working document, to be updated as needed and as additional information becomes available)
2. Linkage between damage assessment and analysis of restoration of alternatives
3. Linkage between restoration uncertainty and recommendations for candidate 1990 demonstration projects

II. HABITATS AND RESOURCES POTENTIALLY DAMAGED

A. Matrix of Potentially Damaged Resources

1. Review of options for relating habitats to resources: an ecosystem approach focusing on relationship between target resources (fish/shellfish, birds, mammals, benthic), coastal habitat zones, and other factors such as specific location and water quality.
2. Develop matrix of resources (with life stages) and habitat areas.

B. Overview of Damage assessment by population and/or habitat

1. What was damaged and how was it damaged?
2. What is the effect of the damage, is it an acute or chronic effect?
3. What is the significance of damage relative to Prince William Sound and/or the Gulf of Alaska?

III. DEVELOPMENT OF CANDIDATE RESTORATION ALTERNATIVES

A. Basic overview of the State-of-the-Art for High Latitude Ecological Restoration

1. What has been attempted?
2. What has been the past performance?
3. What are the current controversies?

B. Prince William Sound/Gulf of Alaska Restoration Alternatives

1. Specific restoration objectives
2. Criteria and measurable attributes for selecting restoration alternatives. For example:
   a. How fast will this speed natural recovery
   b. Probability of success (uncertainty)
   c. What is the probability or consequence of collateral damage?
   d. What is the life cycle cost? (dollars or manpower)
3. Relative importance of criteria/attributes for selection
4. Range of alternatives considered
   a. Objective of each
   b. Description of what is to be done.
5. Evaluating alternatives based on selection criteria and specific measurable attributes
6. Recommended list of candidate restoration alternatives
7. Synthesis (Discussion of the relative merits of above individual restoration alternatives and possible combinations of alternatives)

IV. CANDIDATE DEMONSTRATION PROJECTS (for each project)

A. Purpose

1. Specific objective or hypothesis to be tested.
2. Define performance evaluation criteria

B. Rationale

1. What information is needed?
2. What is the state-of-the-art?
3. What relevant information will this specific project provide.

C. Approach/Study Design

1. Description of what is to be done
2. Experimental design including proposed statistical analysis for performance measurement. (How will success be measured?)

D. Resources Required

1. Equipment and materials
2. Travel
3. Personnel

Questions to Guide Work Group Discussions

STATE OF THE ART:

Note: To the extent possible, discussion should focus on high latitude work.

What is the state of the art in restoration technology for this resource (coastal habitat, fish/shellfish, birds, mammals)?

What has been accomplished?

What has been the past performance of restoration activities?

What are the current trends and controversies?

What is the feasibility of applying these technologies to Prince William Sound and the Gulf of Alaska?

BROAD SCIENTIFIC GUIDELINES:

What broad scientific guidelines should decision-makers consider in evaluating restoration alternatives? (For example, probability of success, extent of collateral damage, cost-effectiveness.)

How can these guidelines be best measured or quantified?

INITIAL DAMAGE ASSESSMENT RESULTS:

See questions provided to principal investigators.

MATRIX OF RESTORATION ALTERNATIVES:

What is the full range of options which can be considered?

For each possible restoration alternative, discuss:

- What is the objective?
- What could be done?
- How does the alternative fit the guidelines?
- What is the possible role of monitoring?
- What is the estimated cost to implement the alternative?

Which alternatives can be combined? What are the potential benefits of such combination?

IDENTIFICATION OF INFORMATION NEEDS AND/OR FEASIBILITY STUDIES:

What scientific uncertainties limit full evaluation of restoration alternatives?

What additional information is necessary to reduce those uncertainties?

What feasibility studies or demonstration projects could be conducted to gather necessary information?

As time permits, further clarify possible feasibility studies by answering the following questions for each possible project:

- What would be the objective of the project?
- How would project performance be evaluated?
- What necessary information would the project gather?
- What would be done?
- What statistical design would be used to measure success?
- What resources would be required (equipment and supplies, travel, personnel)?

TECHNICAL WORKSHOP (1-A) ON RESTORATION ALTERNATIVES
1-A: ECOLOGICAL RESOURCES

April 3-4, 1990
(If necessary, workshop will continue April 5.)

CONFIDENTIAL

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OBJECTIVES:

1. Review initial damage assessment results with respect to potential restoration alternatives.

2. Describe the state of the art in restoration technology and the feasibility of applying these technologies to Prince William Sound and the Gulf of Alaska.

3. Develop broad scientific guidelines for evaluating restoration technologies.

4. Develop a broadly-inclusive matrix of restoration alternatives (including restoration, replacement, and acquisition of equivalent resources) that warrant further evaluation.

5. Based on broad scientific guidelines, identify information needs and/or feasibility studies necessary to evaluate candidate restoration alternatives.

PROPOSED DRAFT AGENDA

Tuesday, April 3

8:30 Restoration Planning Process
Expectations of Workshop

9:00 Fate and Status of Oil

9:30 Summary of Natural Resource Damage Assessment Results

12:00 Break for Lunch

1:00 Work Group Assignments

1:30 Work Groups convene concurrently
(Coastal Habitat, Fish/Shellfish, Mammals, Birds)

Tasks:

Review state of the art in restoration technology and the feasibility of applying these technologies to Prince William Sound and the Gulf of Alaska.

Develop broad scientific guidelines for evaluating restoration alternatives.

Discuss initial damage assessment results with respect to potential restoration alternatives.

5:00 Break for Dinner

7:00 Session chairs meet to review progress and develop overall scientific guidelines which can be applied across all work groups.

Wednesday, April 4

8:00 Plenary Session: Summary of Day 1

8:30 Reconvene Work Groups

Task:

Develop broadly-inclusive matrix of restoration alternatives (including restoration, replacement, and acquisition of equivalent resources) that warrant further evaluation.

12:00 Break for Lunch

1:00 Reconvene Work Groups

Task:

Based on broad scientific guidelines, identify information needs and/or feasibility studies necessary to evaluate candidate restoration alternatives.

4:00 Plenary Session: Summary Reports

5:00 Break for Dinner

7:00 Session chairs meet to discuss work products

Thursday, April 5

8:30 If necessary, key individuals may meet to continue discussion of work products.

EFFECTS OF THE EXXON VALDEZ OIL SPILL ON THE DISTRIBUTION AND ABUNDANCE OF HUMPBACK WHALES IN PRINCE WILLIAM SOUND, SOUTHEAST ALASKA, AND THE KODIAK ARCHIPELAGO

1. NO DECLINE IN NUMBERS IDENTIFIED WITHIN PRINCE WILLIAM SOUND

2. FEWER WHALES USED LOWER KNIGHT ISLAND PASSAGE AREA IN 1989 THAN IN 1988 (MAY BE RELATED TO VESSEL AND AIRCRAFT DISTURBANCE)

3. NO OBSERVATIONS OF WHALES SWIMMING THROUGH OIL

4. PRINCE WILLIAM SOUND WHALES NOT OBSERVED IN SOUTHEAST ALASKA

5. FINITE REPRODUCTIVE RATE FOR 1989 (6.3%) LOWER THAN ANNUAL REPRODUCTIVE RATE (9.8%) FOR 1980-88

6. NO REPORTS OF STRANDED WHALES IN ALASKAN WATERS

ASSESSMENT OF INJURIES TO KILLER WHALES IN PRINCE WILLIAM SOUND, KODIAK ARCHIPELAGO, AND SOUTHEAST ALASKA

1. FEWER WHALES DOCUMENTED, 31 MISSING FROM 3 RESIDENT PODS

2. PERCENTAGE OF RESIDENT PODS VERSUS TRANSIENT PODS SIMILAR TO PREVIOUS YEARS

3. TYPICAL MULTI-POD AGGREGATIONS DID NOT OCCUR

4. REDISTRIBUTION OF RESIDENT PODS LIKELY OCCURRED BUT CHANGES IN HABITAT USAGE CANNOT BE ADEQUATELY DEMONSTRATED DUE TO LACK OF QUANTITATIVE DATA FROM PAST STUDIES.

5. NO APPARENT ATTEMPTS BY WHALES TO AVOID OIL-CONTAMINATED AREAS.

6. WHALES NORMALLY SEEN IN PRINCE WILLIAM SOUND NOT OBSERVED DURING CONCURRENT STUDIES IN SOUTHEAST ALASKA.

ASSESSMENT OF INJURY TO HARBOR SEALS IN PRINCE WILLIAM SOUND, ALASKA, AND ADJACENT AREAS

1. OBSERVATIONS OF OILED SEALS IN OIL IMPACTED AREAS.

   -MAY, OVER 70% OILED.

   -MID JULY, 49% TO 100% OILED.

   -EARLY SEPTEMBER, LESS THAN 20% OILED (SEALS OLDER THAN PUPS MOLTING).

2. HISTOPATHOLOGY FROM HEAVILY OILED PEGNANT FEMALE.

   -DEGENERATIVE LESIONS IN MYELIN SHEATHS OF CNS.

   -CELLULAR NECROSIS IN LIVER.

   -ULCERATIONS OF THE MUCOSA OF THE TRACHEA.

3. NO SIGNIFICANT DIFFERENCE IN RATIO OF PUPS TO NONPUPS FOR OILED VERSUS NONOILED AREAS IN 1989.

4. BETWEEN 1984 AND 1988, POPULATION DECLINE SIMILAR AT OILED AND UNOILED SITES (37% VERSUS 36%). FROM 1988 TO 1989, DECLINE AT OILED SITES SIGNIFICANTLY GREATER THAN AT UNOILED SITES (45% VERSUS 16%).

CETACEAN NECROPSIES TO DETERMINE INJURY FROM THE EXXON VALDEZ OIL SPILL

1. 37 CETACEANS FOUND STRANDED ON ALASKAN BEACHES FROM KAYAK ISLAND TO KING SALMON, MARCH THROUGH OCTOBER.

2. ONLY 7 FRESH ENOUGH TO OBTAIN TISSUE SAMPLES.

3. NECROPSIES COULD NOT DETERMINE CAUSE OF DEATH FOR ANY ANIMALS.

4. LARGE NUMBER OF STRANDED GRAY WHALES (26) ATTRIBUTED TO TIMING OF EFFORT COINCIDING WITH THE NORTHERN MIGRATION OF GRAY WHALES AND TO INCREASED SURVEY EFFORT.

still waiting for HC results

histological work not done

INFLUENCE OF OIL HYDROCARBONS ON REPRODUCTION OF MINK

1. RELATIVELY HIGH TOLERANCE FOR OIL CONTAMINATION IN FOOD (1000 PARTS/MILLION), WITHOUT CLINICAL ILLNESS OR INFLUENCE ON FOOD CONSUMPTION.

ASSESSMENT OF THE MAGNITUDE, EXTENT, AND DURATION OF OIL SPILL IMPACTS ON SEA OTTER POPULATIONS IN ALASKA

1. BOAT SURVEY OF SHORELINE HABITATS SUGGEST A NET POPULATION DECREASE OF ABOUT 700 OTTERS IN PRINCE WILLIAM SOUND, RELATIVE TO BASELINE STUDIES CONDUCTED IN 1984-85.

-LARGEST REDUCTION IN COASTAL AREAS AFFECTED BY THE SPILL.

2. POPULATIONS ON THE KENAI PENINSULA, KODIAK ARCHIPELAGO, AND THE ALASKA PENINSULA DECLINED FROM SPRING TO FALL

-COASTAL DISTRIBUTION NOT ALTERED BY DEGREE OF SHORLINE OILING.

3. HELICOPTER SURVEYS DEMONSTRATED THAT SUBSTANTIAL NUMBERS MAY BE INHABITING OFFSHORE HABITATS.

-IMPORTANT IMPLICATIONS FOR ESTIMATING MORTALITY AND INTERPRETING RESULTS FROM BOAT AND FIXED-WING SURVEYS

5. CARCASS COLLECTION CENTER DATA SUGGESTS 710 OF 878 CARCASSES WERE SPILL RELATED DEATHS

-MORTALITY PARTICULARLY HIGH IN PRINCE WILLIAM SOUND

6. INJURY LIKELY LONG LASTING BECAUSE FEMALES WERE PREDOMINANT AMONG CARCASSES FROM PRINCE WILLIAM SOUND AND THE KENAI PENINSULA

p78
1/2 in otter ctr.

ASSESSMENT OF THE FATE OF SEA OTTER OILED AND REHABILITATED AS A RESULT OF THE EXXON VALDEZ OIL SPILL

1. ALL DATA INDICATE EFFECTS WERE FAR MORE ACUTE IN PRINCE WILLIAM SOUND THAN ON THE KENAI PENINSULA, KODIAK ARCHIPELAGO AND ALASKA PENINSULA.

-TREATMENT CENTERS WERE LOCATED AT VALDEZ AND SEWARD.

-AT VALDEZ 58% DIED IN CAPTIVITY, COMPARED TO 15% AT SEWARD.

-MOST TREATED IN VALDEZ ORIGINATED IN PRINCE WILLIAM SOUND.

-CONFOUNDING VARIABLES (TIMING OF EXPOSURE, DEGREE OF OILING, ETC.) LIMITED ABILITY TO DISTINGUISH WHICH FACTORS EFFECTED SURVIVAL.

2. INSUFFICIENT DATA AVAILABLE TO TEST VARIOUS HYPOTHESES RELATED TO SURVIVAL REPRODUCTION OF REHABILITATED ANIMALS.

3 VALUE OF REHABILITATION REMAINS A TOPIC OF OPINION AND CONTROVERSY.

ASSESSMENT OF THE EXXON VALDEZ OIL SPILL ON THE SITKA BLACK-TAILED DEER IN PRINCE WILLIAM SOUND AND THE KODIAK ARCHIPELAGO

1. TWO MONTHS AFTER THE SPILL, A PILOT STUDY FOUND NO DEAD DEER THAT COULD BE LINKED TO OILING.

ASSESS EFFECTS OF THE EXXON VALDEZ OIL SPILL ON RIVER OTTER AND MINK IN PRINCE WILLIAM SOUND

1. ELEVEN CARCASSES RECOVERED FROM BEACHES IMPACTED BY OIL.

-DECOMPOSITION LIMITED VALUE OF TISSUE SAMPLES.

-SAMPLES OBTAINED FROM 7 ANIMALS.

-THREE NECROPSY REPORTS DOCUMENTED SIGNS OF EXPOSURE TO OIL.

2. IN FIRST MONTH AFTER SPILL, SIGNIFICANTLY LOWER SCAT DEPOSITION RATES IN OILED AREAS.

ASSESSMENT OF THE EXXON VALDEZ OIL SPILL ON BROWN BEAR POPULATIONS IN THE ALASKA PENINSULA

1. NO MORTALITY OR SIGNIFICANT MOVEMENTS AMONG 30 BROWN BEARS RADIO-COLLARED IN OILED AREA ALONG KATMAI COAST.

REVISED 6 April 1990
Draft Outline
EXXON VALDEZ OIL SPILL
RESTORATION PLANNING REPORT

CONFIDENTIAL

I. Introduction

A. Purpose and goals of the restoration planning effort

B. Definition of restoration for this report (3 basic components)

C. Overview

1. The nature of the preliminary report based upon information available and presented at the restoration workshop.
2. Restoration alternatives that may be implemented at some point in time when damage assessment information becomes available
3. Workshop recommendations for potential 1990 restoration projects.
4. Organization of this report. Restoration alternatives for ecological, cultural, and recreational resources. Candidate 1990 demonstration projects.

II. Overview of Damage Assessment Information

A. Fate of the oil

B. General overview of effects (summary of taped sessions)

C. The need for additional damage asessment information in support of restoration efforts.

III. Development of Restoration Alternatives

A. Ecological Resources

1. Coastal Habitats
   a. State-of-the-at for Northern Latitudes
   b. Restoration alternatives

2. Fish and Shellfish
   a. State-of-the-art for Northern Latitudes
   b. Restoration alternatives

3. Birds
   a. State-of-the-art for Northern Latitudes
   b. Restoration alternatives

4. Mammals
   a. State-of-the art for Northern Latitudes
   b. Restoration alternatives

B. Cultural Resources (based on meeting content)

C. Recreational Resources (based on meeting content)

D. Synthesis of Restoration Options

1. Evaluation of interactions between restoration options proposed by work sessions. (Matrix presentation)
2. Discussion of pros and cons of presented restoration options.

IV. Potential Demonstration Projects (for each resource area)

A. Goal

B. Rationale

C. Approach

D. Preliminary Level of Effort

V. Literature Cited

Appendices

Agendas
List of participants by work session
Information sheets
Relevant literature
List of questions (6) to principal investigators

RPW6
AA

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Effects of the Exxon Valdez Oil Spill on the Distribution and Abundance of Humpback Whales in Prince William Sound, Southeast Alaska, and the Kodiak Archipelago.

I. D. Number: Marine Mammals Study Number 1

Marilyn E. Dahlheim and Thomas R. Loughlin
Alaska Fisheries Science Center
National Marine Mammal Laboratory
7600 Sand Point Way N. E., Bin C15700
Seattle, Washington 98115

Executive Summary

Photographs of individual humpback whales occurring in Prince William Sound and Southeast Alaska were collected from May to September 1989 to assess the impact of the Exxon Valdez oil spill on humpback whale life history and ecology. In Prince William Sound, four dedicated research vessels traversed 9,623 nautical miles in search of whales or while photographing whales; reflecting 260 days of field research. In Southeast Alaska, researchers working from five different vessels spent 1,011 hours searching for whales for a total of 230 days of field research. An additional 155 hours were spent off Kodiak conducting marine mammal sighting surveys.

Photographic analysis of Prince William Sound humpbacks revealed 59 identifiable whales in 119 encounters. In Southeast Alaska, a total of 516 whales were identified, representing 2,448 encounters. Total counts for each area represents the largest number of humpback whales ever photographed. A decline in the number of Prince William Sound was not identified.

The distribution of whales in Prince William Sound during the 1989 season was compared to that collected in 1988. In 1988, more whales used the Lower Knight Island Passage area. The effect of increased vessel and aircraft traffic may be a factor responsible for the whale re-distribution pattern observed. No observations were made of humpback whales swimming through oil. Despite considerable effort, Prince William Sound humpback whales were not observed during concurrent photographic studies in Southeast Alaska.

The combined annual reproductive rate for 1980 through 1988 for Prince William Sound humpback whales was 9.8% The finite reproductive rate calculated for 1989 was 6.3%; a rate considerably lower than that expected. This rate is the lowest obtained in eight years of research (1980-1988), except for the 1986 season. No reports of stranded humpback whales occurred within Alaskan waters.

CONFIDENTIAL

Assessment of Injuries to Killer Whales in Prince William Sound, Kodiak Archipelago, and Southeast Alaska.

I.D. Number: Marine Mammals Study Number 2

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Executive Summary

Photographs of individual killer whales occurring in Prince William Sound, Southeast Alaska, and the Kodiak Archipelago were collected from May to September 1989 to assess the impact of the Exxon Valdez oil spill on killer whale life history and ecology. In Prince William Sound, four dedicated research vessels traversed 9,623 nautical miles in search of whales or while photographing whales; reflecting 260 days of field research. This effort represents the most complete study accomplished to date on killer whales in Prince William Sound. Eight resident (143 whales) and four transient pods (34 whales) were documented, totalling 177 animals in 89 encounters. The percentage of resident pods versus transient pods occurring in Prince William Sound in 1989 was similar to that reported for previous years. However, in total, fewer animals were documented.

Photographic analysis of resident pods revealed seven animals missing from AB pod, two whales missing from AE pod, and 22 whales missing from AN pod (an associated subgroup which is defined as a matralineal assemblage of whales). Of the seven missing animals in AB pod, two were reproductively active females that have left behind calves that are two and three years old. The remaining missing whales from AB pod are three juveniles of unknown sex and two adult females that have not reproduced since 1984. The two whales missing from AE pod represent an average loss over a three-year period and is well within expected mortality rates. Since subgroups occassionally travel away from the main pod, the absence of individuals in AN pod may not represent a significant loss at this time. If the seven missing whales from AB pod are not seen in 1990, the 1988-89 mortality rate would be 19.4%; 10 times the expected rate based on over 24 years of research. An annual natural mortality rate of 1.8% has been calculated for Prince William Sound resident killer whales. An average annual reproductive rate of Prince William Sound resident killer whales is 3.8%. In 1989, calves were only observed in AE and AJ pods.

Since 1984, AB pod has been the most frequently encountered resident pod in Prince William Sound. In 1989, AB pod was observed on 31 March but was not seen again until 27 July. This was not the case in 1984, the only other year with a comparable

large research effort (full season of study). In late August and early September each year, multi-pod aggregations are reported in lower Knight Island Passage and Montague Strait. During these months AB and AI pods are present virtually the entire time in aggregations with various other pods (e.g., AN and AJ). In 1989, typical multi-pod aggregations did not occur. Observations of AB and AI pods were of a short-term nature and in contrast with other years the whales did not use lower Knight Island Passage but remained in Montague Strait. Re-distribution of resident pods most likely occurred in 1989 but changes in habitat useage cannot be adequately demonstrated due to lack of quantitative data from past studies. In addition, as a result of clean-up activities, researchers documented an increase in the number of interactions occurring between vessels and killer whales. This included unintentional high-speed approaches by vessels unaware of the presence of whales and the intentional approach and pursuit of whales by oil clean-up crews for recreation. These activities alone could potentially account for changes in habitat useage by killer whales.

On four occassions, five different killer whale pods were observed swimming directly through oil. No apparent attempts were made by the whales to avoid oil-contaminated areas. In addition, four observations of killer whales rubbing along the beach at Pt. Nowell were made. The beach was described by researchers as light to moderately oiled.

Killer whales normally seen in Prince William Sound were not observed during concurrent photographic studies in Southeast Alaska in 1989 despite considerable search effort.

An assessment of the effects of the Exxon Valdez oil spill on killer whale populations in Prince William Sound cannot be made without photographic evidence that the whales missing in 1989 are confirmed missing in 1990.

CONFIDENTIAL

Study Title and I.D. Number

Cetacean Necropsies to Determine Injury from the Exxon Valdez Oil Spill

Marine Mammals Study Number 3.

Project Leader: Thomas R. Loughlin

Lead Agency: National Oceanic and Atmospheric Administration

Executive Summary

Thirty seven cetaceans were found stranded on Alaskan beaches from Kayak Island to King Salmon (Bristol Bay) during March through October 1989. Of these, only seven were fresh enough to obtain tissue samples appropriate for hydrocarbon analysis or histological examination. Results of the toxicological and histological analysis are pending. Necropsies could not determine cause of death for any of the stranded animals. The large number of stranded gray whales (26) was attributed to the timing of the effort coinciding with the northern migration of gray whales augmented by increased survey effort in the study area associated with the oil spill.

ASSESSMENT OF INJURY TO SEA LIONS IN PRINCE WILLIAM SOUND AND THE GULF OF ALASKA

MARINE MAMMAL STUDY NUMBER 4

PRELIMINARY STATUS REPORT FOR APRIL THROUGH DECEMBER 1989

DONALD G. CALKINS
ALASKA DEPARTMENT OF FISH AND GAME
333 RASPBERRY ROAD
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ASSISTED BY
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JANUARY 15, 1990

Executive Summary

This study was undertaken to assess the effects the Exxon Valdez oil spill (EVOS) on the Steller sea lion population of Prince William Sound and the Gulf of Alaska. Steller sea lions are large, conspicuous pinnipeds found throughout the Gulf of Alaska and much of the North Pacific Ocean. In 1976 the highest period of abundance in Prince William Sound occurred during March and April. Thus the highest possible number of sea lions were exposed to the initial effects of the oil spill. Because most sea lions travel long distances from the rookeries of their birth, many sea lions which were in Prince William Sound at the time of the oil spill were born at large rookeries in the Barren Islands and near Kodiak. However sea lions were likely affected from Cape St. Elias to Chowiet Island. It is extremely important to document the impacts of the Exxon Valdez oil spill on sea lions because the population in this area has declined to approximately 1/3 it's original size in the last three decades and is continuing to decline. This decline has prompted the National Marine Fisheries Service to propose listing Steller sea lions (in Alaska west of Cape St. Elias as threatened) under the Endangered Species Act.

Oil contamination of rookery areas was minimal and generally short-term although two major rookeries had oil present in small amounts (<10% coverage) in April. Sugarloaf Island and Seal Rocks had oil present in the pupping areas in April although no oil was seen at these locations in July. Sea lions were observed swimming through oiled water in Prince William Sound in March and April. There appeared to be no avoidance behavior wherever sea lions encountered oil both in the water and on shore.

This study has attempted to assess the effects of the EVOS on sea lions utilizing two general approaches. The first approach involved the assessment of effects on abundance of the overall population through aerial photographic surveys of adults and juveniles on rookeries and haulouts within the study area. In addition, direct counts of pups were made on the rookeries soon after most pups were born but before most pups were capable of swimming. These counts were then used as the basis for comparison to historical information collected in the same manner.

The second approach consisted of assessment of direct physiological effects on individuals. This involved assessment of toxicological effects on tissues by collecting animals and preserving tissues for histological and hydrocarbon analysis. A total of 17 sea lions were collected and tissues were preserved

for analysis. Ten sea lions were also found dead in oiled areas. Whenever possible, these animals were sampled and tissues were preserved for hydrocarbon and histological analysis.
In addition to tissue analysis, it was thought that another direct toxicological effect might be an increase in premature pupping. This was investigated this year by searching haulouts and rookeries for premature pups. This effect would likely be manifested in the next 1 to 2 years so major effort is planned to investigate premature pupping in the future.

Analysis of the count data from the 1989 post-EVOS counts of adults and juveniles and pups compared to historical data failed to show a statistically significant EVOS effect. This does not necessarily insure that EVOS had no effect. We were not able to separate out and identify any effect because of the substantial decline which is already occurring in the population. This decline overshadowed any effect which may have occurred. No premature pups were found in 1989 during associated work at haulouts and rookeries. Tissue analysis has not been completed on any of the samples. Fluorometric analysis of bile was performed on one sample. Results of this analysis did not show hydrocarbon contamination. Histological analysis was also performed on this sample. No significant lesions were found which could be shown to be related to hydrocarbon contamination.

Although no significant effects on Steller sea lion populations or physiology from the EVOS have been shown in this preliminary analysis, much remains to be done. It is impossible to determine the overall effect on sea lions without complete analysis of the available samples. In order to assess the possible impacts on the sea lion population, aerial surveys and pup counts should be conducted for at least one more year. Separation of EVOS effects from the decline would be greatly facilitated by at least one more year of count data. Investigation of premature pupping in relation to the EVOS should be carried out in 1990.

CONFIDENTIAL

State-Federal Natural Resource Damage Assessment

for April-December 1989

Preliminary Status Report

Marine Mammals Study Number 5:

Assessment of Injury to Harbor Seals

in Prince William Sound, Alaska, and Adjacent Areas

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12 January 1990

EXECUTIVE SUMMARY

The goal of this project is to determine whether the Exxon Valdez oil spill (EVOS) has had, or will have, a measurable impact on harbor seals, Phoca vitulina richardsi, in Prince William Sound (PWS) and adjacent areas. Harbor seals are one of the most abundant species of marine mammals in PWS. They are resident throughout the year, occurring primarily in the coastal zone where they feed and haul out to rest, bear and care for their young, and molt. Some of the largest haulouts in PWS, and waters adjacent to these haulouts, were directly impacted by substantial amounts of oil during the EVOS. Oil impacted harbor seal habitat in the Gulf of Alaska at least as far to the southwest as Tugidak Island. The impacts of the EVOS on harbor seals are of particular concern since trend count surveys have indicated that the number of harbor seals in PWS declined by 40% from 1984 to 1988, and similar declines have been noted in other parts of the northern Gulf of Alaska.

During the EVOS, harbor seals were exposed to oil both in the water and on land. In the early weeks of the spill they swam through oil and inhaled aromatic hydrocarbons as they breathed at the air/water interface. On haulouts in oiled areas, seals crawled through and rested on oiled rocks and algae throughout the spring and summer. Pups were born on haulouts in May and June, when some of the sites still had oil on them, resulting in pups becoming oiled. Many also nursed on oiled mothers. At haulouts throughout the oiled areas, seals were exposed to greatly increased human activity in the form of air and boat traffic and cleanup activities.

This study was designed to investigate and quantify, as possible, the effects of oil and the disturbance associated with cleanup on distribution, abundance and health of harbor seals in the affected area. There were five major field components: 1) Small boat work was conducted in PWS from April to September in order to observe seals on oiled and unoiled haulouts and to classify them by presence and extent of oil; 2) Searches were made of the coastline by project personnel and others and the carcasses of any dead harbor seals were documented, necropsied, and if in suitable condition, samples obtained for toxicological and histopathological analyses; 3) Harbor seals that were oiled to various degrees were collected in order to conduct gross necropsies and to obtain samples for histopathological and toxicological analysis and other seals found dead were examined and sampled as possible; 4) Aerial surveys were conducted in June in order to count the number of non-pups and the number of pups at haulout sites in oiled and unoiled areas; and 5) Aerial surveys were conducted during the molt in September to count seals at 25 trend count sites, for comparison of trends in

abundance at oiled and unoiled sites.

During small boat operations in May, we saw no oiled seals in unoiled areas, and few oiled seals in intermediate areas. In oiled areas, however, over 70% of the seals were oiled; most of those were heavily oiled, particularly during the mid-May sample period. Follow-up observations in three areas, Seal Island, Bay of Isles, and Herring Bay, indicated that 49% to 100% of the seals were oiled in mid-July. However, by early September when seals older than pups were molting, less than 20% were oiled.

Seal pups born in oiled areas became oiled when they were as young as 1-2 days old. In Bay of Isles and Herring Bay, 89-100% of all seal pups seen were oiled. Many pups were still oiled in September since they did not molt during their first summer of life.

Thirty-nine harbor seals were examined by project personnel and sampled for toxicology and histopathology. Twenty of those were collected by ADF&G in order to obtain complete, high-quality samples. Of these, 11 were heavily oiled, 3 lightly or moderately oiled, and 6 unoiled. Two female-pup pairs and a single weaned pup were included. An additional 19 harbor seals were found dead or died in captivity following the EVOS and were necropsied and sampled. Fifteen of these were oiled and 13 were pups. Conclusions regarding cause of death cannot be made until results of toxicology and histopathology are available.

Results of fluorometric analysis of bile are available for four specimens. Two of those seals were unoiled and had no evidence of hydrocarbons in the bile. One heavily oiled seal from Herring Bay had clearly assimilated petroleum hydrocarbons, showing fluorescence values 30-100 times greater than reference samples from pristine areas. A second heavily oiled seal had high values but was considered equivocal. However, tissues from that same seal were examined for polycyclic aromatic hydrocarbons (PAHs) and the levels were found to be high, especially in the blubber. The blubber of a second oiled seal from the Gulf of Alaska had much lower PAH values in the blubber.

Histopathology results are available from a single heavily oiled pregnant seal and its fetus. The adult had degenerative lesions in the myelin sheaths of the central nervous system, cellular necrosis in the liver, and ulcerations of the mucosa of the trachea. The only pathology observed in the tissues of the fetus was mild vacuolization in the myelin sheath of a cranial nerve.

Results of aerial surveys conducted during June to compare pup production in oiled and unoiled areas indicated no significant difference in the ratio of pups to non-pups. However, there are no previous data available from PWS during the pupping season

with which to compare the 1989 results. Pupping surveys for at least two additional years are necessary for comparison, since pupping in 1990 may also be affected by the spill.

Prior to the EVOS, seals in PWS had declined between 1984 and 1988. The magnitude of the decline was similar at oiled and unoiled sites (37% versus 36%). From 1988 to 1989, however, the decline in seals at oiled sites was much greater than at unoiled sites (45% versus 16%). Orthogonal contrasts from a repeated measures ANOVA clearly indicated that the difference between oiled and unoiled areas was significant.

In order for the objectives of this project to be fully met, the following tasks must be completed: 1) all histopathology and toxicology samples must be analyzed; 2) two additional years of aerial surveys must be conducted during pupping in June; and 3) two additional years of aerial surveys must be conducted during the annual molt in September. Data from all three years of surveys, in combination with complete histopathology and toxicology results, are necessary to evaluate whether the EVOS caused a reduction in pup productivity at oiled sites in 1989 and 1990, and whether the large decline during the 1989 fall surveys was due to mortality caused by the EVOS. This information can then be used to make recommendations regarding restoration of lost use, populations, or habitat where injury is identified.

DRAFT

CONFIDENTIAL

Assessment of the Magnitude, Extent, and Duration of Oil Spill Impacts on Sea Otter Populations in Alaska.

Marine Mammals Study Number 6

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January 12, 1990

EXECUTIVE SUMMARY

Repeated boat surveys in Prince William Sound in summer 1989 resulted in highly consistent estimates of sea otter abundance of about 3,400 sea otters in shoreline habitats (within 200 m of shore). For the entire Sound, exclusive of Hawkins Island Cutoff and Orca Inlet, the boat surveys suggest a net decrease of about 700 sea otters relative to baseline surveys conducted in 1984-1985. The reduction was not evenly distributed in the Sound but was concentrated in the 1984 sampling area which includes most of the coastal areas in the Sound affected by the oil spill. Within that area, substantial declines occurred on both oiled and unoiled transects. That this reduction of sea otters was the result of the oil spill is supported by data from the carcass collection which suggests that 415 of 490 sea otter carcasses recovered in Prince William Sound represent spill-related mortalities. The majority of those carcasses were recovered in western Prince William Sound.

Fixed-wing aerial surveys of discrete sampling units within the oil spill zone in the Sound documented immediate decreases of sea otter at certain locations and provide evidence of continued declines in numbers of sea otters during fall, 1989, either through mortality or emigration. Fewer numbers of sea otters on post-spill surveys from specific regions in the oil spill zone were accompanied by substantial returns of dead sea otters from the same locations to the carcass collection centers and live, but oiled otters to the otter treatment centers in Valdez.

Although not significant, all point estimates of sea otter populations surveyed on the Kenai peninsula, Kodiak Archipelago, and the Alaska peninsula in the spring declined during the fall. The coastal distribution of sea otters in those areas, however, was not altered by the degree of shoreline oiling. A significant finding from the helicopter surveys was the demonstration that substantial numbers of sea otters may be inhabiting offshore habitats. This has important implications for estimating mortality and interpreting results from boat and fixed-wing surveys in Prince William Sound. Oil spill trajectory maps indicate that substantial portions of offshore habitat in the oil spill zone in Prince William Sound were impacted by oil. Mortality of sea otters in those offshore habitats was probably severe given the lack of oil-free refugia there. Given an offshore component to mortality, then mortality estimates may be substantially higher than earlier thought and recovery rates, which have been estimated to be as high as 75%, may be much lower.

Estimates developed from data collected at the carcass collection centers suggest that up to 710 of 878 sea otter carcasses represent spill-related deaths. An additional 117 sea otters brought to otter treatment centers died in captivity. Mortality was particularly high in Prince William Sound. Female sea otters were predominant in the carcass samples from Prince William Sound and the Kenai Peninsula, confirming that the oil spill affected

primarily female areas. Many of the adult females were pregnant or lactating. Clearly the most important reproductive component of the populations of sea otters in the Sound and on the Kenai Peninsula, i.e., adult females, was affected by the oil spill. In that regard, injury to the sea otter population is likely to be long-lasting given the loss of reproductive potential of female sea otters.

Efforts to determine the long-term effects of the oil spill on sea otters are continuing in Prince William Sound. Analysis of blood parameters from sea otters in oiled and unoiled habitats indicate that otters in oiled areas had blood values consistent with liver and kidney damage whereas otters in the unoiled areas did not. Elevated values for certain blood parameters in treatment animals may be related to either acute injury or chronic injury from the hydrocarbons that persist in the spill zone. Survey effort and repeated capture attempts in the oil spill zone in western Prince William Sound have documented substantial decreases in the sea otter population in that area. If those decreases represent seasonal movements of sea otters to other parts of the Sound, they may be accompanied by movements of sea otters back into the spill zone this spring and summer. This raises the possibility that large numbers of sea otters may continue to periodically come into contact with chronic, non-lethal levels of hydrocarbons. If that is the case, then continued study of chronic, long-term effects as indicated by population trends, reproductive rates, physiological parameters, and toxicology, is critical for documenting additional injury to sea otters in Prince William Sound.

DRAFT

CONFIDENTIAL

Assessment of the Fate of Sea Otters Oiled and Rehabilitated as a Result of the Exxon Valdez Oil Spill

Marine Mammal Study Number 7

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January 12, 1990

EXECUTIVE SUMMARY

All available data indicate that the effects of the oil spill on sea otters were far more acute in Prince William Sound than on the Kenai Peninsula, Kodiak Archipelago and Alaska Peninsula. Three hundred and twenty-nine sea otters were captured and transported to otter treatment centers in Valdez and Seward. One hundred and seventeen of those died in captivity. Mortality varied markedly between otter centers. At Valdez, 58% of the otters died in captivity compared to only 15% at Seward. Most of the otters that were treated in Valdez originated in Prince William Sound. Confounding variables limited our ability to distinguish which factors affected survival. Certainly timing of exposure to oil, degree of oiling, capture, treatment and holding protocols, and the facilities at each otter center all played a part in determining success of rehabilitation. At Valdez, mortality was significantly related to degree of oiling. Heavily oiled otters had only a 27% chance of surviving at Valdez. No relationship between degree of oiling and survival was observed for sea otters at the Seward otter center. Almost all heavily oiled otters came from Prince William Sound. Of all sex and age classes, adult females were most prevalent in otters that were captured during the oil spill. At least 23% of those females in Valdez were pregnant compared to 18% at Seward. Of 18 pups born in captivity, only one survived to release. Another survived and was sent to an aquarium. Sea otters admitted to the Valdez otter center were in poorer condition (based on weight/length ratios) than sea otters admitted to the Seward center. Similarly, sea otters that died after admittance were in poorer condition than sea otters that survived.

Forty-five sea otters that underwent treatment at the Valdez and Seward otter centers were instrumented with implantable radio transmitters and released in eastern Prince William Sound. To date, the whereabouts of 36 of those otters are known. Of the remainder, one is dead, one has stopped transmitting, and seven are missing. The rate of missing and dead otters in the rehabilitation study is high when compared to a study undertaken in Prince William Sound in 1987; however, rehabilitated sea otters made movements of unprecedented scale. A number of rehabilitated sea otters made movements of up to 500 km from their release site; others may have moved beyond the search area. Of 44 rehabilitated sea otters, 15 re-entered the spill zone. Insufficient data are available to test various hypotheses related to survival and reproduction of the rehabilitated sea otters. We expect that additional rehabiliated sea otters will enter the oil spill zone. Based on our survey results and radio tracking results, duration of stay within the oil spill zone may vary seasonally. Therefore rehabilitated sea otters may periodically be exposed to chronic, non-lethal levels of hydrocarbons. It follows that future research should be directed at investigating subtle, longer-term

effects of the oil spill on sea otters, e.g., on physiology (blood parameters), reproduction (as specified in the proposal) and toxicology.

The value of the rehabilitation effort to sea otters remains a topic of opinion and controversy. Early in the oil spill period, there seemed little chance that affected sea otters could be saved, and indeed, most were not. As time passed and most of the otters arrived at the treatment centers less heavily oiled and in better condition, perhaps the effort was successful although disturbance associated with the capture effort and stress related to capture and handling undoubtedly contributed to mortality. Later in the spill period, probably from late May through September, capture, handling and rehabilitation were probably counterproductive. Most of the otters entering treatment centers were in relatively good condition, and many were lightly oiled or not oiled. Capture crews could no longer determine oil status on the otters they caught. There was evidence from the field that otters were surviving successfully in areas impacted by oil. It follows that the capture effort should have been curtailed long before it was.

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ASSESSMENT OF THE EXXON VALDEZ OIL SPILL ON THE SITKA BLACK-TAILED DEER IN PRINCE WILLIAM SOUND AND THE KODIAK ARCHIPELAGO

TERRESTRIAL MAMMAL STUDY NUMBER 1

PRELIMINARY STATUS REPORT FOR APRIL THROUGH DECEMBER 1989

PRINCIPAL INVESTIGATOR

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ASSISTED BY
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JANUARY 15, 1990

Executive Summary

Sitka Black-tailed deer (Odocoileus hemionus sitkensis) are the most abundant large mammal on the islands of Prince William Sound and the Kodiak Archipelago. Although most areas with highest deer densities in Prince William Sound were either lightly oiled or not oiled, deer are found throughout most areas impacted by oil both in Prince William Sound and Kodiak. Deer generally concentrate in a narrow fringe near the coast during late winter and early spring. Intertidal flora are eaten extensively by deer although the nutritional value of this is questioned. A substantial increase of human caused disturbance, introduced as a result of the oil spill, may have caused deer to move to higher elevations prematurely. Deer were observed on Kodiak Island on oiled beaches and eating oiled Intertidal flora. Some of these deer had oil contamination on their legs and feet.

In the initial study plan, the first objective of this study was proposed as a detailed, systematic survey. The goal of this survey was a search for dead deer to assess oil related mortality. A pilot study on a much smaller scale showed this objective could not be met as proposed because, two months after the spill occurred, no dead deer could be found which could be linked to the spill. This objective was therefore given a lower priority and subsequently revised to monitoring concentrations of deer on oil contaminated beaches during the winter of 1989-90. If deer concentrate on oiled beaches, and if there are indications of oil toxicity, a detailed assessment will be conducted for this objective.

The remainder of this study is designed to assess impacts on deer through two different methods: 1) collection of animals for tissue analysis and 2) a deer hunter survey. Thirty-two deer were collected from oil contaminated islands in Prince william Sound and the Kodiak Archipelago and selected tissues were preserved for analysis. In addition, 38 animals were found dead near oiled beaches during the pilot study. An additional 64 animals were found dead during response, monitoring and cleanup operations. None of the 38 animals from the pilot study and 8 of the other 64 animals found dead had tissues in good enough condition for hydrocarbon analysis. No tissues were saved for histological examination from any of the animals found dead nor did any show signs of oil contamination. Most of the animals found animals showed signs of nutritional stress common in Sitka deer in spring. This does not mean that none of these deer died from effects of the oil spill. Spring is the low period of the Sitka deer's annual nutritional cycle. Probably individuals are most susceptible to stress, related either disturbance or

toxicity, at this time. Additional stress other than nutritional deficit could tip the balance, causing death. Such deaths however may be manifested by external symptoms of nutritional stress.

Results from this study are minimal at this time. No tissues have been analyzed for hydrocarbon contamination. Histological examination was conducted on two deer foraging on an oiled beach on Shuyak Island in April. Both of these animals had oil on their feet and legs. The histological examination indicated one deer exhibited necrosis of the collecting ducts of the kidney. This may have been the result of ingestion of oil contaminated intertidal flora. If this condition would have persisted, the necrosis could have lead to kidney failure.

The hunter survey, which was proposed to begin January 1, 1989 has not received approval and funding from the Economics and Legal teams. This part of the study was proposed to conduct a mail questionnaire survey of hunters reporting hunting in Prince William Sound or Kodiak. The oil spill related information gained from this survey would indicate the amount of hunter displacement, resulting hunting effort changes and overall harvest difference caused by the oil spill. Information from this survey could then be used to generate an economic assessment of losses resulting from the oil spill.

ASSESS EFFECTS OF THE EXXON VALDEZ OIL SPILL ON RIVER OTTER AND MINK IN PRINCE WILLIAM SOUND

TERRESTRIAL MAMMALS STUDY NUMBER 3

Interim Progress Report

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January 15, 1990

Executive Summary

Coastal river otter (Lutra canadensis) and mink (Mustela vison) are terrestrial mammals that depend on intertidal and subtidal habitats for food (Larson 1983, Woolington 1984, and Johnson 1985). The introduction of oil into the Prince William Sound (PWS) environment by the Exxon Valdez oil spill (EVOS) may have measurable effects on populations of either species. Mink and otter faced exposure to oil in order to use the marine component of their habitat. In addition to physical contact with oil and inhalation of aromatic hydrocarbons, long term population effects may result because of changes brought by oil to prey populations or through toxic contamination of mink and otters themselves. The goal of this project is to determine if measurable population impacts have or will occur in response to EVOS.

Initial efforts were concentrated on searching beaches for mink and river otter carcasses (to document direct mortality and obtain tissue samples for histopathological and toxicological analysis), instigating a system to detect gross population changes, and acquire information to develop longer term studies. The lack of base line data for mink and otter populations in PWS and the limited population data documented in the literature required technique development to occur simultaneously with data collection.

The combined number of mink and river otter carcasses from all sources (dead animals recovered from oiled beaches and those collected by project personnel) was small. Tissues from only 1 beach dead otter has been analyzed for hydrocarbons and the high Poly-aromatic hydrocarbon (PAH) value for the lung tissue suggest oil related mortality. Ten additional tissue samples from other animals have been submitted for hydrocarbon analysis. No other histopathological and toxicological results are yet available.

In the absence of base line data, a control and an oiled study area (Figure 1) approach has been established to gather data. Comparable numbers of latrine sites that appeared to have regular use by mink and/or otters were selected for systematic scat sampling. If large numbers of mink or otters died due to oil in their habitat, a reduced rate of scat deposition was expected on latrine sites in the oiled study area. Sample boundaries were established for each latrine site and all scat materials removed. The sites were

revisited 5 times during the summer and fall to be re-cleaned and the number of collected scats recorded. Initial and preliminary analysis of scat deposition rates by otters failed to reject a null hypothesis of no difference between study areas but full analysis of available data are not complete.

Scats collected during the cleaning of latrine sites have been frozen for food habit studies. If exposure to oil changed food availability (and potentially carrying capacity), the species composition of undigested materials should reflect the change. Scats collected during the initial clean up will provide data on the pre-oil (baseline) diets. The occurrence of food item in scats from this summer and fall will be compared to baseline data and between study areas for significant differences. Identification of food item composition will be done in the next year by a graduate student at Humboldt State University.

In early December, 11 river otters were captured in the oiled study area and marked by surgically implanting a radioactive isotope and radio transmitter. The capture program established a sample of 10 marked otters. One animal died of exposure in the trap when recaptured during a severe storm. A January 5, 1990, aerial survey monitored 9 of the 10 radio frequencies; mortality mode signals indicated 2 otters may have died since their capture.

Preparing for the 1990 summer program has constituted the major portion of the projects non-field activities. Emphasis of that program will be to detect longer term population declines resulting from diminished reproductive success, delayed mortality, or reduced carrying capacity because of oil. Analysis of that data will determine if continued field studies will be necessary to follow or identify population level impacts that may be attributed to the EVOS.

ASSESSMENT OF THE EXXON VALDEZ OIL SPILL ON BROWN BEAR POPULATIONS ON THE ALASKA PENINSULA

TERRESTRIAL MAMMAL STUDY NUMBER 4

INTERIM STATUS REPORT FOR APRIL THROUGH DECEMBER 1989

PRINCIPAL INVESTIGATOR
DONALD G. CALKINS
ALASKA DEPARTMENT OF FISH AND GAME
333 RASPBERRY ROAD
ANCHORAGE ALASKA

ASSISTED BY
RICHARD SELLERS, DAVID JOHNSON, AND LARRY VAN DAELE

JANUARY 15, 1990

Executive Summary

Brown bears are present in much of the coastal areas affected by the Exxon Valdez oil spill, particularly along the coast of Katmai National Park, located on the Alaska Peninsula. It is suspected that the bear densities along the Katmai coast are higher than reported for any other brown bear population. Brown bears are omnivorous, opportunistic feeders near the top of the food chain. They may ingest oil directly by eating "mousse" (congealed floating oil) and tar balls washed ashore, by eating oiled plants and clams, by scavenging oiled carcasses of animals killed offshore and deposited on beaches, or by grooming their oiled fur. Bears may also consume animals that have been physiologically contaminated by sublethal doses of oil.

This study was designed to assess the impact of the oil spill on brown bear populations along the Katmai coast. The study was focused primarily on the level of the brown bear population, and secondarily on individual bears, by means of a case-control study.

Population level impacts assessed are the mortality rate of females in the oiled area of the Katmai coast compared to the natural mortality rate of female of coastal brown bear populations on Kodiak Island and near Black Lake (further south on the Alaska Peninsula). These populations were not exposed to oil. The comparison should elucidate the overall impact on the bear population in the exposed (oiled) study area.
Impacts on individual bears to be addressed are: assessment of petroleum levels in tissues of bears found dead in the study area and determination of potential effects from that petroleum exposure. Scat samples from bears in the oiled area will be compared to scat samples from bears in the Black Lake control area. The comparison should assess the degree of exposure to and ingestion of petroleum hydrocarbons by brown bears.

Brown bear mortality rates in the study area will be estimated by monitoring radio-collared bears over time. The overall impact of the EVOS on the bear population will be estimated by comparison of the density estimates obtained over the next two years. Assessment of the effects of oil on individual bears will be accomplished by collecting, preserving and analyzing tissues from bears which die during the study.

Thirty brown bears were captured and fitted with radio collars in June, 1989, along the Katmai coast. All bears were captured

within two miles of the coast. The bears generally remained within this area. Seven of these bears have shed their radio collars. An additional 3 bears, which have probably denned, have not been re-located since October 2. Radio locations were verified on a regular basis during aerial surveys of the remaining 20 bears, all of which have subsequently denned.

Most aspects of this project were planned to yield results beginning autumn, 1990. No results are available at this time (January, 1990). This includes analysis of tissues and scats already collected.

NRDA Fish/Shellfish Project Preliminary Results

Prepared for the Restoration Alternatives Workshop
Summarized by C. Meacham
04-03-90

Injury to Salmon Spawning Areas

PWS/LCI: Up to 75% of the pink and chum salmon in Prince William Sound spawn in intertidal areas. Oil contamination was observed and documented in the intertidal zone at the mouths of 47 streams in the habitat survey portion of this project. Thus, adult salmon spawners in oiled areas could be expected to come into contact with oil. While no gross shift in spawning habitat utilization was detected, analysis is underway to compare pre and post oil spill spawner distribution between oiled and unoiled streams and within intertidal and upstream portions of individual streams.

Kodiak Area: Few salmon spawn in intertidal zones within the Kodiak/Chignik areas. However, massive numbers of spawning salmon moved into small streams due to oil related closures of the commercial fisheries. Extremely large numbers of spawners are associated with poor survival. For the region, escapements totalled 20 million fish for areas with escapement goals of 4 million. Individual streams achieved escapements many standard deviations above the mean.

Subsistence Salmon Hydrocarbon Analysis: Of 210 samples of edible flesh analyzed to date, two samples of pink salmon from Kodiak had levels of aromatic contaminants from petroleum nearing about 100 ppb. Eleven samples of pink and coho salmon from Kodiak, Chenega Bay, Tatitlek and Larsen Bay exceeded 10 ppb of total aromatic contaminants. The levels in the edible flesh of salmon from other subsistence fishing areas were generally comparable (less than 10 ppb) to the levels detected in reference samples from Southeastern Alaska. Adult salmon may be more affected than other fish species since fish near spawning condition are not as effective in metabolizing aromatic contaminants.

Injury to Salmon Eggs/Fry

Up to 75% of the pink and chum salmon in Prince William Sound spawn in intertidal areas which are highly susceptible to contamination. Pink salmon alevins are more adversely affected by oil exposure in seawater than freshwater. Preliminary analysis show a 43% increase in mortality of pink salmon eggs laid in the Fall of 1989 in oiled streams compared to control streams. Spring pre-emergent fry digs are currently underway.

Injury to Juvenile Salmon

Migration patterns appear to be normal for juvenile salmon fry released in oil free areas but scattered for fry released in the oiled southwestern area. Migration speed may also have been slower for fry released in this area. Juvenile pink and chum salmon were more abundant in the non-oiled area. Growth rate was significantly lower in oiled areas. Comparisons of fry grouped by collection area as well as by tag lot indicate that oil was a significant factor in reducing growth rate. Analysis of length and weight information suggests that "apparent" fry growth rates in the vicinity of the AFK hatchery were quite low despite abundant pelagic forage stocks and adequate temperatures.

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Coded wire tags

Slower swimming speeds

Injury to Dolly Varden / Cutthroat in PWS

Unlike anadromous Pacific salmon, trout and char utilize nearshore and estuary areas for feeding. Their marine migrations are not as extensive as those of salmon. Some of the most important stocks inhabit areas that have been severely impacted by direct contact with oil. Dolly Varden have shown the highest levels of bile hydrocarbon concentrations found in fish. Bioassays have shown that the presence of crude oil in low concentrations can affect the survival of the prey of these species and high concentrations may directly impair reproduction, growth, and survival rates of both char and trout.

Injury to Herring in PWS

Herring are a major resource of Prince William Sound from both a commercial and ecological perspective. While no direct mortality of adult herring was observed, preliminary results from eggs and larval studies indicate serious negative effects associated with oil. The proportion of live eggs observed was greater in unoiled areas relative to oiled areas. From eggs which survived to hatch, very high levels of embryonic, cytologic and cytogenetic abnormalities were found in larvae from oiled areas compared to samples from unoiled areas.

Injury to Clams

Bivalve mollusks are found in many of the areas impacted by the oil spill. Due to their sedentary nature, clams are particularly susceptible to contamination by oil as tidal action constantly oils and reoils beaches. Clams do not have an efficient method of metabolizing hydrocarbons, as do fish, so high concentrations can develop within tissues. While no direct mortality of clams was detected immediately after the spill, clams

used for subsistence purposes were sampled and tested the highest hydrocarbon content of any fish/shellfish species. Additionally, injury to clams may impact the health of their animal predators, such as sea otter and bear.

Injury to Spot Shrimp in PWS

Spot shrimp are known to be sensitive to oil contamination in both the larval and adult phase. They inhabit near shore, deep, rocky areas. Tagging data indicates that this species has very limited movement either within or between years. Shrimp pots placed in unoiled areas had a significantly higher cpue than did pots placed in oiled sites, although other factors than oil may be involved. Shrimp hold their eggs externally, enabling direct contact with any oil that may be present. Preliminary study results showed an approximate 20% greater fraction of shrimp from oiled areas with one or more dead eggs.

Injury to Rockfish

Preliminary study results suggest oil spilled from the Exxon Valdez killed demersal rockfish in Prince William Sound in 1989. Five rockfish brought into collection centers in Valdez and Cordova from sites of reported fish kills were sampled and crude oil was found to be the cause of death. Eleven of 36 bile samples analyzed from oiled areas of the Sound showed hydrocarbon accumulation. Study results suggest that oil contamination persisted in the environment well after the initial oiling and that oil contamination has extended to benthic habitats.

Injury to other fish

A variety of fish were captured by trawl gear and submitted for hydrocarbon analysis. Preliminary results from sampling bile indicated at least the following species had been exposed to oil:

flathead sole
halibut
herring
Pacific cod
pollock

These species are important to commercial, sport, and subsistence fisheries. Additionally, they play an important roll in the ecosystem, serving as an important food source to a wide variety of marine mammals and birds.

Sockeye Over-escapement

Commercial fishing for sockeye salmon was curtailed in Upper Cook Inlet, Chignik, and Kodiak due to presence of oil in the fishing areas. As a result, the number of sockeye salmon entering a number of spawning systems greatly exceeded levels that are thought to produce maximum sustained production. Overly large spawning escapements may result in poor returns by producing more rearing juvenile salmon than can be supported by the nursery lake's productivity. Sockeye salmon can be a major contributor of nutrients to systems in which they spawn.

All subjects →

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RESTORATION PLANNING WORKSHOP

INFORMATION NEEDS FOR FISH/SHELLFISH

It was the consensus of the Fish/Shellfish session members that the damage assessment did not provide adequate information upon which to base firm restoration recommendations. However, it was also recognized that some uncertainty as to the nature and magnitude of damage was likely to exist for some time and that decisions would have to be made under risk.

A range of information needs considered critical to making sound management decisions for exploited resources were identified during the course of the two day session on fish and shellfish. These needs arose from two basic problems: 1) the need for additional damage assessment data either from ongoing but as yet incomplete studies or studies that were cancelled and 2) the requirement for more precise management information due to the uncertainty introduced by the effects of the oil spill. Although some of the continuing studies were not expected to produce results immediately, other studies that were not continued due to their limited relationship to the damage assessment would have, in the session's opinion, provided valuable information for planning restoration.

The following studies identified by the session as important for restoration planning were primarily related to immediate information requirements. These studies were particularly focused on harvested resources for which basic information needed to manage the stocks is currently not available. The session members felt that the uncertainty associated with the spill required more precise information than is currently available and that this information requirement should be a justified expenditure for "restoration" funding.

- Herring scale pattern analysis to identify stocks. This would aid in determining whether there are one or two stocks exploited in Prince William Sound.
- Catalog herring spawning areas.
- Hydroacoustic biomass estimates of resident herring stocks this fall.
- Adult pink salmon tagging near hatcheries to distinguish wild and hatchery stocks.
- Coded wire tags: improve turn around time for management purposes.
- Salmon otolith analysis (hatchery mass marking).
- Tagging rockfish on reefs to provide population estimates.
- Continue groundfish trawling (age and size) and port sampling.
- Catalog and inventory resources in Prince William Sound and lower Cook inlet region.

RESTORATION PLANNING WORKSHOP

INFORMATION NEEDS

Recreation

Public attitude surveys -- what are the values and perceptions?

What is the nature and extent of displacemnet of recreation use resulting from the spill?

Did or will displacemnt of recreation use from PWS affect the quality or quantity of use in other areas in Southcentral Alaska?

Did the spill adversely affect the quality or quantity of wilderness values of PWS for local residents? What about the perception of wilderness for potential visitors to the areas? For actual visitors?

Will the spill result in more recreation use thorugh the spill's "advertising" or name recognition value? Will visitors pay less than they would have had they been visiting an un-oiled PWS? Are we trading high value/low volume tourism for lower value/high volume tourism?

Will the spill attract disaster junkies, as was the case with Three Mile Island or Mount St. Helens?

Will a new tourism industry develop out of people wanting to visit PWS to learn about or study natural or human supported restoration?

What is the effect of the spill on the recreation opportunity spectrum in PWS?

User values

What are the patterns of use?

What are the number of users?

What is the value of recreational opportunity translated into consumer surplus?

How much worse-off are the PWS-Gulf "users"?

What is the land status/acquistion opportunity with respect to ecological-recreational-cultural responses?

What are the land uses/plans on public lands?

Assess public-use facilites and identify other recreational sites in relation to spill damage by integrating (possibly by mapping exercise):

Spill damage
Resource values
Land status/willingness
Agency priorities

Birds

What are the breeding habitat requirements for the marbled murrelet in the PWS area? Do they nest in trees as in lower latitudes? If so, do they require old-growth forest habitat or can they utilize second growth timber?

What is the status of the sea duck population, especially the harlequin duck? What are breeding habitat requirements? What are the winter distribution and site fidelity attributes of the harlequin duck?

What are the harvest levels for sea ducks, particularly the harequin duck?

What is the availability and distribution of forage fish for seabirds in PWS, particularly herring, sandlance, and other non-commercial forage species?

What is the status of the parakeet auklet population on Smith Island (which was heavily oiled by spill)?

What is the magnitude of bird mortality associated with the nearshore gillnet fishery?

What are the annual food habits and requirements of the bald eagle?

What are the overwintering requirements and immigration patterns of the common murre?

ADDITIONAL INFORMATION NEEDS
IDENTIFIED BY THE MAMMALS SESSION
RESTORATION PLANNING WORKSHOP
3-5 APRIL 1990

Marine Mammals

Sea Otters

- Population modeling studies to derive an accurate estimate of the proportion of the Prince William Sound sea otter population impacted by the oil spill

Humpback and Killer Whales

- Expansion of individual identification capabilities (fluke and dorsal fin catalogs) to facilitate studies of residency, habitat use, reproductive rates, and stock identity of whales using Prince William Sound and the Gulf of Alaska

- Biopsy sampling studies for stock identification (resident vs transient groups)

- Prey availability surveys

Sea Lions

- Determination of causes of pre-spill population decline and the relative contribution of the spill to the declining trend

- Stock separation and identification

Harbor Seals - pup counts

Terrestrial Mammals

Sitka Deer and Bear

NO - Determination of the frequency and extent of usage of marsh vegetation and beach grasses by deer and bear to assess the value of restoration of those resources

NO - Assessment of potential delayed effects of oiling on black bears

River otter and Mink

IN - Determination of: total populations in affected area, habitat use, reproductive potential, and food habits

- Continuation of laboratory study of the effect of oil ingestion on mink reproduction to contribute to an

FIELD OUT
LAB OUT AFTER JULY

estimate of the magnitude of suspected damage to the Prince William Sound population

Exxon Valdez Oil Spill

Damage Assessment Information Needed by the
Coastal Habitats Restoration Work Group

The Coastal Habitat Restoration Work Group was, as were other work groups, frustrated by the general lack of damage assessment information presented at the *Exxon Valdez* Restoration Workshop, April 3-5, 1990. No information was presented concerning the extent and magnitude of oil contamination to the coastline of Prince William Sound. Neither was information available, except in the most general qualitative sense, on the effects of oil contamination to coastal ecological resources.

The Work Group chose to consider damage assessment and restoration alternatives for three major coastal habitats: the supratidal zone, the intertidal zone, and the subtidal zone. Each of these habitats was further divided into low and high energy environments reflecting their exposure to waves, sediment type, and slope.

The Work Group as a whole was of the opinion that it would be valuable to have an overall view of the extent, magnitude, and effects of oil contamination in Prince William Sound. The Work Group also sought to separate the effects of exposure to oil from the effects caused by clean-up efforts. The group thought this was one of the most important points to come from the damage assessment efforts, since such information could be applied to future spills which the group thought were sure to happen.

Although not specifically stated, it was my opinion as rappateur for the Work Group, that the Group wanted made available the following types of information:

- What was the area and proportion of Prince William Sound shoreline made up of sandy beaches, cobble beaches, and rocky shores?
- What proportion of each of these types of shores were impacted by oil from the *Exxon Valdez* and what was the magnitude of oiling?
- What proportion of each of the three habitat types (supratidal, intertidal, and subtidal) was exposed to which clean-up options (no clean-up efforts, hot water rinse, cold water rinse, bioremediation, etc.)?
- What proportion of each of these types of shores was exposed to which clean-up options?
- What were the direct effects of exposure to oil and can these effects be distinguished from the effects caused by the clean-up efforts?

- Was the Prince William Sound shorelines being monitored for long-term effects and if so, were studies being conducted to adequately discern the effects of oil from the effects of clean-up efforts?

In addition to this general type of information, the Coastal Habitat Work Group suggested that the damage assessment should include information concerning the extent, magnitude, and effects of oil on specific communities and populations. For example, questions were raised concerning how much oil reached the sediments within Prince William Sound and what oil concentrations were measured in the sediments. Questions were also raised concerning the communities within those sediments, since benthic communities have been shown in a number of studies to be sensitive to petroleum hydrocarbon inputs. Unfortunately, not only were no data presented, but it was not clear what samples were taken and would be eventually analyzed to address these questions. It was also considered important to know the areal extent and exposure to oil of supratidal marshes. Finally, because of its perceived importance as a population effecting the very structure of intertidal communities in the Sound, information concerning *Fucus* populations was requested. Lacking was information on the areal distribution of *Fucus*, what proportion of the population was exposed to oil and to various clean-up methods, and what effects oil and clean-up efforts had on these communities.

The Habitat Work Group expected and asked for considerable damage assessment information, but received only qualitative descriptions of exposure and effects. Consequently, the Group was not comfortable recommending damage restoration alternatives and none were made.

o:\alaska\damassnd.doc
16 April 1990

RPWG
AA

Fish + Shellfish

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Information/Research needs:

All species:
- better escapement estimates (and stock abundance) (Coded wire tags)
- otolith eval. studies (need better real time data)

Commercial fish:
- adult tagging (Pink salmon) near hatcheries to separate hatchery/wild stocks
- more rapid turnaround on CWT data
- escapement enumeration — more frequent air + ground surveys <this year> for oiled streams (NOAA)
- VALDEZ hatchery needs $ to read otoliths + conclude experiment this year (⅓ of returning fish are marked)

Sport fish:
- continue port sampling — esp. for rockfish (dropped this year) need age-size database to id. recruitment rates, etc (NOAA)
- catalog/inventory DV/cutthroat pops in a few select systems + lower Cook Inlet (Cook Inlet dropped from NOAA)

Herring
- ~~[illegible]~~
- beef up catch + age analysis
- outer CI has herring stock that may be PWS juveniles; show advanced warning of year class probs from spill
- hydroacoustic est's of PWS resident herring
- habitat Identif. (spawning areas catalogue)
- herring stock ID project. incl.

✓ * → - scale pattern analyses - outer Kenai/CI vs PWS to see if from PWS stock (stock seperat.
- same (as above) within PWS to look at whether these are different stocks (*next year)

~~*~~ - artificial substrate feasibility study - may be too late for this years spawning

NRDA * - better info on spawning area

Ground Fish / Rockfish

- rockfish - need more basic biol. info. before do restration
- need ~~more~~ port sampling for rockfish

✓ * ? - tagging rockfish on reefs

- other groundfish → baseline info is poor (age structures, pop. sizes et

NRDA * ✓ - 1990 trawls stopped by NRDA ; probably more important this year than last.

NRDA * Clams + other Shellfish
- monitoring contamination

for ~~restor~~ restor - reciprical transplants (some ongoing under NRDA) + catalog + ID alternate areas

part of herring stock expansion study

✓ ✱ Herring scale/pattern analysis for Outer KP (CCI vs. PWS)
- possible to do this year
- important to determine if CCI/PWS are one stock

see p. 4 of 4/4 notes

4/3 Notes

- need to know more about state of stocks

- need better knowledge of exploitation rates / sustainability would avoid driving stressed stocks too low

SALMON -(?)-
- need to know what optimum escapement is for different stream systems; need to know rates of return or exploitation rates for many indiv. streams

- need to evaluate hatchery/wild stock interaction to do better (mgmt precision)

J ✱✱ Before spill, did not need high precision in mgmt; but with added stress from the spill need better monitoring of harvest rates.

Clams -
- very little known about where stocks are
✱ - need to identify when clams are OK for human consumption
? - if CI shows contamination; need for mgmt chgs.

Other shellfish - (decapods)

- ~~management~~ little info known; some stocks already depleted
- more info (mgmt. precision);
- monitor contamination
- identify alt. species ? see ∈ p. 4 on 4/3 for fisherman

Groundfish Options -
- catalog/ inventory stocks right away (rockfish)

* better real-time harvest info
* Mass marking techniques for better stock mgmt (to separate hatchery from natural fish & assess wild/hatchery stock interaction)
  otoliths
  electrophoretic tech.

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4-3-90 Fish / Shellfish Workshop Seattle 1

Sign-up sheet: attached

Fisheries impact studies - handout w/ summaries - attached

Start w/ P-I views on restoration needs

Kelly Hepler + Doug ~~Kelly~~ Sportfish Div.

INITIAL DISCUSSIONS FOCUSED ON MANAGEMENT OF FISHERIES

Lack of prior info will be a concern for pre-post studies; ~~not need high level of precision~~ Ability to manage the sportfisheries ~~did already affected by~~ ~~Lack of info.~~ before fall. Spill means there's a need for a higher level of precision in info in order to adequately manage the resources now.

* Concern that need to know enough about stats of stocks so we don't push some below a threshold by overfishing. Need to "manage the kelp" will be critical to protecting the populations into the future.

Can place artificial reefs, build hatcheries, etc. - but if we can't control the harvest (or know enough to do so) ~~none~~ none of this will matter much.

Mundy - disagrees w/ John Veals' "best to do nothing" approach

* because fish are an exploited resource. Better knowledge of exploitation rates / sustainability would ~~avoid~~ avoid driving ~~released~~ stocks too low.

For salmon - escapement-driven management, so should be able to quickly measure if management is way off.

* - But - we don't have a good handle on what optimum escapement is for diff't ~~stocks~~ systems. And, don't know rates of return or exploitation rates for many individual (small) streams.

Need to talk about how to get around lack of precision (more conservative mgmt) and how to best live with lack of precise info (better monitoring of catches during harvest, more terminal fisheries, etc.)

Better mgmt (higher intensity) may be ~~best~~ a good, appropriate focus. Puget Sound fisheries (lower #s, lower values overall) have 1000s of biologists working on fisheries management - much more than here.

Can we separate hatchery harvest management from harvests to natural stocks sufficiently to afford some better protection to natural stocks? Yes + no - have decent idea of time/area use for hatchery fish. But at this time, would have to harvest more terminally, but quality of product ends up being poor. However, there are technologies for mass-marking (stock eval) programs - incl. otolith marking (next year - too late for this year), electrophoretic work (Dr. Garrett?) (load w/ pukes).

Argument from Epoa may be, state should be doing these things for appropriate mgmt, anyway. But before spill, less precise info was adequate for mgmt.

* Rest

Restoration projects could include doing things to maximize productivity/recruitment of the next year classes - to include more data collection on fish themselves.

Dolly study could be fine-tuned to get more of the info needed for more precise mgmt - now basically know only #s/biomass caught. ~~This is~~ All we're continuing to do now is looking @ tagged lots' survival - won't know recruitment rates, etc.

* Rest.

Increasing Mgmt Precision is one idea that needs to be on "restoration" list.

FTG ~~has~~ sees 3 options: ① what should be done no matter what results of NRDA studies are; ② what if signif damage is found; ③ what if no sign. damage is found. Increasing mgmt precision is seen as #1. Habitat protection should fit in #1, too. For D-V + cutthroat, could also mitigate damage (under #2) by stocking. ~~But need to decide~~ ~~If~~ ~~this~~ issue is sportfishing, esp.

* Rest.

Short-term vs long term restoration strategies – how do we divide?

Species x species discussion

(A) Salmonids – options (no-beval, eo for)

Restore

Fisheries Mgmt changes
- Habitat rehab
- stock-specific enhancement (egg boxes, etc)
- fishways
- lake fertilization
- reduce high-seas interception
- Predator ~~control (sea birds, sea lions, etc)~~ prey considerations

Replace
- hatcheries
- off-site fishways
- off-site egg boxes, etc
- off-site lake fertilization
- new stocks on-site
- ship-in food for ~~subsistence~~ others
- relocate ~~subsistence~~ fisheries locations.
- identify alt. species for fishermen (new)

Note: PWS, CI, Kodiak have regional fisheries mgmt teams. PWS one meeting monthly, CI bi-monthly, Kodiak 4 hrs to get their views on what we should meet w/ them to get best fit in w/ existing mgmt approaches would ~~be~~

Acquire
- "Wilderness" + habitats – riparian habitats
- changing land mgmt practices
- buying permits + holding until recovery or ② giving to natives
- sportfishing access elsewhere
- buy back Bristol Bay leases

(B) ~~Herring~~ ~~option~~

D.V./Cutthroat – options

Restore

Same as above, plus

Replace

- "Aquatic education" (where not to fish, +/or give other access)
- identify new alt. species for fishermen

Acquire

(C) Herring – options

Restore
- rehab. spawning areas ($ need for rehab – not in NRDA)
- (also need to catalog fishery, some changing use occurs)
- protect spawning areas from nearby fishery impacts (from logging to trawling)
- increase resol'n of mgmt.
- protect pop'n from over-harvest (fishing and ~~predation~~ roe on kelp)
- increase harvest in oiled areas and decrease harvest in unoiled areas

~~Hatcheries~~

Replace
- hatchery options – (being done in Japan)
- identify new alt. species for fishermen (some sole species, invert's like urchins or cucumbers)

↓ could be part of fishery education package, broadly

Acquire (WEL, TIMBER RIGHTS)
- acquire uplands in areas where spawning is prevalent to protect intertidal areas from development effects (likely to coincide w/ high productivity for other spp).
- permit buy-backs

pm Break -

Q - does rest extend to hatchery fish, too? If wild stocks are stressed, & if hatchery fish outcompeting wild fish, can we focus fishery onto hatchery fish more heavily? See p. 2 - yes, but experience has been quality/marketability ↓.

? → So, need to evaluate ~~hatchery~~/wild stock interactions to do better (more mgmt precision, again).

(D) Clams - options

* NRDA? very little known about where stocks are - subjistens areas near communities are known. - need to ID when clams are OK for humans to eat again (Restn or NRDA or other?)

Restore
- digging - up contaminated area & reseed (or transplant)
- stabilize beaches w/ mesh.
- pilot project possibilities
- hab. improvement (Puget Sd beach terracing to promote settling)
- artificial substrate for mussels
- other culture techniques
- management (want needed before)
  - improve ~~stock~~ stock/fishery evidence
  - ID stocks (increase mgmt precision)
  - Cook Inlet, if shows contamination ⇒ needs for mgmt changes.

Replace
- identify alt. clean areas for subsistence use.
- mariculture for consumption - commercial - or for seed stock
- acquire seed from elsewhere

Acquire
- provide access to alt. areas for sub. users.
- acquire uplands to protect tidal areas

(E) other Shellfish (Decapods)

- management issues important here - commercial, personal & sport uses. Little info known, some stocks already depressed.

Restore
- management ↓s -
- more info (mgmt precision)
- habitat, artificial structures
- * - monitor contam'n

Replace
- mariculture = limited - slow growth limits data
  - ↳ should be possible
- transplants
- (- ID alt. species, as ↑ $, for fishermen)

Acquire
- acquire uplands to protect tidal areas from effects of development.

- prey spp. missing, in general.
- ecology, vs fisheries mgmt needs to be added next.

NEED TO CONSIDER FOR GROUNDFISH!

5

4-3-90 Fish / Shellfish

(F) Groundfish - options

- high #s in nearshore areas, rearing juveniles esp.

Restore
- management Δs
- habitat impr. - artificial structures, etc.
- catalog / inventory of stocks
- target away (rockfish)
- public education for sportfishing
- (WDF says may be able to find "stress checks" in otoliths - they will be collected, but not analyzed under current budget)

Replace
- D alt. species for fishermen
- shift efforts to other areas (when know where to shift to!)

Acquire

(G) Other fish (for interbids like pholids / sticklebacks, + transients - coastal hab. projects would benefit these)
↳ non-commercially exploited, incl forage spp. like sandlance:

Restore
basic biol. info needed

- long-term research fund / endowment for monitoring both natural recovery, + effectiveness of short-term restr measures, as well as fill key gaps incl. need for more mgmt precision.

4:55 - End today!

4-3-90 RESTORATION WORKSHOP
FISH/SHELLFISH SESSION

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4-4-90

RESTORATION WORKSHOP
FISH / SHELL FISH SESSION

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BRIAN ROSS, EPA	437 E. ST, SUITE 301, ANCH., AK 99501	271-2461

4-4-90

Fish / Shellfish

Developing a matrix
— on Flip chart page

Short-Term needs

- all species - in short term in absence of more precise info, no mgmt changes can be made.
But - need funding for: better escapement ests (stock abundance) ; otolith eval. studies. (coded-wire tag) (need better real-time data)

Com Fish

Real-time mgmt: data for this is critical.

→ - adult tagging near hatcheries to separate hatchery/wild stocks, with recovery program.

→ - more rapid turn-around on CWT data (small $ need) (NOT REQUESTED FOR NEXT YEAR. NEXT SPRING JUV. TAGGING)

→ - escapement enumeration: more frequent air + ground surveys even this year (VALDEZ) for potentially oiled streams

- one hatchery has otolith marks on 1/3 of fish returning this year — need $ to read otoliths + conclude experiment.

Sport Fish

→ Continue port sampling — esp. for rockfish (got dropped this year) need age-size database to I.D. recruitment rate, etc (1st way to increase mgmt precision)

→ Catalog/inventory DV Cutthroat popns in ~~4~~ few select systems + Lower C.I. ~~Both~~ (LCI dropped from NRDA)

Herring?

Could beef-up catch @ age anal —

- ~~Cook Herring~~ Outer CI has herring stock that gets fished that may be PWS juveniles — could show advanced warning of year-class probs from spill
- Hydroacoustic ests of PWS resident herring.
- Habitat I.D — (spawning area catalog) — Herring stock I.D. project: →

- scale-pattern anal - outer Kenai/C.I. vs PWS — see if from PWS stocks (can do this year)
- same w/in PWS to look @ whether there are diff't stocks (can't do till next year)

Once know if sep't stocks, can do restn actions ranging from transplanting eggs on substrate from oiled to clean areas.

- Artificial substrate feasibility study - may be (is) too late for this year's spawning

Groundfish / Rockfish

- Rockfish need more basic bid. info before do much artificial reef work. But could transfer the fishing effort from Bligh reef (hardcopy left here), for example, to new constructed habitats nearer Valdez. Depending on species, reefs can both enhance pops + aggregate them.

Unknown if reef rockfish habitat - limited here but can add to hab. anyway (compensation). Also can redirect fishing + learn about immigration + recolonization (i.e., have a baseline).

- Tagging rockfish on reefs

Other groundfish - very poor baseline info, except some spot catch data — don't know age structures, pop'n sizes, etc., well. 1989 trawls got abundance info on groundfish + shellfish, as well as idea of age-structure.

NRDA

- Trawling for 1990 dropped by NRDA. - probably more important this year than last.
  - ↳ gives info on epibenthic inverts, too, this way.
- Mariculture in some cases

Discussion w/ Jim Nicoll - to get restn dollars, need to:
1. is stat regeneration adequate
2. show there's a reasonable scientific certainty of injury (from other indicators of directly)
3. a restn measure is tech'ly feasible
4. costs won't be grossly disproportionate to value of the resource.

Clams + other Shellfish

- culture / enhancement techniques (long-term)
- monitoring contamination (should be ongoing) ok NRDA
- Reciprocal transplants (some ongoing under NRDA) for sedentary spp. (incl shrimp)
- + Catalog + ID alt. areas
- Transplant for depuration (time & cost studies) (Subsistence)
- Feasibility study to explore ways to restore qual/quant. of contaminated / reduced subsistence resources — Feas.
- ID alt. resources to exploit.
- Clean + stabilize contaminated subsistence use beaches, + replace — Feas. study → Feas.

Lunch Break

Other Habitat ideas —

Restor. Enh.
- Fishways - removing barriers - would benefit salmon + D/V-Cut.s
- spawning channels
- rearing ponds
- egg boxes
- lake fertilization
- re-maintain existing (old) fishways
- riffle-repair in spawning areas
- spot deep-cleaning
- eelgrass or kelp transplanting.

Sleepy Bay > Kasp Shelter Bay
- beach terracing
- building subtidal islands + / or islands of clean substrate
- early marine food abundance enhancement via fertilization in embayments (feasibility study to consider)
- reduce early marine mort

Weighing the options w/r/t work this year:

How to do this? Consider: ① Time-critical issues from standpoint of Ⓐ doing anything even if we want to (eg., PWS herring spawn in 2 wks), + Ⓑ most important projects to do right away, this year.

* – Herring – scale/pattern anal – (for LCI vs PWS Outer K.P.)
NRDA?
1. Can still do this year (Obj. – determine if LCI/PWS = one stock.)
2. Importance – ① ability to reduce pressure on PWS stock by reducing mort. on juveniles ② monitor to 10 year-class failures, etc.
($ to analyze existing w/in PWS samples, + collect + analyze LCI samples)

– Salmon escapement / CWT data
Adult Tagging
Collection of otoliths

– Rockfish port sampling

Get flipchart * Flip charts have 8 criteria for comparing projects for this year study.

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NRDA Fish/Shellfish Project Preliminary Results

Prepared for the Restoration Alternatives Workshop
Summarized by C. Meacham
04-03-90

Injury to Salmon Spawning Areas

PWS/LCI: Up to 75% of the pink and chum salmon in Prince William Sound spawn in intertidal areas. Oil contamination was observed and documented in the intertidal zone at the mouths of 47 streams in the habitat survey portion of this project. Thus, adult salmon spawners in oiled areas could be expected to come into contact with oil. While no gross shift in spawning habitat utilization was detected, analysis is underway to compare pre and post oil spill spawner distribution between oiled and unoiled streams and within intertidal and upstream portions of individual streams.

Kodiak Area: Few salmon spawn in intertidal zones within the Kodiak/Chignik areas. However, massive numbers of spawning salmon moved into small streams due to oil related closures of the commercial fisheries. Extremely large numbers of spawners are associated with poor survival. For the region, escapements totalled 20 million fish for areas with escapement goals of 4 million. Individual streams achieved escapements many standard deviations above the mean.

Subsistence Salmon Hydrocarbon Analysis: Of 210 samples of edible flesh analyzed to date, two samples of pink salmon from Kodiak had levels of aromatic contaminants from petroleum nearing about 100 ppb. Eleven samples of pink and coho salmon from Kodiak, Chenega Bay, Tatitlek and Larsen Bay exceeded 10 ppb of total aromatic contaminants. The levels in the edible flesh of salmon from other subsistence fishing areas were generally comparable (less than 10 ppb) to the levels detected in reference samples from Southeastern Alaska. Adult salmon may be more affected than other fish species since fish near spawning condition are not as effective in metabolizing aromatic contaminants.

Injury to Salmon Eggs/Fry

Up to 75% of the pink and chum salmon in Prince William Sound spawn in intertidal areas which are highly susceptible to contamination. Pink salmon alevins are more adversely affected by oil exposure in seawater than freshwater. Preliminary analysis show a 43% increase in mortality of pink salmon eggs laid in the Fall of 1989 in oiled streams compared to control streams. Spring pre-emergent fry digs are currently underway.

Injury to Juvenile Salmon

Migration patterns appear to be normal for juvenile salmon fry released in oil free areas but scattered for fry released in the oiled southwestern area. Migration speed may also have been slower for fry released in this area. Juvenile pink and chum salmon were more abundant in the non-oiled area. Growth rate was significantly lower in oiled areas. Comparisons of fry grouped by collection area as well as by tag lot indicate that oil was a significant factor in reducing growth rate. Analysis of length and weight information suggests that "apparent" fry growth rates in the vicinity of the AFK hatchery were quite low despite abundant pelagic forage stocks and adequate temperatures.

Injury to Dolly Varden / Cutthroat in PWS

Unlike anadromous Pacific salmon, trout and char utilize nearshore and estuary areas for feeding. Their marine migrations are not as extensive as those of salmon. Some of the most important stocks inhabit areas that have been severely impacted by direct contact with oil. Dolly Varden have shown the highest levels of bile hydrocarbon concentrations found in fish. Bioassays have shown that the presence of crude oil in low concentrations can affect the survival of the prey of these species and high concentrations may directly impair reproduction, growth, and survival rates of both char and trout.

Injury to Herring in PWS

Herring are a major resource of Prince William Sound from both a commercial and ecological perspective. While no direct mortality of adult herring was observed, preliminary results from eggs and larval studies indicate serious negative effects associated with oil. The proportion of live eggs observed was greater in unoiled areas relative to oiled areas. From eggs which survived to hatch, very high levels of embryonic, cytologic and cytogenetic abnormalities were found in larvae from oiled areas compared to samples from unoiled areas.

Injury to Clams

Bivalve mollusks are found in many of the areas impacted by the oil spill. Due to their sedentary nature, clams are particularly susceptible to contamination by oil as tidal action constantly oils and reoils beaches. Clams do not have an efficient method of metabolizing hydrocarbons, as do fish, so high concentrations can develop within tissues. While no direct mortality of clams was detected immediately after the spill, clams

used for subsistence purposes were sampled and tested the highest hydrocarbon content of any fish/shellfish species. Additionally, injury to clams may impact the health of their animal predators, such as sea otter and bear.

Injury to Spot Shrimp in PWS

Spot shrimp are known to be sensitive to oil contamination in both the larval and adult phase. They inhabit near shore, deep, rocky areas. Tagging data indicates that this species has very limited movement either within or between years. Shrimp pots placed in unoiled areas had a significantly higher cpue than did pots placed in oiled sites, although other factors than oil may be involved. Shrimp hold their eggs externally, enabling direct contact with any oil that may be present. Preliminary study results showed an approximate 20% greater fraction of shrimp from oiled areas with one or more dead eggs.

Injury to Rockfish

Preliminary study results suggest oil spilled from the Exxon Valdez killed demersal rockfish in Prince William Sound in 1989. Five rockfish brought into collection centers in Valdez and Cordova from sites of reported fish kills were sampled and crude oil was found to be the cause of death. Eleven of 36 bile samples analyzed from oiled areas of the Sound showed hydrocarbon accumulation. Study results suggest that oil contamination persisted in the environment well after the initial oiling and that oil contamination has extended to benthic habitats.

Injury to other fish

A variety of fish were captured by trawl gear and submitted for hydrocarbon analysis. Preliminary results from sampling bile indicated at least the following species had been exposed to oil:

flathead sole
halibut
herring
Pacific cod
pollock

These species are important to commercial, sport, and subsistence fisheries. Additionally, they play an important roll in the ecosystem, serving as an important food source to a wide variety of marine mammals and birds.

Sockeye Over-escapement

Commercial fishing for sockeye salmon was curtailed in Upper Cook Inlet, Chignik, and Kodiak due to presence of oil in the fishing areas. As a result, the number of sockeye salmon entering a number of spawning systems greatly exceeded levels that are thought to produce maximum sustained production. Overly large spawning escapements may result in poor returns by producing more rearing juvenile salmon than can be supported by the nursery lake's productivity. Sockeye salmon can be a major contributor of nutrients to systems in which they spawn.

4 April 1990

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Nicholson

- important to consider time for recovery and PIs need to calculate recovery times

Nyquewonder

- seabird colonies on Kenai coast are important to building public support

Nicholson

- need educational program to geared toward disturbance at colonies, etc.

Potter

- are there seabird colonies to be purchased that provide good opportunities for public education *

Nyquewonder

- FWS has a list of lands to be purchased
- some

Anon

- further discussion of data needs with respect to monitoring recovery rates *

Mitchell

- spoke of ships of opportunity to get some research continued

Wahl

- don't need to buy land; can buy easements, development rights, etc.

Potter

- at least buffer along stream and coastal perimeter

Anon

- Marbled Murrelet, Bald Eagle

Unidentified

- may need to emphasize old growth

Kuletz

Patten

- identify old growth } timber in relation to land ownership and proposed land uses on public lands
  commercial }
  (large trees)

Sowles What spp. in addition to murrelets & eagles will benefit from acquiring timber?

Barrow goldeneye
2 merganser
Harlequin ducks
~~Kittlitz~~
Pigeon guillemots } all affected by spill

Anne
- concern about patch size

Mackinson
- buffer around eagle nests as well as along coast

Hotchkiss

- water-borne log booms create biological deserts for birds

log dumps bad on land, too - outer term

Senner

- Geographic areas of concern
  - everywhere there is private land
  - public land depending on Forest Service plans
  - terrestrial component — not just coastal

PWS
Kenai
Kodiak - Afognak

- Feasibility study?
  - Forest Service planning process *
  - GIS inventory?

GIS project
Forest Service
DNR
FWS
Exxon - ?

- FWS
  - colony sites
  - eagle + peregrine nests
  - 2 previous review

acquisition list

marine review

Statewide waterfowl

Hotchkiss

- concern about logging practices
  - can we influence on private or public land

Wohl
- State Marine Park system doesn't restrict logging (where uplands involved)

Irons
- all of PWS should be a National Park

Faing
~~Department~~

- Marine Sanctuary Program - designation of sanctuary in oil spill area

Nicholson

Hotchkiss
- colony sites or islands not in particular danger (nothing to be done on them)
  - threats are external
  - warning is off the water

Patten

Sonnus

Sources of disturbance?=
- Logging
- Fishery
- Recreation - tourism
- Airborne

Patten
- guidelines for people behavior
- enforcement - more people in field
- public education

} more important than guidelines - have authority

Safety
- guidelines for tour boats
- harassing sea lions
- zapping rather than shooting habituated off colonies

Lacey
- monitor tour boat levels and behavior

Patten
- problem is not w/ tour boats but w/ yahoos

Sonnus
- protect full ful for public education opportunity

Nyswander
- excellent education opportunity

Anne
- follow up w/ disturbance in relation to clean up? *

Anne + Kaleta
- clean up activities should avoid whales and pupping areas at sensitive ~~times~~ times

Ryan Saunders
- clean up crews not to introduce rats, tour mice colonies, etc.

Kaleta
- concerned about oil-control sites as source of pollution

Wood
- clean-up not restoration

Seans
- fishing conflicts? *

Patten

Nyaswonder

- not too much problem w/ seining gillnetting in PWS
- needs to be monitored *
- off-site problems in Bering Sea due to bottom fish

World

- sandlance + capelin especially important forage fishes; not now fished and should not be.
- ~~off site prob~~
- Round Isl - disturbance problems from fish

Nyaswonder

- south shore of Naked Isl - herring spawn "hot spot" in mid-April for eagles, gulls, waters, etc. (no shorebirds)

Pattern

- if herring spawn is regular, should there be restriction at certain key sites
  - reduces disturbance
    competition for food

Mechelson

- problems w/ sport fishing?
  - probably not

Nysewander

- prioritized lists of islands of predator removal
- budget is very low
- an infusion of funds could have immediate affect
- have documented 900% increases over ~~[illegible]~~ <10 yr

John Trapp at Bailey

Sexton

- what are needs for forage fish? *

Michelson

- acoustic tracking of herring schools (other forage fish)
  - to map distribution

Wohl

- need to document cause of long-term declines to bird populations *
- need to determine importance and biology in relation to birds

~~[illegible]~~

Irons

- what affect did oil spill have on forage fish?
- intertidal fish? *

Patten (deleted from change consent.

- need to continue productivity studies, to monitor recovery of populations *

Nebelson

- herring "farming" to create spawn for birds
  - hanging substrates in "ponds"
- Spawn fed in concern for a number of spp.
- when oil has wiped out marine plants as substrate for spawn

Senner

- worldwide chronic oil pollution is problem for birds
- any evidence in affected area

Irons

- 1987 - collected hydrocarbon samples from ? *
  Valdez dam (ducks)
  - to look at chronic pollution levels in seabirds
  - data not analyzed yet *
- Everett Wilson to help w/analysis

Patten

- Vital analysis as baseline for Senner duck work

Michelson
- boat harbors are a source of chronic pollution
- problem is primarily non-compliance and public education
- in Cordova, seaducks winter in harbor

Senna
- Mariculture a problem? ?

Michelson
- more Cordova people jumping into mariculture
- problems -
  - siting - disturbance
  - need for protection from ~~seaducks~~ predators
  - enforcement problem w/shooting of birds predating "tame" mussels, etc.

birds get caught in nets

Patten
- mentioned Svoni comment about fewer mussels in PWS vs outer coast, yet we have lots of seaducks in PWS in winter

Wohl
- ~~Fa~~ mariculture is problem under disturbance
- Taking up prime space

- mariculture for birds not desirable
  - habituation
  - costly relative to pay off

Semmens
- Water Quality - Mining ?

Nyquewonder
- lots of potential placer mines or lagoon complex or Tugidak (off SW coast of Kodiak)
- lots of claims staked - not yet in process
- could buy back claim
- had been effort to declare State Critical Habitat
  - not yet successful

Nicholson
- historically huge copper mines on Latouche and elsewhere

Nyquewonder
- Valley area - mine is putting out plume of silt, etc.
- more mines also means more people

Patten
- isn't DNR land proposal to dispose of land for cabin sites?

Michelson

- erosion from logging is water quality problem
- Two-Moon Bay - native logged
  (south of Tatitlek)

Senner

- Marine debris - plastics

Wold

- high seas flying squid fishery (drift net fishery)
  - both fishery itself
  - nets broken loose
- may or may not have impacts on birds from oiled areas
- restoration measure would be to ban fishery, which is foreign
- data of incidental take of salmon, marine mammal

- aquaculture - PWSAC has a hatchery proposed for every bay in the sound
  - disturbance problem

Patten

- hatcheries not necessarily bad

-

Senner

- siting of hatcheries for restoration must take birds into account

Fidalgo

- hatcheries help create cushion to keep water pure

Senner
- erosion ?

Nyseworsley
- desertification has occurred on some big islands
- natural recovery may be slow
- restoration activity would to restore more quickly

Senner
- ectoparasites ? disease ? *

Anner
- many diff vectors have avian influenza

Nyseworsley
- no information on impacts on Ak seabirds *

Senner
- hunting ?

Nyseworsley
- lots of local hunting or seaducks
- could be restricted, if need be

Patten

- don't know level of harvest in barlagoon
- knowing more about "take" is information need
  - establishing pop status is need too
  - winter site fidelity? are "resident" - what does that mean?
- general population biology

~~Wainwright~~

Nyquvenuka

- yellow-billed loons wintering in PWS
  - what component of population does that represent
  - where do these individuals breed? Siberia?

Asone

Kathy

- off-site acquisition for birds? Murrelets in SE AK

Mickelson

- sea ducks ~~wintering~~ staging/migrating in PWS
  winter in SE AK - acquisition there? logging?
- resident + migrant geese in PWS
  ↳ winter in Middleton Wilamette Valley

Mukilteo

- Dunn Flats Management Area in Valley Area (state critical habitat)
- needs funds devoted

Nyseworks

- Middleton owned by Nature - USFWS game refuge
- easements protect the colony (5)
- this would be equivalent resource possibility
- hittiwake nesting on various structures
- rabbits introduced there (European hare)
- has moorage and other linkages to spill area sea lion
- right in the middle of timber town

Patter

- N-S Heron workers - where? how many? *

Mukilteo

After lunch

Seamus

- Captive breeding not recommended
  - only appropriate for highly endangered spp.

- Fostering/hacking techniques for raptors
  - separate peregrines from eagles
  - techniques are available; require judgement on advisability

- Fostering/translocation techniques for seabirds
  - major information gaps about philopatry before one can evaluate
  - very little relevant history in restoration
  - techniques are most appropriate for small pop., where one can have an influence relative to total pop.

Nickelson

- what do you if a colony is simply wiped out? *
- answer — depends on size of colony; human use
  - Big & Little Smith Isl. in PWS — parakeet auklets *
  - population monitoring of alcids on Smith Isl. got cut out of NRDA

Patten

- if wiped out, restoration could be attempted as experiment

Schempf

- moderately to heavily oiled → 80% failure 1.0 young
- other oiled & unoiled beaches → 50% failure ≥1.2 young
- PWS as whole was significantly less productive than other areas in Copper River basin
- PWS as whole was affected for eagles - they range widely
- radio tagged birds move far
  - Homer to Petersburg
- productivity monitoring to continue
- one radio marked bird showed up on Chilkat last fall
- ~150 free-flying birds picked up dead
- ingestion probably main source of mortality
- live chicks that died? starve? oil? *
- most of diet is fish

Sexton

- how long to restore naturally? *

Schempf

- key is how many adults were killed? *
- also, what happens to productivity

- if productivity returns to "normal", recovery will be relatively quick

Patten
- inexperienced breeders less efficient than older birds; ∴ productivity may be lower on that basis alone

Snyder
- what proportion of eagles killed were picked up?

Schempf
- radio-marked birds that have died were picked up in forest
- pick-up proportion maybe only 12%
- occupancy rates of nests only ~45% in PWS
- nest occupancy in spring '89 50% lower than when such surveys done previously

Nyquvonder
- what do these results suggest for restoration

Schempf
- translocations, etc. probably a waste of time

Sexson
- asked about Chilkat situation?

Schempf

- number of Chilkat eagles were down in '89, due to reduced salmon
- a number of native allotments on ridge adjacent to coastal area along river
- state park surrounded by state forest lands, some of which may be logged
- concern about native land in PWS, Kenai, Afognak
- disturbed peregrine

...

Sennes

- direct restoration for peregrine advisable, given smaller worldwide pop.?

*?.

Schempf 2

- can't say, w/o more field data on real impacts

Michelson

- peregrine good habitats in winter *
- ~~OK~~ marbled murrelets? rock sandpipers?

4-5 CULTURAL RESOURCES SESSION RPWG AA

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4-5-90 Cultural / Recreational Workshop 1

8:30A Intro - Stan
- Adler video
Breaks
Groups @ 9:45

COPY OF LIT. REVIEW DRAFT TO.
Barbara Hyder
Atty General's Office
1031 W. 4th Ave., Suite 200
Anchorage 99501

Note: BIA rep didn't show up. (until 1:30pm)

Cultural Resources Session

Eligibility for listing on Natl Historic Register:
Pre-qualifying criteria:
(1) ~~Integrity~~ (if not, don't move on)
Epps may argue that given 1964 quake uplift, integrity isn't there. But integrity test is if info can still be gotten — raised areas (where deposits stay stratified) would still be in tact. Where land sunk from quake, & erosion scatters artifacts on beach, an argument could be made that integrity doesn't exist (but Shaw feels it isn't always true even in those cases).
(also, quake affected elevations so greatly that some (now) intertidal / subtidal sites are still in tact).

Note - both prehistorical and historical sites are at issue → under N. Historic preservation Act. So, in most cases, don't just say "archeological" resources.

50 yr. age criterion (sometimes younger)

100 yr age criterion

(But arch. Resources Protection Act is also a tool where arch. resources, specifically, are at issue. Both acts contain tools to determine $ amounts.)

4-5-90 Cultural session

Kodiak is area ~~had~~ highest [ ] of habitation — + sites there tend to be large, deep, complex sites. Where erosion is taking place, not all eroded. = Opportunity for restoration work. Katmai coast also has similar site densities.

NHPA Re: $ - acts give ways to determine (Sec 106 NHPA — 36 CFR 800 = implementing regs)
Mitigation / Negation steps req'd would be devel'd via consultation w/ SHPO, lead managing agency, + some others. (Would incl. data collection activities) — But focused on before the fact (damage).

APRA — ways to recover value of archeological data lost due to vandalism. Cost of scientific data recovery and value (market) of resources lost, and physical restoration costs (+ a 4th cost, too).

Martin McAllister's symposium presentation: →

3 things proposed now (Shaw):
① Oil is contaminating deposits, + can mask ability to find them.
② Impacts on radiocarbon dating (for aging deposits) affected by oil - (easier to demonstrate a damage) (220 million year-old oil on <10,000 year old sites contaminates dating significantly.
Study proposed to assess feasibility of pre-treating samples to remove oil + get actual age. If not a viable pre-treatment, we'd probably lost the info we could otherwise gain.

→

Cultural

4-5-90

affects to stratified sites is very impt. Many sites in Alb. not stratified at all - so these stratified sites are very impt.

Shaw - believes signif # of sites w/in impact area have been missed by SCAT teams. Need better info on # of sites (more dedicated surveys) also need more detailed info to determine how oil is affecting sites) specifically.

Ted B. - Original study was ~~extended to~~ proposed for 3 years. Now restudies to 1 yr. Concern for supratidal vegetation, if veg. dies, erosion will accelerate + affect sites more. Also, cleanup activity may have had same effect or other effects. Also, how many remote, possibly unknown sites ~~now~~ have been exposed to "1000's" of eyeballs - already had a FS employee prosecuted for looting. So an impact likely to be both increased vandalism, and (as impt to archeologists) vandalism's resulting loss of the matrix (strata) info from which the artifacts were removed.

Tie to supratidal (rye grass) survey / pert. work →

Anecdotal - increase in interest of collectors, esp spill, or spill-area artifacts (objt from high archl interest).

Heritage value, to natives, is also impt but nothing proposed for NRDA on this currently.

- Possibility of using oil-marker (oiled artifacts) to ID + recover stolen artifacts. (problem is that it is legal to pick up artifacts on private land, so would have to establish pieces weren't from private land.)
- Note - arch. site locations are excluded from disclosure under FOIA by ARPA.

→

State Hist. Pres. Act also exists - generally parallel to NHPA - some diffies, too.
Haven't pursued using SHPA, because cleanup has been under Fed. control. (Though, trying to use NHPA & NRPA as framework so as not to invent new wheel - like ~~over~~ using DOI NRDA regs as guidelines.)

Prob. of ID'ing land status boundaries - Valuable (but expensive) exercise to devel. such maps? Yes - but can do predictive survey work to est. # of sites.

Subsistence uses are ongoing, & in some cases (like Windy Bay - high traditional shellfish harvest use), ongoing use is in same area as traditional / historic value...

Ted/B: A Rest'n project/approach could be to do intensive (sample) survey of sites/damages to get the info not known in order to protect them better, by being able to respond to protect the sites. Idea is that the "pot hunters" know pretty well where to go & rarely get that info from the agencies. I.e. - pot hunters know better than the agencies in many cases.

NHPA - incl's language from an exec. order that Fed. agencies must inventory all sign. arch. resources.

Thorne - We're talking about cultural resource management. Last 2 days neglected to talk about the impact of the cleanup (incl. the 1000's of people) - re: cultural - even issues like bioremediation may have effects by biodegrading sites/artifacts. →

Thorne, cont — Vandalism + looting not one in the same — thinks lots of damage has been done unintentionally just by all the cleanup people - tramping, bathroom use, etc. So Vandalism broadly is probably more than just intentionally looting damage.

Re: rest'n, need to have multidisciplinary approach. Concerned @ hearing discussions that some whole sections of beach may be dug-up during clean-ups. also concerned about lack of info so far from NRDA. Hard to get to rest'n w/o more info on damages. Also, doesn't want to spend $ stabilizing a site if more cleanup disturbance will occur afterwards. Need assurance that we can get diminution of vandalism / untended looting.

Opposed to "do nothing" + "avoidance" — Advantage re: cult.-res. management is we have yrs of experience doing "crook cases" mgmt. So know about things that can be done. But, can't make blanket determinations. For rest'n, must make stabilization/preservation decisions on a site x site basis. Only place to start is to do a statistically valid sample survey to predict —.

SCAT info clearly inadequate for making any specific restoration decisions. Simply don't have adequate info on coastal resources to make site preservation/rest'n decisions.

Fed B — Paleoecological data (+ its value) is also at risk, from cleanup +/or rest'n techniques. Pollen is example.

→

Thorne - ~~Need to~~ Unlike biol'l resources - arch'l resources do not have a restorative capacity. Therefore, feels that arch'l resources should receive higher priority for ~~th~~ than some of the ecol'l resources, both in terms of restn and NRDA.

Lunch Break

Objectives for afternoon —
- Develop list of potential restoration options / approaches
- Identify relative importance of work for feasibility studies this summer.

(I LEFT FOR 5 min to let BIA rep. Ricky Hoff in.)

~~But first~~ - Craig Mishler re: subsistence + ~~arg~~ "current" cultural issues.

Short-term vs Long-term Restoration possibilities

Thorne - 1 short-term need, where ~~real~~ erosion is or may be occurring, would be to plant annual rye grass right away

Ted B - NRDA study as proposed would start to help ID short-term needs.

A short-term non-field study would be to use GIS system (that incorporates physiographic info) to ~~help develop~~ a model to predict where we find sites, + to help predict how many sites may be affected as well as to better design future detailed survey work.

Thorne - could use high-qual video to rapidly get good info on veg. cover / state

Mattson - notes that mammals getting oiled, moving inland to die in caves, etc, will contaminate cultural resources, too (from mink / river otter results). So study to survey these inland cave / rock shelter sites would be useful. →

Craig Mishley — one need for restr is restr of faith in the environment: i.e., faith that contaminated food is edible & healthy.

Results of surveys to date, generally, show: fish look good re: contamination, shellfish w/ some exceptions look good for consumption, but still concerned re/a/t intertidal organisms.

One idea is to open-up new substitute areas/times. access will probably not be equal, & going further out increases risk.

(I MISSED 15 min to meet w/ Tom Kron/Jerry Madden re: RPWG coord. w/ RPTs)

Ted B. — one restorative mechanism could be oral history-type program to help recover info, for people, on how it was — how places were used in past & before spill, etc. Getting such info out & accessible to children, future generations, & the general public is very valuable to the current native culture.

Travelling exhibits (ethnological) to go through villages would be restorative mentally, & well-received by natives. Perhaps anthropology through exhibits, etc, can help restore some of the cultural erosion caused by the spill (insult to the environment used by the culture) and resultant insults to the culture (importing canned food, etc.).

→ Crossroads of Continents exhibit (Smithsonian) due in Anch in 1992 — book from/of this or circulating part of this in villages may be poss.

→ Inventory of artifacts — search & locate & look @ possibility of recovery/repatriation. (Or at least locate/catalog/document & notify the natives, have agencies)

→ There are "King Tut" opportunities out there.

4-5-90 Cultural

Craig - To do a ~~thorough~~ job, need to do not just an exhibit in Anch., but a video / book distrib'd to villages is important, too.

Ted Video taping traditional subsistence / cultural practices that the natives may feel is threatened by the spill ("can't clam the way we" has been used elsewhere - and can help restore a sense of community / community values, etc.) (Sense of Place / Sense of Self)

The cataloging efforts would be relatively cheap, but locating the artifacts could be difficult. However, "curatorial detectives" are good at it, + it can be done.

Exxon is doing a pamphlet on Cultural Heritage - outside CEPCA efforts - Might be effective to give some of the ideas discussed here to Exxon, in that they may want to do more on their own for their own public image reasons.

- Important to get key people like Craig M. to review prelim draft of July 1 report, because how many of these ideas are presented to the public can determine how they are received.

↓ and Dorie Macken (Macnow?) - Asst Dir of Humanities Forum, Anch'

Summary of Restr options / Priorities on Zp. of Flip chart. (w/ session member priority votes in green)

Talk to Quarternary Center @ UAF - Dr. Craig Gerlach - re: bringing many of these issues together

5:00 pm - END

Brian's Copy

FAX TRANSMITTAL PAGE

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To: BRIAN ROSS

Company: RESTORATION PLANNING OFFICE

Fax Telephone #: (907) 271-2467

Verification Telephone #:

From: CAROL DELISLE

Date Sent: 5/16/90

Account #: 5266-031-02 Copy for Central File? ☐ Yes ☒ No

Number of Pages 14 Plus Cover Sheet

Notes: Cultural resource notes. If you need any interpretations give me a call at x379

Carol

MAC #3

CULTURAL RESTORATION 5 April 1990

Bob Shaw - Damage Overview

BACKGROUND PWS poorly known archaeologically
900 known sites in spill zone prior to area
PWS least known of all sites
landmark surveys old
not investigated in any depth

pertinent to two age criteria ARPA and NRHPA 50 100

Basic agreement that all sites of human activity regardless of age are eligible for national registry of historic places

Criteria d - potential to yield historical + prehistorical ability of site to yield information critical to the past

PWS is tectonically active - tilt line across PWS (64 quake) resulting in severe erosion of a. sites
Cast out to the beach as bay deposits

Criteria for eligibility for NRHP
Prequalifying criteria to
physical integrity (in question because of bay deposit nature) → of eroded or quake dist. site
where there are stratified deposits - no question of integrity but where erosion has occured may be questionable

- Underlying strata may have survived transgression of 64 quake Cook Inlet

Character of sites

NRHP covers historical and prehistorical

historic properties are archaeological resources

Kodiak Area – general location of highest prehistoric population

large complex deep sites

some only partially eroded to beach

May find CERCLA proposals

Framework to evaluate injury/damage

flexible younger ← 50 yr. NHPA National Historic Preservation

properties can 100 yr. ARPA Archeological Resources Protection

be eligible

COST ESTIMATE

using these regulations by analogy would these questions be answered before disturbance of the site

NHPA. if Feds. chose to drop 11 mil. gal of oil on Bligh reef, what would they be required to do to mitigate

Sec 106 of NHPA

developed through State Hist pres off

Advisory Council

Agencies

Data collection activities to assess characteristics of sites (prior to impact)

Cost

Vandalism – determine amount of money required to recover data lost

Cost of arch. work to collect info

Cost to bar landscape

~~4 issues~~

TYPES OF DAMAGE

3 things:

1 oil contaminating deposits
masks ability to find sites - can't see on beach
(3) must test in adjacent uplands

theory being if present in adjacent uplands some may have survived & moved landward & bleached

2 impacts on radio carbon dating techniques
effects ability to age - coated with 220 mya oil over 10,000 yr. old arch. sites
(1) proposal to assess potential for removing oil from typical materials used to age arch sites (pretreatment?)
- stratigraphy may be masked by sleeping oil
90 cm of strat. dep. in intertidal zone

3 number of sites effected -
Exxon "Seat" survey - combat archeology
find the sites, keep people off
probably do not meet minimum reconnaissance standards - prob. a sig. # of sites missed

(2) Proposal to look at specific sites empirically to see what effect oil is having

Collateral damage
- loss of upland veg. due to spatterings of oil by storm
may contribute to additional erosion
- effect of clean-up activities

Chugach corporation

- theft of artifacts by cleaners
- loss of matrix that contained artifacts
  additional erosion from holes
  very sophisticated artifacts fetching high prices
  pre-spill theft of attention to exclude artifacts from this area

Heritage value / tourist value
  Native view of these sites from non-scientific point of view
  injury to peoples whose ancestral sites have been devastated
  want to do a survey - how do natives feel
  anthropological perceptions

Katmai coast opposite to Kodiak - Similar site density
Kenai fords ———

Vandalism under ARPA must be intentional (know its an artifact)
  arrowheads
  bullets + coins } excluded from criminal pros.
  misdemeanor

Native corporations appreciate the importance of leaving the artifacts, have their own archaeologists

Oiled artifacts ~~in the sand~~ removed from beaches may be recovered — oil is a marker → couldn't see. work back to orig. location

Native knowledge of sites is being tapped.
  site locations are excluded from FOIA under ARPA
  legal to collect artifacts on private land

Important to inventory sites

BACKGROUND

Many artifacts below mean high tide - State ~~has~~ historic preservation act - not using State leg because Clean-up has been clearly defined as a Federal Act - using 36 CFR 800 Fed. regs by analogy (1)

Fed Regs used as guidelines or framework - not directly applicable

Subsistence ADFG - contemporary use - continuity of sites - use value

Type of Damage

areas have to be restored if culture is to be restore to subsistence economy (2)

Statistical survey of sites to estimate total number modeling and GIS survey

Vectors of damage have occurred
quantity unknown

RESTORATION NEEDS

Major restorative effort is survey of sites because pre-spill information does not exist

Want to look at Criminal sociological ~~effects~~ impacts - cash, why enforce commercial looters, as uneducated public don't understand psychology (3)

Two impacts:
- Oiling and Clean-up
- Bioremediation effects
- dispersants

* Archaeological resources do not have a regeneration capacity. Bob Thorne

Differentiation between Vandalism and looting unconscious movement etc that destroys is ↓

Need dimmunation of Vandalism + looting.
Thorne disagrees with the "no action" and avoidance alternatives

– First priority for restoration is a comprehensive evaluation of the sites
floral
faunal
slope
aspect

When you lose data you lose a whole range of cultural info not just the artifact

Having restoration mtgs attempting to make decision without required information is wrong. bad politics Ed Birkedal NPS

Archaeological data helps establish current multiple management decisions — do not agree – will not include → loss of paleoecological data – pollen types etc. has occurred such info would not necessarily direct

* Should take priority for stabilization protection etc because it is non-renewable Contemporary management.

Should carry a parallel for damage assessment funding

Ricky Hoff
Bureau of Indian Aff.

CERCLA

Series of steps proceeding to restoration
data collection, injury assessment, to get to damage estimate

3 yr. study to sample the range and diversity of cultural resources in the oil spill area

REST. ALTERNATIVES

Planting annual rye grass to revegetate a site - won't reproduce in a year

site occurence modeling

Using GIS to identify sites
- look at physiographic regimes
- determine what things correlate with sight occurrence

modeling effort to identify sites

Forest Service is in GIS mode for cultural resource data.

TYPE OF DAMAGE

Video survey of coastal vegetation

Effect on vegetation inland is not well documented but is reported to have occurred. Bird and animal life getting inland are carrying oil to inland vegetation, cave and rock shelter that may contain cultural resources

Cultural resources found on river otter and mink land habitat

Subsistence

Restoration need
fault in environment
trust that food is edible

REST. NEED

Systematic testing of seafood resources
fish look good
shellfish look good on the whole
but showing PAH's in some areas

→ Exxon has stopped toxicity testing of food in Kodiak
Open up new areas and new seasons for harvest
Increased difficulty of access

Emergency openings last fall in Kodiak in Carlay lagoon
every community got what they needed Reduces
self sufficiency Exxon shipped in and distributed canned supplies. Loss of traditional methods

Minerals Management
Social Indic. Study ↑ alcoholism and suicide rate
Major harvest survey 83 - 86 - 89

How long will it take clams to clear of hydro c/o
accumulate until exposure stops

Community as a cultural resource -
Social / economic impacts
Exxon has responded to the demands of natives whose food resources were impacted

Archaeological studies instill a sense of continuity and pride
Oil spill has damaged the sense of local or regional pride
Seeing evidence of ~~sense of invasion~~
am insult to heritage and culture

One kind of restoration may be an attempt to change / restore native perception / restore sense of cultural pride / integrity

Rest
Rest alt. mechanism
a potlatch to the communities to say that you care and are sorry

1. Oral history project - how was PWS used in the past
2. Place name studies
3. Access to school children and other sensitive groups
4. Ability to develop interpretive museum
5. Traveling exhibits

to counteract cultural erosion

Chugach
Denaina

1992 Exhibit of Crossroads of ~~the~~ Continents coming to Anchorage
all or part to Villages (book or video)

6. Inventory cultural items extant in museums around the country that are of Chugach origin
7. Investigate options in the private sector to bring back opposition to Exxon actually buying artifacts to public holdings
8. Need to do a media recording and distribute ~~of~~ 400 the intruges
9. Allow natives to video tape traditional activities that may disappear as the needs of the OS

Restoration Priorities / Options

Native cultural Renaissance Sense of Place

Short-term and obligate!

- Increase / NRDA study Budget / time line
- ~~Feasibility study to evaluate existing and ongoing~~
- Mitigate / clean up by revegetation combine with data collection Hard and soft technology Biotech approaches
- Public education, to prevent looking fishing licence brochures poster campaign etc public service announcements
- Feasibility study Vegetation Study to determine upland veg patterns and loss - of biomass exists to determine what should be done about it - what long term stabilization ~~stat~~ technologies are available and approp. in Alaska
- Highlight need for agencies (during clean-up and assessment) to comply with preservation acts
- Enforcement - investigative background on sociology of looting

Long-term

- Acquisition Programs
- Catalog / inventory programs
- Public ed.
- Retrieval Programs (Pics + info of actual)
- Stimulate traditional heritage preservation
- Exhibits and museums
- Purchase of Private
  - Timber rights
  - Land holding / Terrai Firma
  - Easements
- Cooperative agreement or joint cultural resource management plans

SHORT-TERM

Write regional portion of state hist. pres. plan for South central Alaska

LONG TERM

(follow on of feasibility study)
Restore individual sites by stabilization in place or data recovery as damage is identified

Establish a per unit of volume curation agreement w/ UAF archiving for long term maintenance of artifacts (native repatriation of artifacts when they establish curation capability)

One or two top priorities for summer

1 - public education
KN 110 burial cave - 1 Law enforcement should have specific investigation of characteristics and restoration plan developed for site

1 - feasability study for slabodzyaka

1 Video
2 write region plan
2 Mitigate clean up effects
1 Site watch
1 intensive gov't survey

SHORT-TERM

Sign Lights that are being looted so that prosecution can be carried out

- Fund a "sting" operation NO WAY
- Increase law enforcement personnel
- Modeling GIS information for site correlation cultural and physical data

annotated inventory videotape of coast line ($20,000.00) to vegetation analysis / erosion rel.

- establish information clearing house for restoration

Intensive go'tsurveys to verify Exxon / Clean up (SCAT) Survey quality W/RIT Archeological Resources

Fund a site-watch/steward Program

LONG-TERM

Funding additional cost of pre-treatment of oil fouled undatable artifacts (~~feasibility study to initiate~~ (endowment, trust fund)

Restoration Priorities / Options

Native cultural Renaissance Sense of place

Short - term and obligate!

- Increase / NRDA study Budget / time line
- ~~Feasibility Study / Handbook existing and ongoing~~
- Mitigate / clean up by revegetation combine with data collection hard and ~~soft~~ technology Biotech approaches
- Public education, ~~to prevent looking~~ via fishing licence brochures poster campaign etc public service announcements
- Feasibility study Vegetation ~~Study~~ to determine upland veg patterns and loss - of season exists what should be done about it - what long term ~~stabilization~~ ~~stress~~ technologies are available and approp. in Alaska
- Highlight need for agencies (during clean-up and assessment) to comply with preservation acts
- Enforcement - investigative background on sociology of looting

Long - term

- Acquisition Programs
- Catalog / inventory programs
- Public ed.
- Retrieval Programs (Pics + info of artifacts)
- Stimulate traditional Heritage Preservation
- Exhibits and museums
- Purchase of Private
  - Timber rights
  - Land holding Kenai Fiords
  - Easements
- Cooperative agreement or joint cultural resource management plans

Those mechanisms reinforce community

These measures are partial replacement for potentially lost resources

Video Tape
Cost - relatively inexpensive $10,000 for about 20 min

Exxon is doing a pamphlet on cultural heritage in this area
Exxon might implement these efforts on their own if they were made available to the company.
Doesn't matter who takes the lead in this direction

Why does Frankie ref. to the CERCLA process on this issue

For the report
handle sensatively because handling determines how the public will react

Sense of place and Sense of self - National Endowment for the Humanities

Doreen Latcha

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Oil Spill Restoration Planning Office

TO: Frankie Pillsfant

OFFICE/PHONE: _____

FROM: BRIAN D. ROSS, U.S. EPA
Restoration Planning Team Leader

DATE: 5-16-90

NUMBER OF PAGES: 16 total (include this coversheet

MESSAGES:

FYI

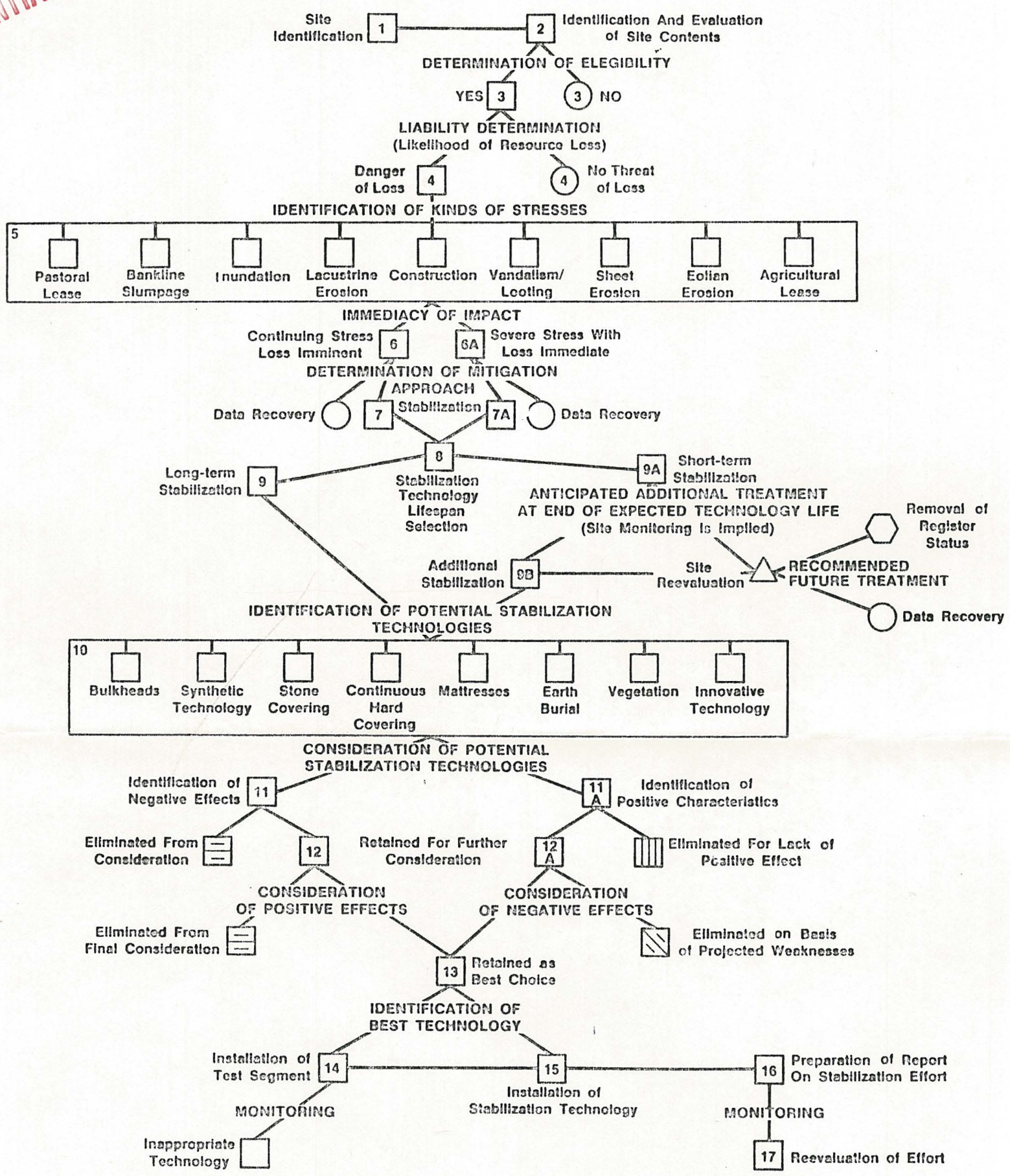

Figure 2. Schematic of proposed steps in archeological site stabilization projects

Thorne, Robert M.

1988 Guidelines for the Organization of Archaeological Site Stabilization Projects: a Modeled Approach. Techincal Report EL-88-8, U.S. Army Corps of Engineers Waterways Experiment Station, Vicksburg, Ms.

Bird Group

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Information needs:

Jenner Kuletz * need more research to determine if murrelets nest in trees

= need more research on forage fish (sandlance + herring)

(Irons) what effect did oil spill have on forage fish, intertidal fish

(Patten) Need to continue productivity studies (deleted from damage assessment) to monitor recovery of populations (general)

Patten * - need pop est. for harlequin duck

- don't know level of harvest in harlequin (and other spp?)

- knowing more about "take" is needed ?

- also establishing population status is needed

? - winter site fidelty

need to know more about harlequin breeding habitat + nest sites

Nysewander - yellow-billed loons wintering in PWS

- what component of population does this represent?

- where do these individuals breed?

Patten - GB. Heron rookeries - where? how many?

Birds

Research needs (info.)

* - (Michelsen) Population monitoring of alcids on Smith Island got cut out of NRDA.
(special concern – parakeet auklets)

✓ are there sea bird colonies to be purchased to provide good opportunity for public education

✓ in order to det. recovery rates, need to continue NRDA studies on bird productivity

Pattee ✓ identify timber stands (old growth, commercial, etc.) in relation to land ownership and proposed land use (on public land)

✓ = need feas. study evaluating wildlife habs in relation to land ownership + uses (GIS type)

General

✓ ✓ whether seining + gillnetting in PWS are causing bird mortalities

(Wohl) ✓ – need to document causes of long term decline to bird pops. before we know whether its worthwhile to do restoration

→

✓ - complete analysis of 1987 (chronic) hydrocarbon sea duck samples in Valdez Arm (USFWS)

✓ - what are peregrin falcon food habits in winter

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9 April 1990

Ms. Frankie Pillifant
Oil Spill Project Coordination Office
Alaska Department of Natural Resources
P.O. Box 107005
Anchorage, AK 99510-7005

Dear Frankie:

I enjoyed working with you last week. I think our session was productive, identified important issues pertaining to restoration in coastal habitats, and supplied much background information necessary for our report. I have high hopes that most of the demonstration projects talked about in the Coastal Habitat Session will be implemented this summer. Overall, the Versar crew went away feeling that the meeting was productive but was frustrated by the lack of damage assessment information available at this time. I think the Restoration Planning Work Group felt the same.

Enclosed are your notes from the meeting. As I begin to look through my own notes, I may be contacting you to help clarify some ideas presented at the meeting.

The Alaskan scenery was breathtaking! I would imagine you find it hard to stay in the office during the summer.

Sincerely,

Jeffrey B. Frithsen, Ph.D.
Ecological Sciences and Analysis

enclosure

cc: D. Sheehy

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Jeff Fritchen, VERSAR
refs. for restor, design-test & monitor

CHS A/W - will deal L/AW ?

- supratidal expert !
- ~~data gap~~
- management options

= Restoration plan =

progress/success by time

to pre-spill
or
20-30 yrs. previous
(address a wrong currently going)

clearing info. that will help determine best approach for ~~best~~ each habitat in future oilings

NRA's long term measurement of perturbation

NSF - LTER's

b.b. cont'd.
significant movement of oiled bears

Mink - feeding oil to animals
to discover tolerance of animal
to polluted food source & oils
effect on reproduction

Birds Kent Wohl

30,000 collected by Aug. 1
7,000 reported (collected?) after Aug. 1

CH Workshop - Inter / Sub / Supra } tidal

1.) Review by PI's

2.) State of the Art in restoration tech.

Successional or wacky shores
1.) diatoms → everything else

(taking and product & implementing)

timing vs. siting

at-depth restoration:
- possibly allow recovery to continue un-aided

high-energy areas are clearing well
recruitment vs. survival

+ oil rigs or artificial reefs
consistent monitoring

+ Design a testing and monitoring program

1.) structural/artificial substrate

2.) monitoring sites
- hot H_2O; high pressure
- biorened.
- diff. sizes of areal disturbance
  100 m cleared vs. 800 m cleared
- oil character

3.) Recruitment - (seeding ~~restoration~~ ongoing) by areal effect
seed stock may be needed in large areas, but only if areas are low energy and large areas

4.) Intrinsic decisions to restoration priorities

5.) Timber buy backs

6.) Spend $ on mitigating future impacts

7.) 'Murder' brood stock, remove; future populations won't be polluted.
- Probably need to 'clean' substrate

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Mammals

Information needs

- need assessment of mortality (sea otters) ✓

- bottom fishery damage assmt studies were cut

- need specific info. on how much salt marsh habitat was damaged in PWS/Gulf ✓

sea otters - pop'n modeling studies to derive accurate assmt. of proportion of PWS sea otter population impacted by Spill. ✓

→ see Versar notes.

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4/3

Review of Damage Assmt:

- sea otter
- killer whales
- harbor seals

terrestrial mammals

river otter, deer, mink reprod. } more info coming

needs more info; hard job;

* concur on general ideas (deer, bear → not much to work with.)

Sea Otters – no question that damage exists

T. Degnan most practical thing → let pop'n restore itself

acquisition of equivalent resources

↳ restore mussel bed for pups

alot of females were killed;

Byron Morris is tracking restoration part of the process: monitoring

8 mos after spill –

sampled bld from otters in spill zone; shld had physiological dysfunction

(i.e: could continue to sample blood)

* what if monitoring is showing that spp. is coming back?

** – need assmt. of mortality

– will try to develop popn' models

? is monitoring part of restoration?

? monitoring w/o anything else is not really restoration

? altering habitat? ie: ① close Fisheries to save more food

② sanctuaries for protection

W. Reegmar cleanup of otters was part of cleanup

Restoration → "indirect attempts" would include monitoring

Morris – indirect attempt → manipulating food source

no action alternative – is always implied as an alt.

① ident. resources out there

" resources damaged?

determ. if feasible projects } all alts will require monitoring

Johnson: when it is determined that otters are reduced by —%, estimate response to pop. to No act. altern. monitoring should be done until time when you feel confid. that pop'n has responded

B. Morris → at one time, sea otters were potentially to be ~~[illegible]~~ managed; pop. is/was spreading; is this still going

to occur regardless of spill?

Johnson → Spill will reduce the rate of expansion of sea otter range [esp. east of Cordova]
food stress appears to have caused expans. of range
the lower #s in PWS may effect the goal of recolonizat.
sea otters protected since early in century.
Replacement substitutes outside Alaska (w/in historic range) →
[Vancouver Is., Wash., CA.] exception?

Replacement

e: use hatchery tech's to establish a new fishery stock

Reggelin

enhance the use of a different resource

could be #3 ← e: seaotters; dev. opportunity for people Round Is. area to enjoy bird or sea walrus in better, easier way.

Acquisition →

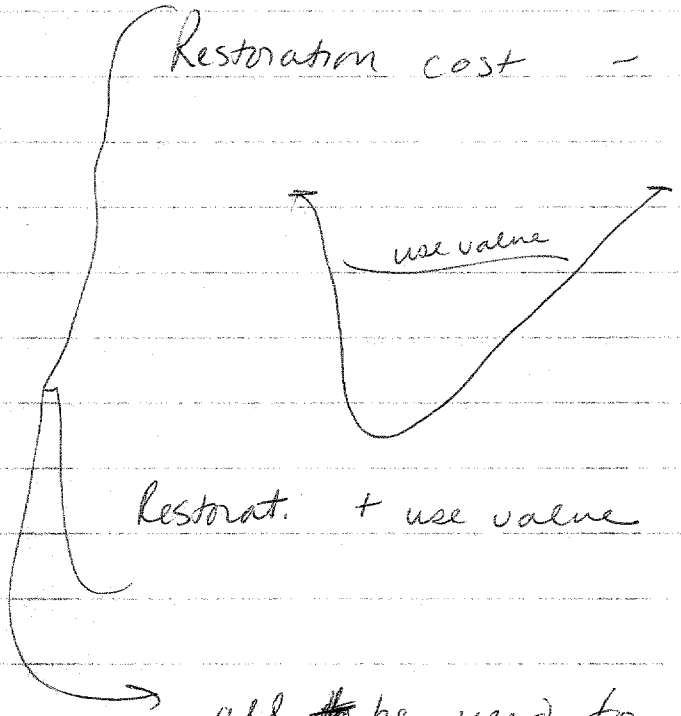
← will # be earmarked for a particular spp.?
B Morris → no

Mona

may not be any way that man can go in + replace ecosys.; all that applies in typical man-made Superfund case does not apply here.
Long term monitoring must be done
(maybe dive fisheries is legal.)

Legal: trust fund for use in P.W.S., or elsewhere when not needed in PWS.

need lasting resource



use value → market value is not 1st thing to look at

cost to rehabilitate

intrinsic value study

Species

Restoration Alternatives

Marine Mammals

Humpback Whales

- Inside passage SE
- PWS → Kodiak, AK peninsula

(4) create marine parks (critical habitat)

(1) – procedure by which you can fund + decrease disturbance / protect calving grounds (Hawaii, Mexico)
* (Marine Debris) Persistent Marine Debris {Separate}

(2) – fund educational programs (to prevent disturbance)
(tour operators, boaters etc.)

increase enforcement of existing laws ~~(~~ (NMFS)

- NMFS guided recovery team (6 mos - 1 yr. til report)

(3) – Expand Marine Mammal Stranding Network: training program
– beef up entanglement response network
(people trained, permitted, with vessel → to reach entangl. whale)

for other spp. as well

* marine debris

(5) Mobile or Permanent marine mammal treatment center for oil spill

(6) Marmot Island (largest sea lion pupping area) – purchase + protect (viewing area)
Purchase of other wildlife areas (even outside AK)

(7) trust fund for long-term monitoring + research on marine mammals in AK

Prioritizing Alternatives re Spp.

Wheeler Bio factors regarding mobility + reproductive rates
(ie: to determine which spp need more attention)

? Johnson [Marine mammals → highest priority for recreational viewing
but need to look at resource itself for
its value as part of ecosystem

Continued:

educat. (8) (long term research) incl. establishment of viewing areas (ie: McGrath River)

(9) Env. education generally
(12) Establish sea otter pop in Channel Island Nat Park

Priority

#1 – trust fund (long term research incl. long term monitoring + viewing, + education

#2 – Critical areas purchase Protection of (all species marine + terr.)
(ie: purchase, legislation etc.)

Randy Davis #3 Enforcement to prevent disturbance
+ education to prevent disturbance

4 Expand marine mammal stranding network →

entanglement / debris / fishery interaction

(5) Expand env. education

(6) Mobile Treatment Ctr.

More ideas:

* - computerized matching system for identify. whales (e: humpback whales) – does it qualify as restoration

Byron Morris – research – e: find out specifically where PWS whales winter

– buyback oil leases in Bristol Bay (Belugas esp. use area)

killer whale Specifics:

– reduce ~~xxxxxxxx~~ killer whale injury from black cod fishery (PWS + Bering Sea) (learned behavior of whales to take fish off long lines)

e: compensate them for lost catch

fits under # 4 above

- photo id catalog for killer whales

Harbor Seals specific ideas:

Legend to West.

Sea Lions Specific

- Marmot Island preservation → Kodiak (only area not under fed. ownership)
- close down fisheries around rookeries #2 (homestead wants to log)
- "The Needles" in PWS
- status of land ownership

Sea Otters Specific

- ~~take~~ expand translocation (e: Calif. Channel Is. + St Nicholas)
  - Channel Is.
  - Queen Charlotte Is.
- reducing native take in PWS

Is there still a risk in western part of Sd. due to remaining oil?

Mona → yes, based on ~~data~~ DEC data presented today

min. toxic. to get biol. effect (e: ingest.)

{ one clean otter released went back in 2 days to Windy Bay, + got oiled }

~~trans~~ - translocation back into PWS

pop is not classified as depleted or endangered,

no argument to repopulate area.

(SW Sd.) → areas of PWS that was hit, was not a popular public viewing area

Problems with transloc →

- mortality
- animals move outside area you want them to go.

Priority for sea otters →

treatment center #6

using to pop. #5

- Mgmnt & Harvest #5 (mid 100's/year has been documented → state wide)
- Entanglement low prob. not much of prob. #7

translocation #2

trust fund #1

* Eliminate [Protect & Critical Hab #2] * can't identify any critical habitat to protect

Educat. + Enf. #3

Education #4

Wed. 4/4

Criteria

① Feasible
- technological
- biologically

② Effective
- populations
- cost

③ Public acceptance / need

④ Biological need (top priority)

Harbor Seals -
can find areas @ large numbers
conflicts @ timber, mining (haulout areas)
PWS - 2-3 areas of importance to H. Seals
positive
K. Frost * why rank trust fund higher than [acquis.]
& critical habitat
Specific areas for harbor seals —
incr. boat traffic/tourist: Channel Is., Seal Is, Applegate Rocks
Protect to minimize disturbance
placer mining
* Tugidak Ist.
@: buffer zone

delete "critical" for habitats — "critical" has strict meaning legally - may be too restricting

Humpbacks -

(1) Trust fund (incl. killer)

① expand fluke id - to track status of whale popns.
useful to monitor specific humpbacks

No humpback specialist present should get to reviews

② stock identity
residency
migration patterns
reprod rates
calving/birth rates

③ biopsy sampling
genetic separation of ~~state~~ stocks

contaminants { killer whales → specific areas not identified, general habitat concerns

for killer whales #4

(2) Habitats

calving areas (ie Hawaii, Mexico - some whale preserves due to fishing interest)

need to find out relative importance of areas to PWS stocks

key feeding areas - have been identified in PWS

(3) Educ./Enf

minimize distn. in calving area in Hawaii

~~monitor at entrgent~~.

for killer whales → Priority #2 → ④ Stranding Network
Entanglement
< fishery interaction @ black cod → killer

⑤ Education Effort
understanding whales
* killer whales → specific whales educ. @ cod fishermen

Sea Lions — Stellar stocks → opening on threatened list

② Trust fund —
research to invest decline of sea lions

① Protect. of Habitats —
all sea lion haulouts + rookeries
(esp Marmot Island)

③ Educ - Eng - Disturbance

④ Entangle./Debris
fishery interaction < pollack - some entanglements mostly trophic
salmon - direct fishermen

⑤ Env. Educ.

Mobile Vet Pathology Ctr — ranked 6 for all spp.
not just cleanup

scientists were should look at options scientifically w/o overly considering public percept.

Sea Otters

① Trust fund

② Protection & habitat

⑧ ~~Educ.~~ Translocation *

K. Frost

- Need broad approach to preserve integrity of PWS habitat (ie: timber mgt, natural resource mgmt on a broad scale)

- Single impact on steller species will not be great enough to effect overall chgs in PWS habitat

* Harbor Seals

trust fund research:

pup counts

Most PWS owned by USFS
deer - have been sampled
- results not in

possible impact
on black bear
+ brown bear → seaweed dead, oil
birds

Brown bear study will continue

mink + river otter
intertidal feeders
(life history info)
→ most damaged
as assessed by
damage assmt

(5)

Terrestrial Mammals - Alternatives

(1) - Trust fund - research on indiv spp.
ecosystem research
compreh. non-consumptive ~~wildlife~~
program incl. viewing
env. educat. (conservation
monitoring

(2) - Protection of habitat
- restricted use of State-owned 3 mile strip <restrict mineral rts>
- purchase (lease) timber rts.
- moratorium <may need injunction>

critical habitat areas on Montague Is.
↳ owned by natives
USFS building roads on Montague
- change timber management on public land

areas near Kenai Fjords Park — possible selections

~~Public~~ Public Lands Management (general)

(3) - Game Harvest Management <restriction of take>
trapping was closed for mink + river otter
will stay closed the more info is gotten
deer season was not closed

* [- Ground Fishery management
risk
(bottom fishery damage assmt
studies were cut)]

not specifically appropriate for terrest. mammals:

[- Enforcement - general need in Ak for law enf of wildlife regulations]

[Part of hab. protection
Purchase/Restoration of Salt Marsh areas <- need to know more info on how much & type of habitat

[blk bear use grassy, marshy areas to feed → could some of these be cleaned & restored so bears could use them?

→ not many of these areas in PWS area that was affected

Salt marsh areas on East Side near Copper River
(Port Fidalgo, Olsen Bay)
Purchase or added protection for that hab.
possible * demonstration plan this summer → rehab.
(Coastal hab. air/water group is sampling eel grass)

[~~part of trust fund~~ Education {hunter ed → defense of life/property killings}]

④ - Translocation - not applicable
wiser to let natural reestablish,
possibility in future * unless find that pops diminished due to continuing ingestion of oil (extrapolated from in large areas)
(effects of oil contamin could extend thru several generations)

Overall Ranking:

1. Protection of Habitats
2. Trust fund
3. Game harvest mgmt
4. Translocation

Species specific ranking:

need to know habitat use (pop. assmt.) ↓

use lower energy intertidal areas →

	Deer	Blk Bear	Brown Bear	River Otter	Mink
Prot. of Habitat	1	1*	1*	1*	1*
Trust fund	2	2*	2	2	2
Game Harvest Mgmt	3	3	3	3	3
Translocation	-	-	-	4*	4

Research Priorities:

- Blk Bear: * habitat research on importance of beaches
- Brown Bear: * spawning streams; * (2) Additional viewing area creation (ie McNeil River); (2) Educat. of deer hunters to avoid bear; improve pop'n. survey technique
- River Otter: * Prot. of tidal areas; Restrict mineral entry; (2) ↔ (2) Continue
- Mink: * Prot. of tidal areas (3 mile over) restrict mineral entry; (2) Continue population, food habitat use studies

Brown Bear - potential habitat areas:

head of Sheep Bay
head of Port Gramena
Olsen Bay
} hi density of Brown bear in PWS (on mainland)

* new game spp: Small mammals
vole, shrew, mice, etc
① Protection of habitat
② Trust fund

list of all mammals occuring in Spill area

Other marine mammals:
porpoises, grey whales, minkes, harbor porpoises
walrus? (Bristol Bay)
see Cook Inlet

① trust fund
② Protection & habitat
③ educ. to prevent disturbance
④ expand stranding
⑤ env. educat.

Ecosystem Risk Factors

- Oil (Development) Industry
  - offshore
  - transportations
  - storage
- Mining
- Timber / Logging
- Commercial fishing (excessive)
- Commercial facilities supporting tourism (excessive)

→ Potential Demonstration Projects:

late June pupping

can also do harbor seals

Marmot Island

- measure noise levels from boat traffic

Don Calkins ADFG

- to set up control + experimental area where disturbance is limited

Goal: document use + potential adverse impacts from human activity.

Rationale: potential use planned for island

(10)

In PWS - important haulouts for Harbor Seals

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Fish + Shellfish

Information/Research needs:

All species:
- better escapement estimates (and stock abundance) (coded wire tags)
- otolith eval. studies (need better real time data)

Commercial fish:
- adult tagging (pink salmon)? near hatcheries to separate hatchery/wild stocks
- more rapid turnaround on CWT data
- escapement enumeration – more frequent air + ground surveys (this year) for oiled streams (NRDA)
- VALDEZ hatchery needs $ to read otoliths + conclude experiment this year (1/3 of returning fish are marked)

Sport fish:
- continue port sampling – esp. for rockfish (what other spp. (in general)) (dropped this year) (NRDA)
need age-size database to id. recruitment rates, etc
- catalog/inventory DV/cutthroat popns in a few select systems + lower Cook Inlet (Cook Inlet dropped from NRDA)

Herring
- ~~[illegible]~~
- beef up catch + age analysis
- outer CI has herring stock that may be PWS juveniles; show advanced warning of year class probs from spill
- hydroacoustic est's of PWS resident herring
- habitat Identif. (spawning areas catalogue)
- herring stock ID project. incl.

X ✓ * → - scale pattern analysis - outer Kenai/CI vs PWS to see if from PWS stock (stock seperat.
- same (as above) within PWS to look at whether these are different stocks (*next year)

~~*~~ - artificial substrate feasibility study - may be too late for this years spawning

NRDA * X - better info on spawning area

Ground Fish / Rockfish

X - rockfish - need more basic biol. info. before do restoration

X * - need ~~more~~ port sampling for rockfish

X ✓ ? - tagging rockfish on reefs

- other groundfish → baseline info is poor (age structures, pop. sizes etc)

NRDA * X ✓ - 1990 trawls dropped by NRDA; probably more important this year than last.

Clams - other Shellfish

X NRDA * - monitoring contamination

~~Sea Otters~~ assist - reciprical transplants (some ongoing under NRDA) + catalog + ID alternate areas

part of herring stock approach survey

✓ ✓ * Herring scale/pattern analysis for LCI vs. PWS (outer KP)
- possible to do this year
- important to determine if LCI/PWS are one stock

see p. 4 of 4/4 notes

4/3 Notes

- need to know more about state of stocks

- need better knowledge of exploitation rates / sustainability would avoid driving stressed stocks too low

SALMON -(?)-
- need to know what optimum escapement is for different stream systems; need to know rates of return or exploitation rates for many indiv. streams

- need to evaluate hatchery/wild stock interaction to do better (mgmt precision)

J ✓ * * Before spill, did not need high precision in mgmt; but with added stress from the spill need better monitoring of harvest rates.

Clams -
- very little known about where stocks are
* - need to identify when clams are OK for human consumption
? - if CI shows contamination; need for mgmt chgs.

Other shellfish - (decapods)

- ~~management~~ little info known; some stocks already depleted
- more info (mgmt. precision);
- monitor contamination

- identify alt. species ? see ∈ p. 4 on 4/3 for fishermen

Groundfish ~~Options~~ -

✓ - catalog / inventory stocks right away (rockfish)

✓ ✱ better real-time harvest info

✓ ✱ mass marking techniques for better stock mgmt (to separate hatchery from natural fish & assess wild/hatchery stock interaction)

~~otoliths~~

electrophoretic tech.

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Pilot Project 1990 -- Coastal Habitats

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TITLE: Reestablishment of critical intertidal species

OBJECTIVE: To demonstrate the feasibility of reestablishing key faunal elements needed to recover fully functional rocky intertidal communities in PWS and other affected locations.

BACKGROUND: Intertidal communities were probably the most heavily affected of coastal environments. Elimination of entire communities, either through oiling or cleanup activities, has been documented. Further, initial results suggest that certain key species that are likely to structure these intertidal communities were moderately to heavily affected. Natural restoration processes in these communities will be limited by recolonization rates of these key species, which in some cases are known to be quite low. Reestablishment of Fucus alone may therefore not be sufficient to ensure reestablishment of pre-spill conditions on ecologically meaningful time scales.

Before a restoration plan might be proposed, we must demonstrate the feasibility of enhancing the rate of recovery of the intertidal community by the reestablishment of key grazers and predators.

RESEARCH PLAN: We propose to compare rates of recovery of intertidal areas with and without key species and combinations of species. Based on the damage assessment information available and presented at the restoration workshop, we have identified limpets as important grazers in these systems. Predators such as Nucella and Leptasterius could be just as important in structuring these intertidal communities, although there is currently no information suggesting that these species were heavily impacted by the oil treatment.

Grazer, predator, and grazer predator exclusion and enhancement plots will be established on the following "habitats" 1) Heavily oiled/not cleaned; 2)moderate-light oil/not cleaned; 3) Bioremediated; 4) Heavy oiled/hot water high pressure cleaned; 5) Heavy oiled/cold water washing; 6) Not oiled. A key aspect of the study will be demonstrating the feasibility of enhancing colonization by key species.

The usefulness of these studies will be maximized if done in conjunction with the Fucus recolonization studies being separately proposed.

RESOURCES REQUIRED:
FY90: $75K FY91: $60K

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5 April 1990

RESTORATION OF FUCUS COMMUNITIES:

PURPOSE:

To determine the feasibility of reestablishing fucus in damaged areas of Prince William Sound. To develop and demonstrate potential large scale seeding techniques.

To demonstrate the efficacy of seeding vs transplanting of fucus.

RATIONALE:

Qualitative evidence indicates that fucus was damaged by both the oil itself and by the clean up effort.

There may be substantial delay in natural recovery of areas where populations were reduced over large (100 to 1000 meters of shore line) areas because dispersal of seeds is limited (< 1 meter in most circumstances) Drift plants may increase this distance but importance of this mode is unknown.

This is an important perennial plant that is a critical structural component of the intertidal habitat in Prince William Sound and serves as an important spawning habitat for herring. Reestablishment of this species will increase the rate of recovery of other associated biotic communities.

The reproductive and life history of the plant is well known. Effective techniques for collection of seed are well established.

In southern parts of the range plants are fertile year round so the timing of the application of seeds may be relatively unimportant in the establishment of the plant. The specific life cycle of fucus in Prince William Sound is unknown, but it is expected that plants will be fertile for at least most of the spring and summer.

APPROACH:

Due to potential logistic problems associated with working in remote parts of Alaska three key biological properties of the species need to be determined. First, laboratory experiments will be conducted to determine embryo attachment strength vs time after release. Second since the seeds must remain in suspension the effects of agitation on seeds needs to be determined. Third, the laboratory experiments will be conducted to assure that embryos will remain viable in culture media for two weeks needs to be established.

It is anticipated that the clean up procedures utilized may affect the success of retoring fucus habitats. Field tests will be conducted of various "seeding" procedures in varying types of oil and clean up disturbance. The "seeding procedures to be tested are: 1) Dispersal of embryos; 2) dispersal of fertile

branches; 3) transplant of fertile adults. All three methods will be tested in one control and one habitat that was disturbed by oil and subsequently cleaned. Dispersal of embryos will then be tested in the following "habitats" 1) Heavily oiled/not cleaned; 2)moderate-light oil/not cleaned; 3) Bioremediated; 4) Heavy oiled/hot water high pressure cleaned; 5) Heavy oiled/cold water washing; 6) Not oiled no cleaning. The experimental design will be to use three replicates of each habitat type and four replicates of each procedure and four replicates of controls to measure natural settlement. In habitat 6 above artificial cleaning of the rocks will occur so that both a seeding treatment and a transplant experiment will be done.

The endpoints (variables) to be measured will be: a) visible recruits (counts); b) survivorship (counts); c) growth as a % of cover and d) associated fauna.

OUTPUTS:

Report on the feasibility of full scale restoration of Fucus communities in subarctic environments.

RESOURCES:

FY90 R&D ~~125~~ 50K FTE 1.0 S&E 15K (Travel)
FY91 R&D 60K FTE 0.5 S&E 10K (Travel)

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5 April 1990

Pilot Project 1990 - Coastal Habitats

TITLE: RESTORATION OF OIL-IMPACTED MARSHES

PURPOSE:

Oil removal from marshes is a slow natural process because they are sedimentary, anaerobic habitats with minimal flushing. It is unlikely that current clean-up techniques will be efficient enough at oil removal (or even attempted) in marshes to allow clean-up without long term adverse impact on the plants comprising the habitat and the associated flora and fauna. This project will utilize several approaches to remove oil from impacted marshes while attempting to minimizing the impact of the removal process. With out reduction of oil to soil concentrations less that some critical value, regrowth in the oiled area will not occur. Restoration will utilize natural regrowth and plant transplant techniques to introduce healthy plants back into the impacted marshes.

Performance criteria for evaluation of success will be assessments of oil removal efficiency over the course of the summer for several different treatment techniques. Additional measures of success will be quantifying the manner by which the removal techniques allow minimal impact on soil compaction; minimum residual traces from trenching, raking or foot paths. Once oil has been removed, proven transplant techniques will be evaluated by percent viable plantings and growth (biomass) of the transplants.

RATIONALE:

Recovery of oil impacted marshes in Prince William Sound and the Gulf of Alaska may be slow as these marshes are small and uncommon, especially compared to those of major river deltas such as the Copper River. Because of their limited aerial coverage and their patchy distribution, opportunities for natural recolonization through seeding or propagule dispersal are extremely limited. These marshes are also important resources for the area, serving as an alternate food source for browsing mammals (especially in harsh winters), as refugia for small birds and migratory water fowl, etc. Restoration of a rare habitat that serves as an alternate food source or cover within the ecosystem should be a high priority.

Historical attempts for cleaning up spilt oil in marshes has shown that clean-up methods that disturb the soil or hydrology of the marsh will have long term effects equal to or more severe than direct oiling. Because of this, oil removal by EXXON has been discouraged to date. We expect to find impacted marshes with residual oil or with impacts by soil compaction or hydrological changes. This project will demonstrate the efficacy of oil removal by natural processes using techniques minimal impact on the marsh.

In order to begin restoration, we must know the extent of oiled area, depth to which the site is oiled, concentrations of oil at these depths, and physical characteristics of water movement in the system.

Oil recovery in marshes and subsequent restoration techniques have utilized a variety of physical removal processes ranging from trenching, application of sorbent booms and pads throughout the marsh, and removal of contaminated soils with replacement with clean soils. Once oil removal attempts were completed, replanting was initiated. Success rates were unsatisfactory for sites where oil removal was not successful, where the process of removal altered soil characteristics or hydrology of the site, or where replaced soils did not match the physicochemical characteristics of the original marsh sediment. Without oil removal, plant growth and long term survival is not insured.

Transplanting efforts have been successful when proper site preparation has occurred. This experience has led to a state-of-the-art wisdom that recovery and restoration approaches can not use heavy equipment, cork crews who trample and march through the area, or collection methods that leave altered landscape feature.

This project will demonstrate the feasibility of using oil degradation techniques, applied in a minimally obtrusive nature, to restore oiled soils and transplanting techniques to provide viable propagules. The project will incorporate a test design that will allow comparisons of the relative rates of oil removal by several techniques and a determination of plant growth rates following transplant.

STUDY APPROACHES:

The project should be implemented in a large marsh, preferably where a large portion of the marsh was not impacted, so it could be used as a on-site reference (control). Oil removal techniques will be selected for testing based on some likelihood that they will be successful. Techniques to be considered are: 1) periodically, gently rake surface soils to bring oil to the surface, to disperse the oil more evenly throughout the surface sediments and to ensure aeration of surface soils; 2) to install a network of aeration pipes, buried in the oiled surface sediments of the purpose of constantly supplying air to the soil (under gentle pressure) in a manner similar o a drip irrigation system; 3) installation of a network of trenches to drain oiled soils or to supply air-saturated water on a periodic basis to infuse dissolved oxygen into the soils; 4) augmenting the aeration techniques with fertilizer to enhance the growth and metabolic rate of oil-degrading, aerobic bacteria and 5) and initial transplanting prior to application of remove techniques. Once we have evidence that oil concentrations in the

test plots have been reduced to acceptable levels, transplanting marsh plants will begin.

Test plots for each treatment could be on a 10M x 10M scale, should be triplicates within the marsh, and should be assigned randomly to available test plots. Proposed treatments are:

Reference (Control)
Rake
Aerate
Trench and flush
Initial transplants

Reference + nutrients (Control)
Rake + nutrients
Aerate + nutrients
Trench and flush + nutrients
Initial transplants + nutrients

If oil reduction techniques are successful, marsh vegetation will be planted in triplicate on randomly selected 2M x 2M plots within each of the above treatments and plant biomass determined at the end of growing season. Sites will visited twice in the second year; once at the beginning of the growing season the determine if viable plants still exist and at the end of the growing season to assess relative plant biomass production.

Parameters to be measured during the demonstration project are:

Physical Site Characteristics
- Marsh soil descriptions
- Depth to peat

Chemical Parameters
- Hydrocarbons (according to standard analytical protocols used during the EPA Bioremediation Study)
- Nutrient Series
  Nitrogen
  Phosphorus
- Plant residues (oil)
- Water quality parameters
  DO/temperature/conductivity/REDOX

Biological Parameters
- Microbiological assessment of oil degraders
- Marsh plant biomass
- Plant productivity - fluorescence measurement
- Growth (photographic documentation)

RESOURCES REQUIRED:

Time period - two years minimum

Personnel - 1 - 2 man years

Resources - $150K / yr

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5 April 1990

Pilot Project 1990 - Fish Study 1

The extent of damage resulting from the oil spill and attendant operations is not well documented for several important species of commercial fishes. It is likely that the greatest impact of the damage will be seen in the year-classes produced during the year of the spill and the next several years. One way to limit further population depletion in these stocks is to limit any further controllable mortality, e.g. by halting all commercial fishing upon these stocks. However, because of the uncertainty of the extent of damange and because of the value of the commercial fishery and the human cost of season closures, an acceptable alternative might be to allow fishing but closely monitor the take so as to minimize the harvest of potentially oil-impacted stocks.

In the case of pink salmon, this could be accomplished by targeting fishing pressure towards hatchery fish and away from wild stocks from oil-impacted waters. Because these stocks tend to mix in the ocean, one method of targeting fishing is to concentrate on terminal fisheries (i.e. near the hatcheries at the time of return). There is still some mixing of stocks at this time, but the extent is not known. One project that is proposed is to expedite the identification of wild and hatchery stocks in this fishery. In the 1990 harvest, this would be expedited by rapid recovery and identification of hatchery marked fish from which data the proportion of non-hatchery fish could be calculated and fishing stopped or shifted if too many non-hatchery fish were being taken. Another aspect would provide more detailed information for the 1991 season; adult fish in various fishing areas would be tagged and released so that tags recovered at hatcheries and in oil-impacted spawning/rearing waters would provide detailed stock distribution data. These data would also provide a bottom-line damage assessment regarding the adult salmon return from oiled, and non-oiled areas, both to the fishery and to the spawning grounds. An ancillary task would be to provide funds to speedily evaluate the promise of otolith marking of hatchery fish to provide a way of marking and identifing all hatchery produced fish, rather than needing to rely on marking programs with sub-sampling uncertainty. Finally, conducting detailed spawning ground escapement counts and tag recoveries would provide impact information (both oil and fishery) and provide tagging-recovery data to help minimize fishing mortality on oil-impacted stocks. All these tasks would allow fishing to continue while reducing the liklihood that the harvest might significantly slow the recovery of oil-impacted stocks.

A similar problem exists with the herring fishery of Prince William Sound and adjacent waters. It is possible to shift the herring fishery from the Sound to outside waters, but there are indications that some herring in outside waters may be juveniles of the Sound herring stocks. If that is the case then shifting the fishery to outside would still impact the Sound stock. If we can, by scale analysis, show that the ouside stocks are indeed separate, then such fishery shifts for the next several years would protect the possibly impacted Sound herring stocks.

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5 April 1990

Fairbrother

Pilot Project 1990 -- Bird Studies

TITLE: Marbled Murrelet Breeding Habitat Identification

OBJECTIVES: Determine breeding habitat requirements for marbled murrelets in the Prince William Sound area, specifically to determine if they nest in trees and, if so, whether they are dependent upon old-growth forest habitat or can utilize second growth timber.

BACKGROUND: Marbled murrelets are noncolonial seabirds that breed along the west coast from Northern California to Alaska. In the lower latitudes, the birds are known to nest in trees and have a strong preference for hold-growth habitat (i.e., large trees with an open understory). However, in Alaska, it is not known wether these birds have the same requirements for nesting habitat or if they may utilize other resources such as smaller timber or ground nesting areas. The numbers of marvelled murrelets has been decreasing in the Sound since the early 1970s with only 40% of the numbers found in 1989 as were present in 1972. These birds depend upon the fisheries resource in the Sound which probably was damaged by the 1989 oil spill, further contributing to the stress on the population and potentially accelerating the rate of decline. Preservation of breeding habitat would contribute to support of the population and maintenance of a viable population.

PROPOSAL: A study would be conducted in the summer of 1990 along the shores and islands of Prince William Sound to determine the breeding habitat of marvelled murrelets. Visual observation of birds would be made and location of nests would be attempted. Additionally, a small number of birds would be captured during foraging flights in the Sound and equipped with radio-tracking devices. These birds would be located by helicopter or fixed-winged aircraft to identify nesting sites. Ideally, at least 50 nest will be located to determine how many are in trees and which are in old-growth versus second growth timber areas.

This project has a high probability of success as experienced personnel are on-site (USFWS) that could mount such a study on short notice. Information gained from this study is necessary for long-term preservation of the Prince William Sound population by identifying critical terrestrial sites that need protection in the near future (i.e., restriction of logging activities). Additionally, the results from this small study may have ramifications on management decisions throughout the range of the marvelled murrelet. v

Pilot Project 1990 -- Bird studies

TITLE: Forage Fish Availability

OBJECTIVES: Determine numbers and distribution of forage fish for seabirds in Prince William Sound, in particular herring, sandlance, and other noncommercial fish species.

BACKGROUND: Many of the colonial and noncolonial nesting seabirds as well as bald eagles are dependent upon near-shore fisheries for a food source. It is suspected that a decrease in these resources over the last 10 years may be significantly contributing to the gradual decline of the seabird populations. If the oil spill of 1989 also affected the numbers and/or distribution of these forage species, then continued and accelerated declines in the bird populations can be expected and restoration attempts such as replacement of breeding habitat would be severely impaired. Additionally, influence of commercial fisheries activity on seabird and eagle populations often are part of management decisions. For example, sandlance currently is not harvested commercially in the Sound although it is a market fish in other parts of the world. If this species of fish is determined to be a critical resource to the birds in Prince William Sound, especially in light of potential effects of the oil spill on other forage fishes, then opening of this species to commercial fishing should be delayed, if not prohibited. The redlegged kittiwake population at the Barren Islands is declining due to over fishing of pollack in the area.

PROPOSAL: Acoustic tracking of schools of herring, sandlance, and other fish in the Sound should be done in summer 1990. Distribution and numbers of fish species would be plotted using a GIS currently under development for the Sound. Known locations of oil already have been entered into this system. Additional overlays should include locations of nesting colonies of seabirds and known locations of bald eagle nests.

This study is very cost-effective as it could be piggy-backed onto other on-going studies of commercial fisheries (e.g., herring schooling) and would provide data to an existing GIS. Information gained from the study would be used in determining future restoration activities, such as protection of fisheries, where within the Sound efforts should be focused for habitat preservation (e.g., reduction in logging activities or other human disturbances). Additionally, sea mammals such as seals also utilize the same fisheries resource. Therefore, the information gained from this project would be applicable to a wide variety of species.

Pilot Project 1990 -- Bird studies

TITLE: Predator Control at Breeding Bird Colonies

OBJECTIVES: Reduce the number of introduced predators on selected islands to enhance success of reproduction of ground-nesting colonial seabirds.

BACKGROUND: Many of the small islands along the Kodiak Peninsula and in the Aleutian chain have had predator species of mammals introduced during the last 100 years. For example, foxes and rats have become abundant on several of the islands. Eggs and chicks of ground-nesting colonial seabirds are a preferred prey item for these mammalian predators. Removal of introduced predators by the USFWS in past years has resulted in as much as a 900% increase within 5 to 10 years of the numbers of eiders and cormorants on an island. This appears to be a cost effective method for acquiring equivalent resources to replace birds lost in Prince William Sound due to the 1989 oil spill. For example, red-legged kittiwakes, pigeon guillimots, and common murres all suffered a reduction in breeding success during the oil spill year. Predator control on islands outside the spill area would more quickly replace the immediate and long-term loss of birds and, hopefully, provide a source from which birds could recolonize the Sound when food resources and breeding areas return to optimal condition.

PROPOSAL: Several islands will be selected that have ground-nesting colonial seabird populations and introduced predators such as foxes and/or rats. Predator control would be initiated on several of the islands while others would be monitored and used as controls. Foxes would be controlled through trapping and hunting while rats would be controlled by trapping and/or poison baits (note: USFWS has standard protocols for predator control measures). Colony size, nesting success and phenology, and recruitment of young would be measured on all islands. The change in these parameters over a two year period would be compared between the controlled and treated islands to document whether predator control had a significant effect.

Cost and personnel is surprisingly minimal for this type of effort. USFWS estimates that it costs approximately 12K for predator removal from each island. Additional costs would be incurred in monitoring the seabird colonies. Total cost is estimated at 100K/yr for two years (to include 5 islands, 2 controls and 3 treatments).

Pilot project 1990 -- Bird studies

TITLE: Prioritization for Acquisition of Sensitive Habitats

OBJECTIVE: Provide a list of areas of high, medium, and low priority for protection and/or preservation to maintain a viable, diverse avifauna in Prince William Sound and other oil-impacted areas.

BACKGROUND: Long-term restoration plans for avifauna in the spill areas include reduction in timber harvest, acquisition of islands intensively used by colonial nesters, eradication of introduced predators from islands with ground-nesting colonial birds, and reduction of human disturbance in sensitive areas. The USFWS has begun a process of prioritizing where these sensitive areas are in relation to long-term plans for acquisition or providing protective status. However, given the added stress of the oil spill and imminent increase in logging activity, the time-frame for this planning process has been shortened.

PROPOSAL: Information from several agencies (USFWS, ADFG, USFS< DEC) will be gathered and collated to identify areas of particular sensitivity to avifauna in the spill area. In particular, prioritization will be given to which areas in which logging should be restricted either by permitting or purchase of timber rights, where predator eradication efforts should be concentrated, and what additional lands should be included in the National Refuge, State Parks, National Parks, or National Forest systems or given greater protective status.

This is a low-cost project and would primarily involve staff time with little need for further field work at this time. It would benefit future restoration efforts by having a consensus among agencies of where to focus further work.

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5 April 1990

MODA

Pilot Project 1990 - Mammals

TITLE: Sea Lion/Harbor Seal Habitat Protection

PURPOSE: To study disturbance and effects of disturbance on sea lion or harbor seal rookeries. Determine and identify factors that are influencing these areas currently, and may influence them in the future. These factors will be documented to bring the current existing data base up to date.

BACKGROUND: Both sea lion and harbor seal populations have been declining in Alaska. Consequently, any additional risk from the oil spill will accentuate this decline. For example, long term chronic effects on reproduction have not been documented, however, this is a potential long-term effect that would cause population decline.

RATIONALE: The object of this study is to identify the habitat use, and document the disturbance to the populations using this habitat in order to develop measures to preserve habitat critical to successful reproduction of the species. General information is needed to document the types of use of each area by the animals. In addition, human disturbance, such as boat traffic and noise, must be documented. In addition, obvious effects on the animals such as interruption of nursing cycles, change in habitat use, and pup mortality should be documented.

Once this information is obtained, it will justify the preservation and protection of these critical habitats through possible acquisition or protection by minimizing the disturbance through restrictions on use or access.

APPROACH/STUDY DESIGN: Two sites will be selected representing both a disturbed area, and an undisturbed control area. Areas for consideration include, for example, Marmot Island which is an established sea lion rookery with some known disturbance. A field team would be at each area documenting such things as types of use of the area by the animals, (reproduction and rearing of young) and any obvious effects on these activities from disturbance. During the first year, observations would start prior to the time of pupping, approximately June 1, and would continue for about three to four months. Pup mortality will be monitored for one to two years following this initial season.

RESOURCES REQUIRED: Estimated cost of this project is $125,000. resources are needed to support two field crews (one at each site), including transportation, subsistence, and salary. In addition, any special equipment, such as radiotransmitters, may be needed. Data analysis will be needed.

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5 April 1990

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Planning Research Corporation
1505 Planning Research Drive
McLean, VA 22102
703-556-1000

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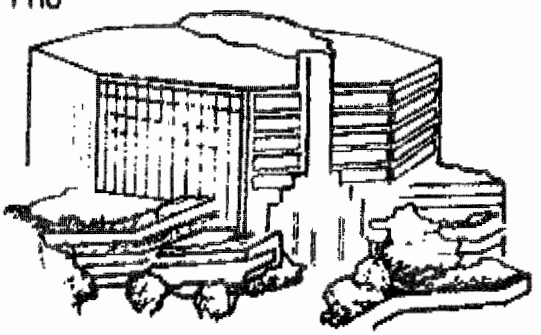

DATE: MAY 1, 1990

TO: LINDA COMERCI

COMPANY: OIL SPILL PLANNING OFFICE

FAX NUMBER: (907) 271-2467

COPY TO:

NUMBER OF PAGES INCLUDING THIS COVER: FIFTEEN

* * * * * * * * *

FROM: NANCY MENNING

PHONE: (703) 883 8849 MAIL STOP: TM 228

GROUP: USEPA/SDC

CHARGE NUMBER: C08516.156

* * * * * * * * *

COMPANY SENSITIVE: _____ URGENT: _____

ADDITIONAL MESSAGE: LINDA, ATTACHED ARE: ① A 2-PAGE SUMMARY OF MY NOTES FROM THE RECREATION PANEL - INCLUDING A 2-PAGE ATTACHMENT OF QUESTIONS WHICH WERE THROWN OUT AT THE PANEL SESSION. AND ② A 10-PAGE SUMMARY OF MY NOTES FROM THE COASTAL HABITAT PANEL. The 10-pages on coastal hab represents ALL of my notes from that session — therefore, I can clarify them but will not be able to add anything substantive. The 2-pager on recreation is not complete and I will send you more in depth info later.

PRC TELEX NUMBER: 248372 PRC UR OPERATOR'S NAME: _____
PRC FAX NUMBERS: 703/556-1174

TECHNICAL WORKSHOP SUMMARY: RECREATION

Natural resources are the underpinning of recreation use. Therefore, biological and physical restoration is critical.

It is the biophysical resource that provides value. Management actions determine only who captures that value.

We need to be concerned with the quality and type of experience.

For recreational uses, perception is of utmost importance.

For the most part, increased use numbers are not necessarily a benefit.

Recreational use (direct on-site and indirect off-site) may be assigned an economic value by adding expenditures and consumer surplus:

Value = Expenditures + Consumer Surplus

Due to consumer surplus, total net benefits are often greater when the number of users is low.

High priority restoration alternatives:

- Additional clean-up of prime recreational sites beyond the State's "stain" standard. (Aesthetics are important.) These additional clean-up actions are only to be undertaken to the extent that they do not cause more damage to the natural resource base when considered over the long term.

- Development, distribution, and presentation of interpretive and educational materials about the spill, Prince William Sound, the western Gulf of Alaska, and the State of Alaska overall. (This will help address perceptual impacts.)

- All restoration activities should involve the public as much as possible. Hands-on assistance with restoration work is especially encouraged. (This is viewed as critical to a psychological healing process.)

- Acquisition opportunities (fee and less-than-fee) need to be analyzed and priorities assigned to specific sites.

DRAFT

Information needs and/or feasibility studies:

- Nationwide survey to determine recreation impacts. (To address attached list of 18 questions involving both direct and indirect uses.)

- Survey to determine recreational value using contingent valuation methodologies. This survey would be targeted at direct users to determine patterns of use, use numbers, and values placed on use as impacted by the spill.

- Assessment of land status and acquisition opportunities.

(Note: the first two studies should have been done as part of the damage assessment. Due to secrecy about the economic studies, it was not clear at the workshop if such studies had been conducted already or were planned to be carried out in the near future. Workshop members stressed the immediate need for this information to be gathered and made available. The land status/acquisition opportunity assessment was characterized as necessary but not time critical; it is not necessary to start that assessment this summer.)

DRAFT

recreation loss:

1. What are the nature and extent of displacement of recreation use resulting from the spill?

2. Did or will displacement of recreation use from the Sound affect the quality or quantity of use in other areas in Southcentral Alaska?

3. Did the spill adversely affect the quality or quantity of wilderness values of the Sound for local residents? What about the perception of wilderness for potential visitors to the areas? For actual visitors? Will future generations of Alaskan's be less impacted because they did not know the Sound before the spill or because most of the obvious signs will be gone?

4. How do recreation and scenic effects of the spill affect different user groups (i.g. cruise ship passengers, ocean kayakers, power or sail boaters, hunters, whale or bird watchers)?

5. Has the long term economic earning potential of the Sound's wilderness image for tourism and recreation related businesses been depreciated?

6. Will the spill result in more recreation use through the spill's "advertising" or name recognition value? Will the visitors pay less than they would have had they been visiting an un-oiled Sound? Are we trading high value/low volume tourism for lower value/high volume tourism?

7. Will the spill attract disaster junkies, as was the case with Three Mile Island or Mount St. Helens?

8. Will a new tourism industry develop out of people wanting to visit the Sound to learn about or study the natural or human supported restoration?

9. What are the different types of impacts to recreational/tourism users?
-changes in wildlife or fish resources
-seeing oil on beaches
-damage to equipment
-damage to perception of wilderness
-wilderness
-smelling oil on warm or sunny days
-seeing or knowing of wildlife kills from the oil
-noise or visual intrusions caused by cleanup, researchers, signs or red X's on cliffs

10) Are the spill's damage to cultural/historic resources, in a recreational/tourism sense, offset or compensated for by the new archaeological and historic information learned from the

archaeological efforts associated with the spill response?

11) What is the value of the new biological information generated by the spill response and damage assessment?

12) Will political backlash from the spill result in more conservation or protection of recreational values of the Sound than would have occurred without the spill?

13) Can the wilderness be restored? Can the wilderness be compensated?

14) What is the effect of the spill on the recreation opportunity spectrum in the Sound?

15) Should land managers (Forest Service, State, Native corporations) amend their land use plans to deal with the short and long term changes resulting from the spill?

16) Beyond restoration or instead of restoration, compensation could include:
-purchasing private lands for public recreation use
-developing recreational facilities
-public education efforts to help users avoid oil impact areas
-dedication of unoiled public lands to wilderness or recreation designations
-future spill response to include protection of recreation and wilderness values (including pre-positioning response equipment in these areas)

17) Are there long term costs to public and private land managers resulting from changes in recreation or tourism patterns as a result of the spill?

18) What are the monetary costs to boaters or other recreationists from the physical or chemical effects of oil on their equipment (boat hulls, motors, tent fabric, etc)?

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prepared for DNR/OSPCO #1
by Al Meiners DNR/Parks
3/21/90
draft

TECHNICAL WORKSHOP SUMMARY: COASTAL HABITATS

Coastal habitat and air/water summary
Dave Gibbons, USFS

Last year's studies looked at degree of oiling within three zones (intertidal, shallow subtidal, and supratidal). The study was stratified on three degrees of oiling by five habitat types. Study encountered some problems with scale, digitization, and readability of color/shade schemes. Also had a problem with control sites being located primarily on mainlands versus oiled sites located on islands.

This year, lightly oiled sites will be dropped out because they can't be distinguished from controls. Will address effects of cleaning techniques (none, cold water, hot water, bioremediation, physical). Coordination with other studies will be much better this year.

More vegetation was observed in oiled areas last year. This may be due to a fertilizer effect or to lack of browsing due to high human presence on sites.

General discussion

THE NUMBER ONE PRIORITY IS GETTING THE NECESSARY INFORMATION - ADEQUATE FUNDING OF DAMAGE ASSESSMENT STUDIES AND GATHERING ADDITIONAL DATA ON NATURAL RECOVERY AND ECOSYSTEM LEVEL DATA.

In habitats where vegetation provides the major source of structure, and fauna will recolonize, vegetative restoration is a good place to begin whole ecosystem restoration.

Physical structure is important in high energy areas.

Need not use restoration monies to restore opportunistic species which will recolonize naturally. Should instead focus on the next stages of succession where our activities might speed up the natural successional process.

On rocky shore systems, natural succession is probably diatoms and bacterial cover then everything else. No other clear successional stages are expected. Therefore, restoration activities can place final composition (climax species) directly.

Deep water habitats are so vast that direct restoration is unlikely. Restoration alternatives should focus on better management solutions (double hulling, tanker escorts, etc.) that will prevent further impact thereby allowing the system to recover over time.

Restoration efforts should focus on low energy environments.

In evaluating restoration alternatives, need to consider survival in addition to recruitment. Restoration may need to focus on cleaned areas to enable restoration efforts to survive.

Timeliness is important. If we leave it now, but go in later to do some restoration activities, those activities may disturb recolonizing species.

Early species composition may be quite different from the desired climax composition. This is not necessarily bad; need to consider what the long-term balance will be.

No action alternatives must be coupled with strong monitoring, especially with respect to contaminant pathways.

No action alternative must be predicated on "adequate" clean-up. Performance standard for "how clean is clean" must be flexible to account for various management designations (e.g., wilderness).

Reoiling will affect success of restoration. Sites need to be clean with little chance of being reoiled.

Need to know at what point bottoms go anaerobic resulting in greater persistence of oil.

In selecting sites for mitigation, must assess why certain species do not exist there naturally. (In this context, restoration is putting a community back together where it previously existed and mitigation is rebuilding the damaged community on a different site where it did not exist naturally.)

Damage assessment is a litigative, not scientific, process. Restoration needs to consider long-term monitoring.

Need to somehow resolve problems of cleanup v. restoration. Legal definition does not necessarily fit ecological, scientific definition.

Distribution of damage (scale) is important in selecting appropriate restoration techniques.

Transplant species with limited dispersal. This is not necessary if damage is patchy and propagules are available.

Need to monitor natural recovery rates with respect to size of initial disturbance.

High energy beaches had larger impact (in terms of scale) but also had historically low productivity. More sheltered areas, which were more patchily hit, were the richest in populations.

Alaska is different from Falmouth. If Falmouth recovered to pre-spill conditions (civilized) that doesn't mean PWS will recover to pre-spill conditions (pristine).

State mandated clean-up standard is "to stain" - including removal of mobile components and break-up or removal of asphalt.

Whether we do any restoration or not depends on how long Alaskans want to wait for a restored ecosystem. This is a value judgment. We need to carefully balance the use of restoration monies - to slightly speed up a process that will occur anyway vs. buying timber rights, for example.

Recovery following a spill will not be a sustained process but, rather, will show progressions and regressions.

Alaska is unique in the sense of being early in the cycle of cumulative impacts. Thus, purchasing timber rights to stop accumulating impacts may be quite valuable.

Some priorities for coastal habitat restoration may be dictated by the use of the coast by external (to coast) resources/users, e.g., use of clam resources by bears and subsistence gatherers.

For contaminated subsistence resources, removal by overharvesting and destroying is possible. This has been done in North Carolina. This technique is most appropriate and effective for species with long life spans.

Regarding the literature review for relevant literature, can consider anything from Point Conception to the Aleutians as similar environments.

A long term monitoring strategy must be the overall framework within which restoration fits. control sites are critical to track nature's moving target.

Managers need more scientific information - education and funding for necessary research.

Restoration may address issues in PWS not directly related to the spill which would provide overall benefit to PWS residents - e.g., timber rights, commercial fishing, mining sites, etc.

Use restoration money for better management of intertidal resources. Need more long term research on systems and keystone species.

Coastal management must consider the watershed - protect water quality, etc.

A coastal resource mapping project may be considered as a generic restoration effort. Problems with scale and transience of some resources (e.g., kelp forests) necessitates monitoring/updating.

Because of scale, many of our final restoration decisions will likely be indirect, acquisition, and/or management options. Direct restoration may not be feasible for 900 miles of shoreline.

The legislature would have to do much of what we propose and then the restoration money would be used to enforce.

Need to explore the feasibility of setting aside natural resource areas for long-term assessment of oil spill damages and to protect habitat from further development impacts.

Supratidal - low energy

Impact: Some higher production of browse species may be due to (1) oil acting as fertilizer, (2) reduced browsing due to human activity, (3) improper application of Inipol, and/or (4) reduced browsing due to oiling.

Restoration options:
- mowing
- no action
- monitor increase in productivity
- assess productivity of oiled vs. non-oiled sites

Impact: Erosion due to debris removal and burning (and resulting habitat loss). This impact will be ephemeral; driftwood would be replaced within the year.

Restoration options:
- acquire equivalent
- create real estate (dike and fill, rip-rap, etc.)

Impact: Data not available regarding soil impacts (PI not present).

Impact: Damage to vegetation from three-wheel and foot traffic.

Restoration options:
- transplanting
- fertilization for stabilization (especially in proximity of cultural archaeological sites)

Impact: Unknown impact on small mammals, etc.

Restoration options:
- long-term monitoring of cleaned, uncleaned, and pristine sites

Supratidal - high energy

Damages were unclear. Josh Schimmel and Cordell Roy were mentioned as possibly having more info on damages. Sampling, treatment, monitoring, etc. are generally infeasible largely due to safety concerns.

Impact: Oil speckling and "bathtub line" (band of sticky, asphalt tar). Note: this "bathtub line" looks like a naturally-occurring vegetation (*varicari??*), therefore, it is virtually insignificant from an aesthetic perspective.

Restoration options:
- chipping and removing
- no action
- spray with Inipol
- acquisition of equivalent resources
- monitoring of weathering (e.g., photo logs)

Intertidal - low energy

This category includes sheltered rocky areas, sheltered coarse grains and fine grains, and sheltered estuaries. Note: sheltered estuaries are more common on the Alaska Peninsula and lower Cook Inlet.

Impact: Effects on polycheates, bivalves, and crustacea.

Restoration options:
- reintroduction of species with low larval recruitment (importance of this depends on scale or extent of impact)
- removal of contaminated clams (overharvest and destroy) and replacement with new stock (after cleaning or replacing substrate)
- move clams to area where they can clean themselves
- culture early stages and seed areas where conditions are favorable
- depurate clams to be eaten (after subsistence gatherers collect them)
- seeding spat (aquaculture) on clean substrate
- close beaches impacted by spill to prevent harvest of contaminated clams. (Note: local Fish and Game Boards have a history of not closing beaches. May need to review and modify Alaska Fish and Game policies and management overall.)
- assess management plans (e.g. Kodiak Dungeness crab harvest)

Information needs:
- Does replacing clams on cleaned substrate adequately consider viability of the food chain?
- Are clams used for subsistence?
- Do clams clean themselves up? Does depuration work? (Depuration is better for metals than organics.)

Note: Subsistence, recreational, and other users can make some studies difficult to carry out and reliably analyze. Study areas may need some sort of protective management designation for the duration of the study. This would require local support to be effective. Areas closed would have to be small.

Impact: Effects on grasses/sedges. Marshes may be ecologically unimportant to PWS (though their overall rarity may make them more important); regardless, they are important in terms of public perception.

Restoration options:
• break up the asphalt to speed weathering
• remove asphalt (dig it up and remove it), then replant
• where oxygen is the limiting factor for biodegradation of oil, gently aerate substrate to enhance degradation before oil sinks too low
• provide habitat support in other parts of migratory range to alleviate cumulative effects on migratory users of wetlands

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Impact: Impact on fish spawning and feeding areas. Note: apparent damage assessment result that "fish love oil" is due to problems with the study (due to map scale and the tendency for control sites to be associated with the mainland and oiled sites with island habitats). Regarding restoration options, the general feeling of the group was that physical habitat is there and food source species will come back quickly if the area is cleaned.

Impact: Impact on *fucus* (both from initial oiling and from clean-up activities). *Fucus* disperses by detachment of fertile plants in high energy environments; in low energy environments, has limited recolonization potential through sticky, non-flagellated diploid embryos (one meter maximum dispersement). Potential for vegetative repopulation from fragments of holdfasts was unclear.

Restoration options:
• move rocks with attached *fucus* from unimpacted sites. (This has removal site impacts which must be considered; this is also very labor intensive.) This option would also result in restoration of other elements of the community which might also be attached to the rock.
• seed zygotes (may be possible to disperse gametes/zygotes in solution from an airplane)
• transplant fertile or pre-fertile plants

(Note: for all restoration options for *fucus*, site selection will be critical for success; need to minimize the possibility of reoiling.)

Intertidal - high energy

Can't do much here. This habitat will probably recover relatively quickly on its own. Should assess damages and apply money to other areas.

Subtidal - low energy, high energy, and deep

Damages are unclear. Breaking up asphalt and dumping it in the intertidal to be weathered may lead to more chronic impacts. The world literature shows acute impacts but chronic impacts have not been documented. Only in estuaries and closed areas are chronic effects being well documented.

Impact: Impacts on flatfish, rockfish, herring, and pink salmon fry.

Restoration options:
• remove biologically active oil from beaches with the least intrusive methods

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Impact: Low concentrations of subtidal substrate oil last year detectable to 20-40 meters. May have gone further over winter.

Restoration options:
• level of exposure does not warrant capping sites

Impact: Dead zones in Herring Bay.

Information needs:
• What treatment technologies were used on the adjacent beaches?
• What was the impact of Exxon corralling oil in this bay to await skimming?
• Do silled bays have fauna kills naturally due to anoxia?

Impact: No clear evidence of major damage to sea grass beds.

Restoration options:
• transplanting

Note: Sea grass transplanting has had varying success. Some experts suggested that big plugs were needed to include the necessary rhizomes. Other experts suggested that there has been some success with stapling rhizomes directly to the substrate thereby avoiding the need for large plugs. Subtidal transplantation sometimes is more successful that intertidal transplantation due to less sediment washing.

Airsheds

Lichen assessment (pH) can be used as an indicator. It is unclear how pulses would show and be traceable to the spill. A lichen study was proposed and dropped in the damage assessment study evaluation process as not likely to produce damage results.

Selection criteria for restoration plan options
(Note: additional criteria may be inferred from the general discussion on pages 1-4 of these notes.)

• Probability of success
• Extent/magnitude of damage
• Effectiveness (bang for the buck compared to natural recovery)
• Prepare us for better response/cleanup to NEXT spill
• Creating a system which is even better than it was before is preferable to just speeding up some process by one or two years.

(Selection of pilot projects for this summer should consider the above criteria PLUS the level of scientific uncertainty.)

Suggested feasibility studies for summer 1990

[Note: My notes on this are incomplete. Therefore, refer to contractor's report regarding feasibility study recommendations.]

The group selected a stratified study design to assessment natural recovery rates vs. restoration efforts stratified by habitat, clean-up type, species/community, and management changes.

Must determine site-specific residual fractions and characteristics of oil before any restoration activity.

Pilot study to test range of options must control for the impacts of clean-up activities. Need to be able to identify site treatment (problems with doing this throughout the spill area due to scale of data). Only need clear data for some areas since replicates can be done on subsamples.

For replanting, must include assessment of impacts on sites from which plants were removed (benefit/harm balance).

Two applications of the stratified study design:

Study 1: In sheltered, rocky intertidal, apply three types of *Fucus* treatment: no action, seeding, and whole plant transplanting.

Fucus is important as it stimulates and indicates system health but we want the study to assess recovery of the entire system.

Study 2: In low energy intertidal marshes, apply two types of sedge/marsh grass treatment: no action and transplanting. Use one marsh (with subsamples) for all data.

Need a series of long-term study sites that can be protected (from human use). This needs to be further discussed. Need sites and ongoing funding for study. National Park Service and the State of Alaska are the most likely management agencies to carry this out.

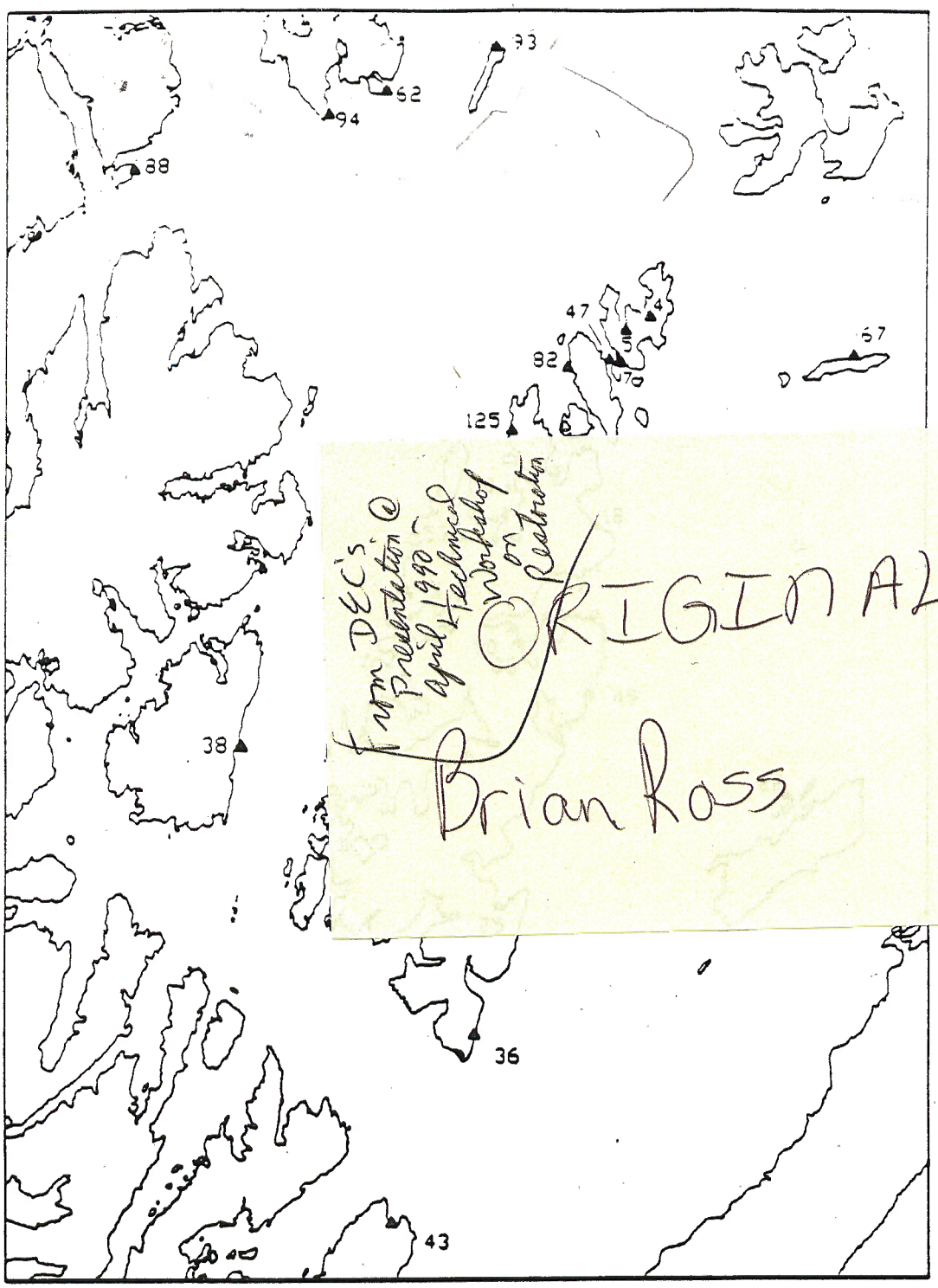

Figure 1. Locations of field stations to be monitored through the winter.

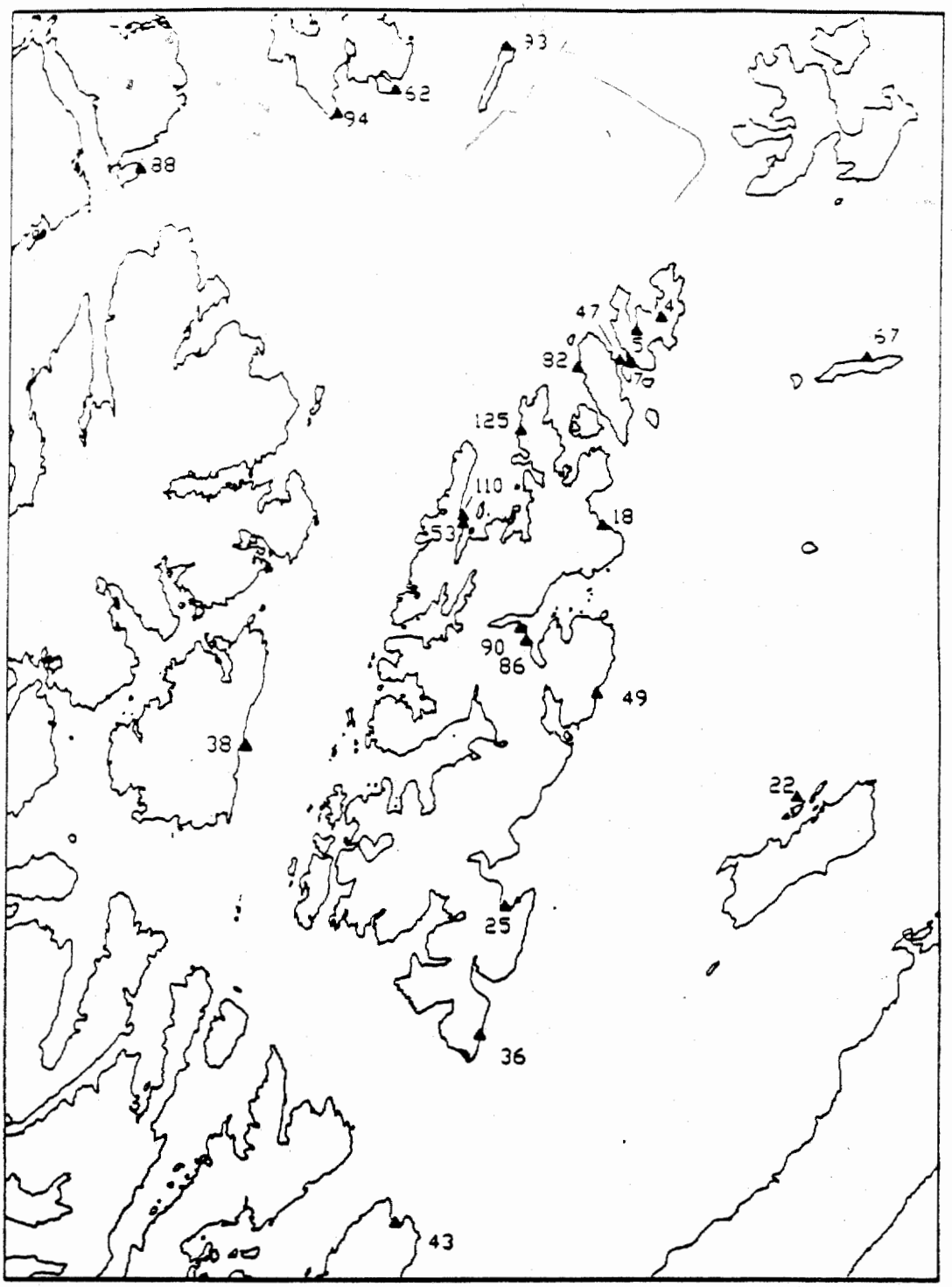

Figure 1. Locations of field stations to be monitored through the winter.

LOG MPN FOR POREWATER
WINTER CRUISE - PRINCE WILLIAM SOUND

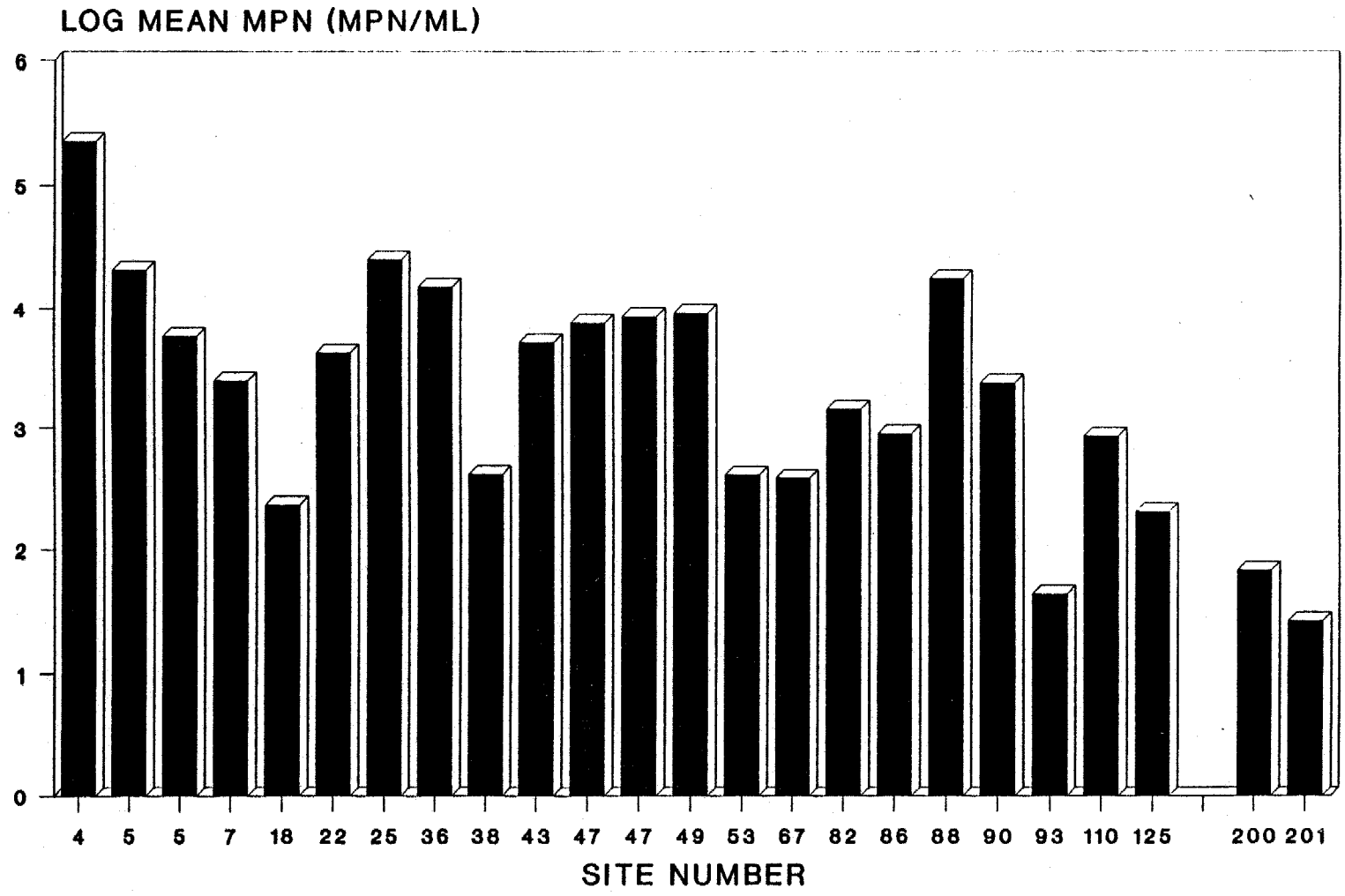

Figure 3

LOG MPN FOR TR01
WINTER CRUISE - PRINCE WILLIAM SOUND

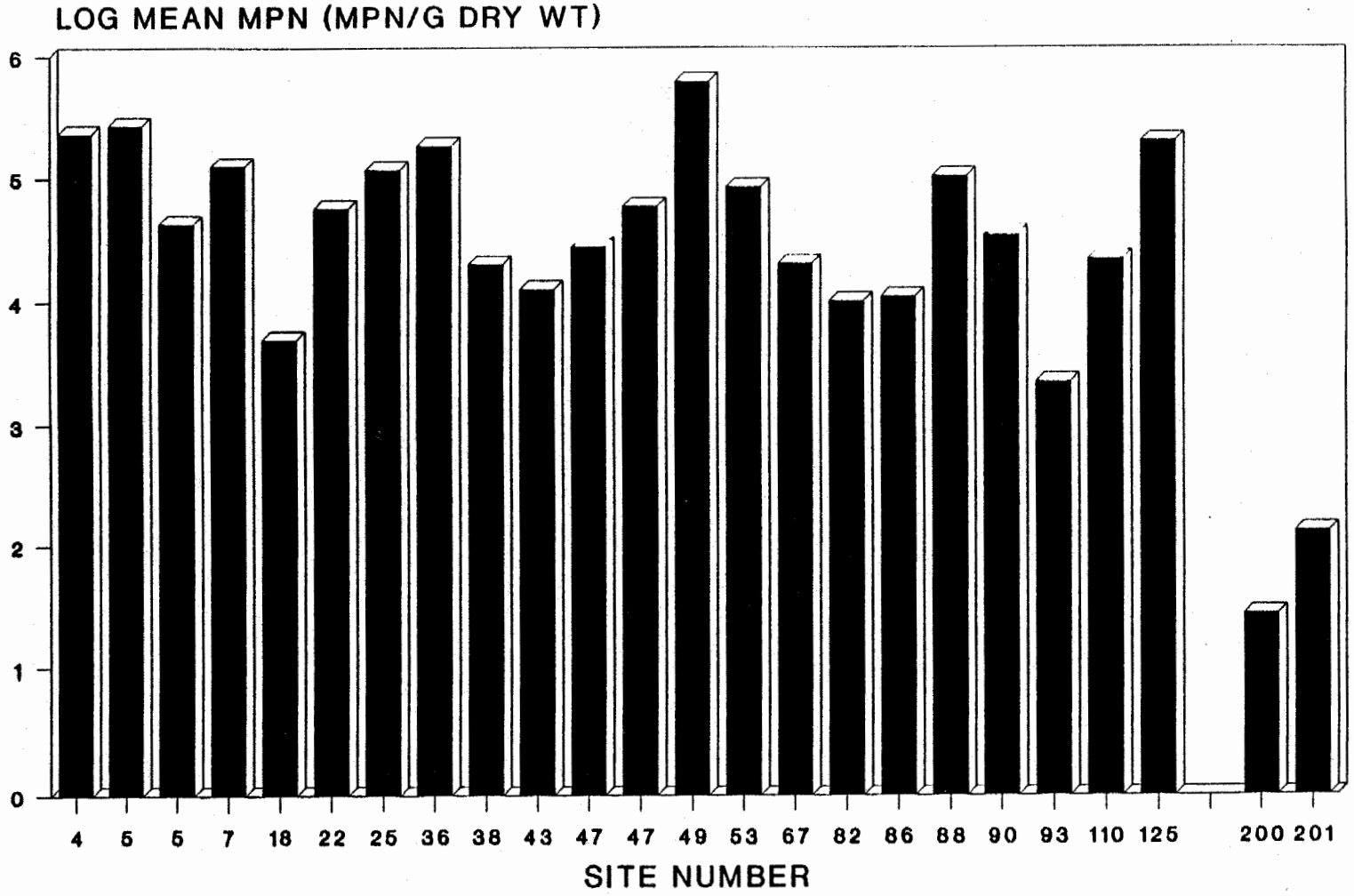

Figure 4

LOG MPN FOR TR03
WINTER CRUISE - PRINCE WILLIAM SOUND

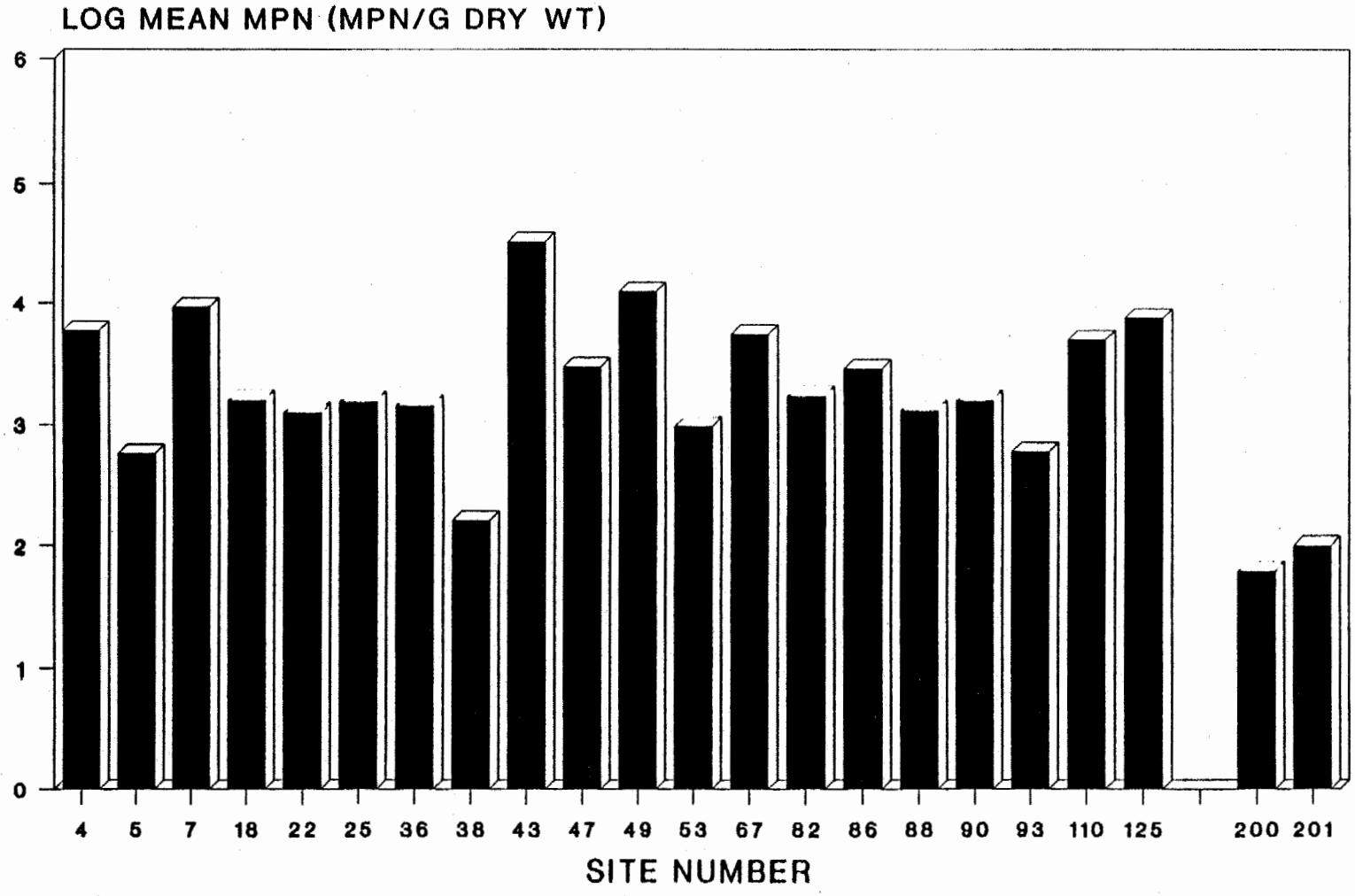

Figure 5

NAPHTHALENE ORP - POREWATER
0 - 2 DAY INCUBATION PERIOD

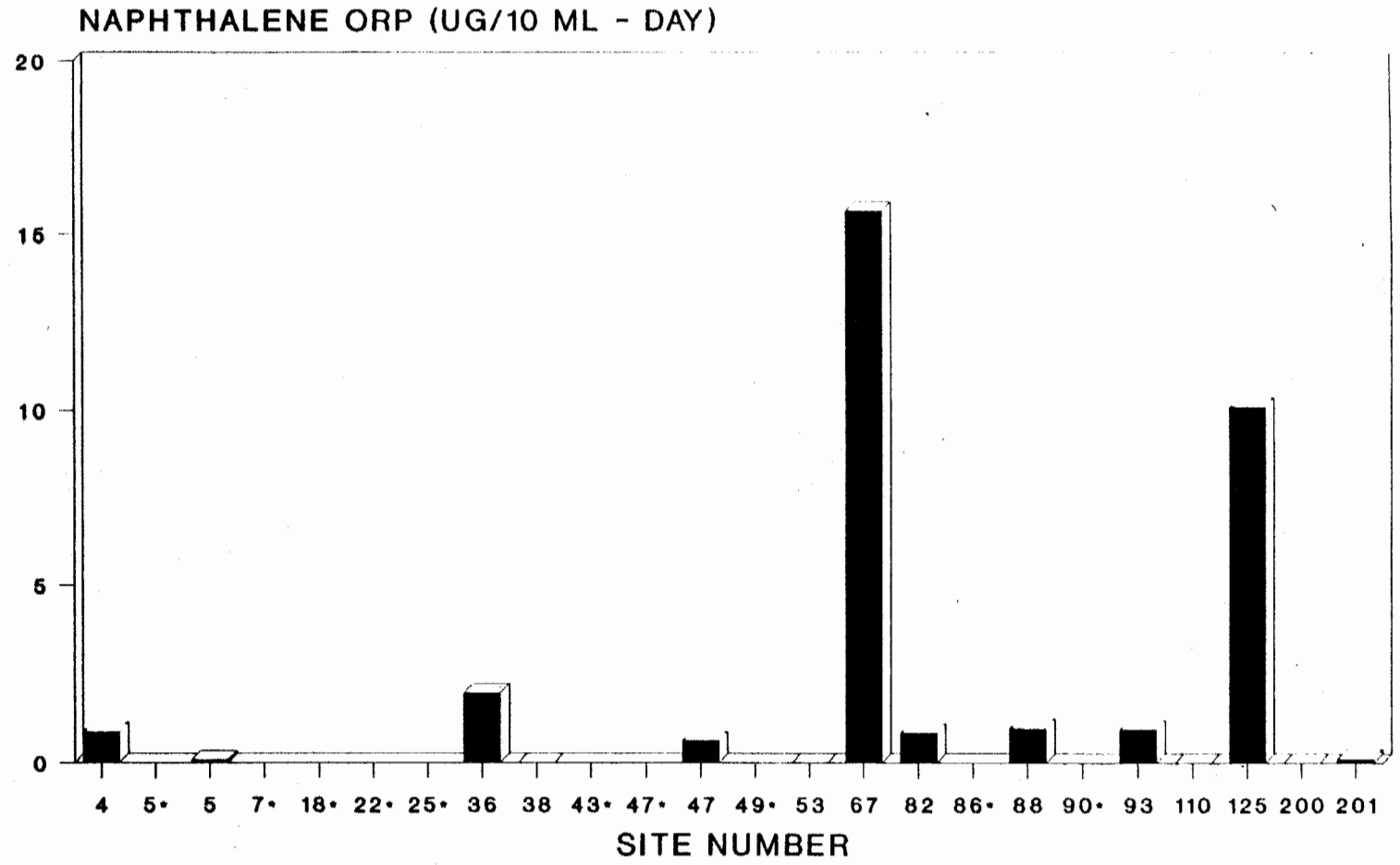

Figure 12

* Assay not performed for this incubation/isobath/isotope scenario

NAPHTHALENE ORP - TR01
0 - 2 DAY INCUBATION PERIOD

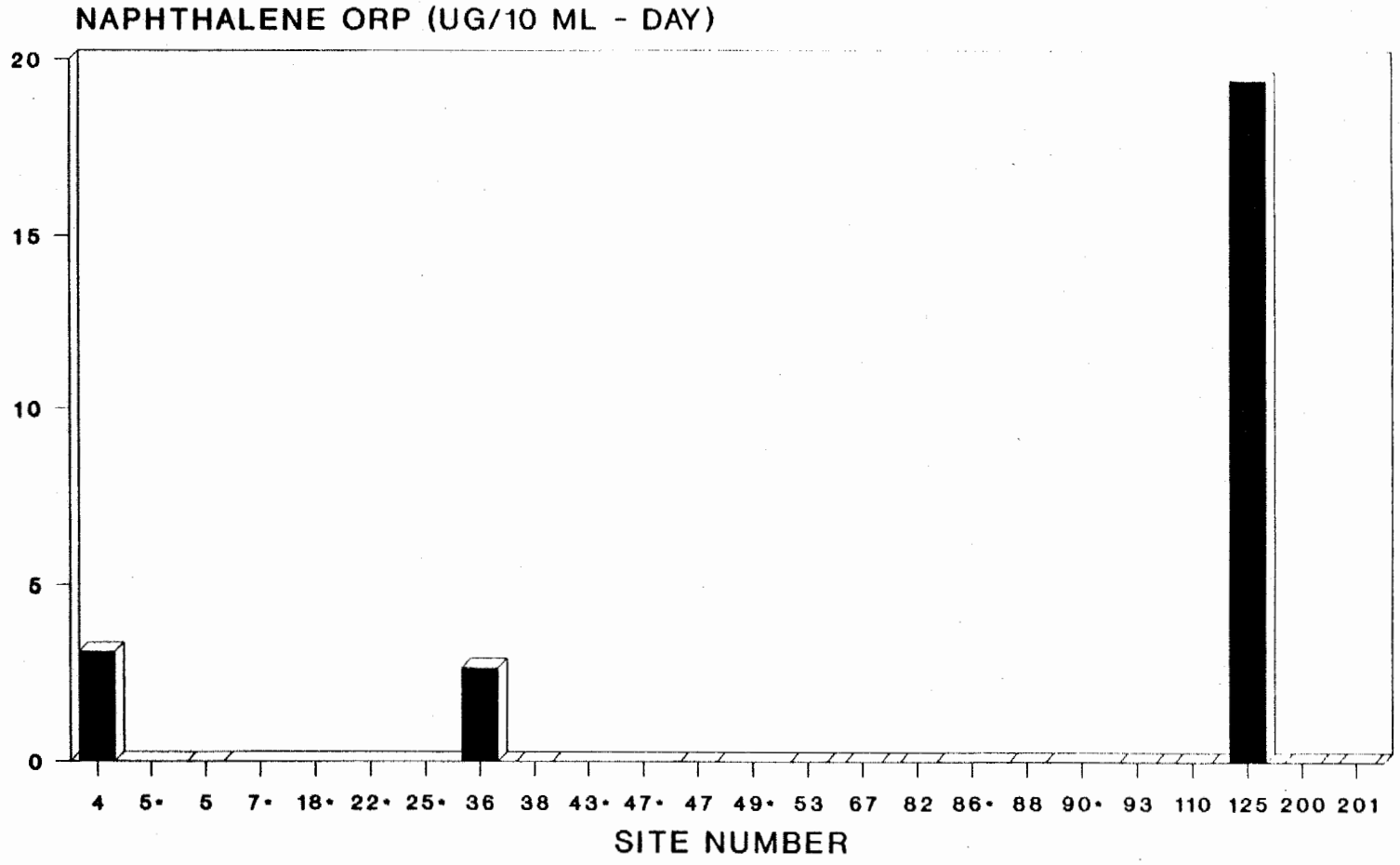

Figure 13

• Assay not performed for this incubation/isobath/isotope scenario

NAPHTHALENE ORP - TR03
0 - 2 DAY INCUBATION PERIOD

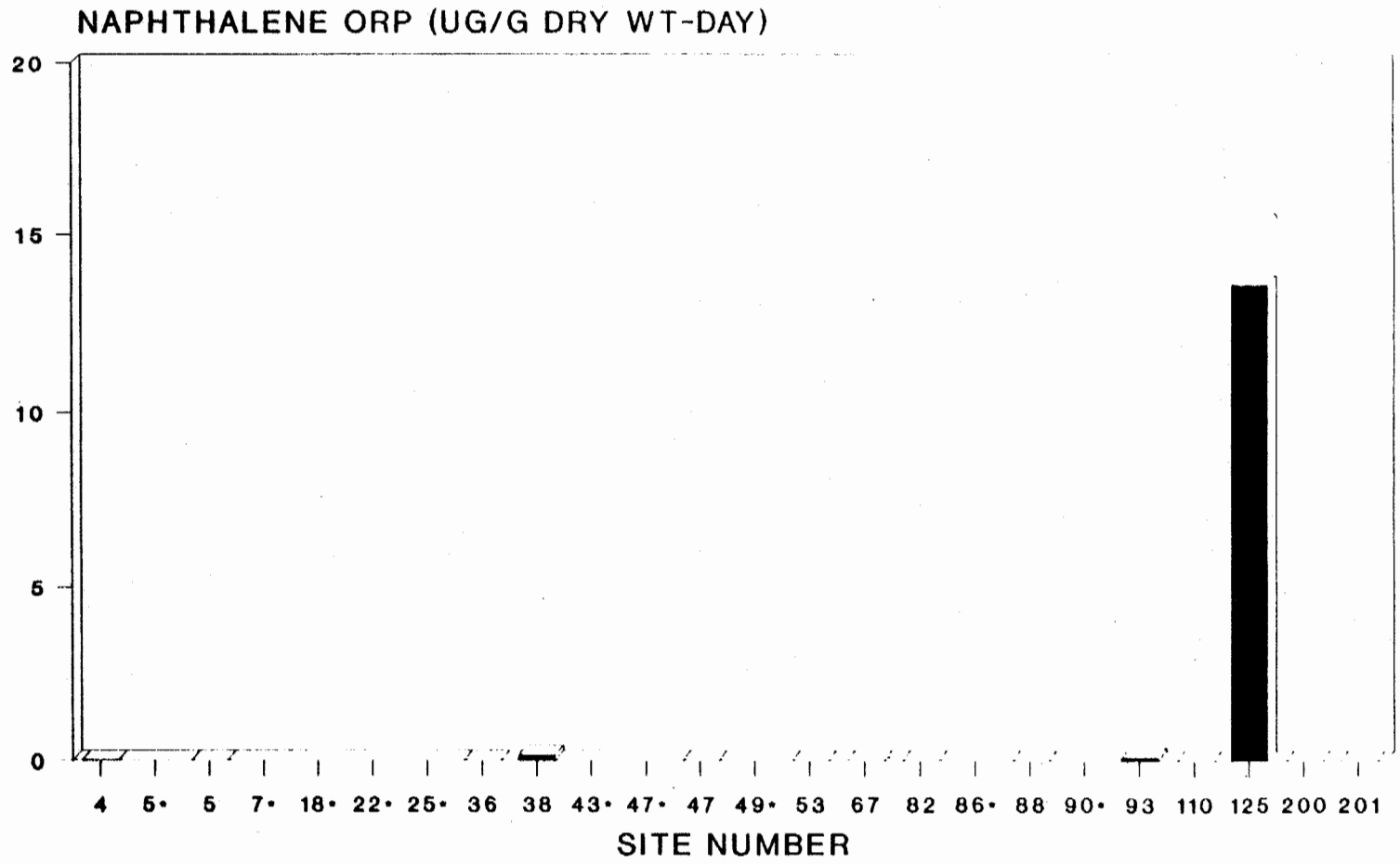

Figure 14

• Assay not performed for this incubation/isobath/isotope scenario

PHENANTHRENE ORP - POREWATER
0 - 2 DAY INCUBATION PERIOD

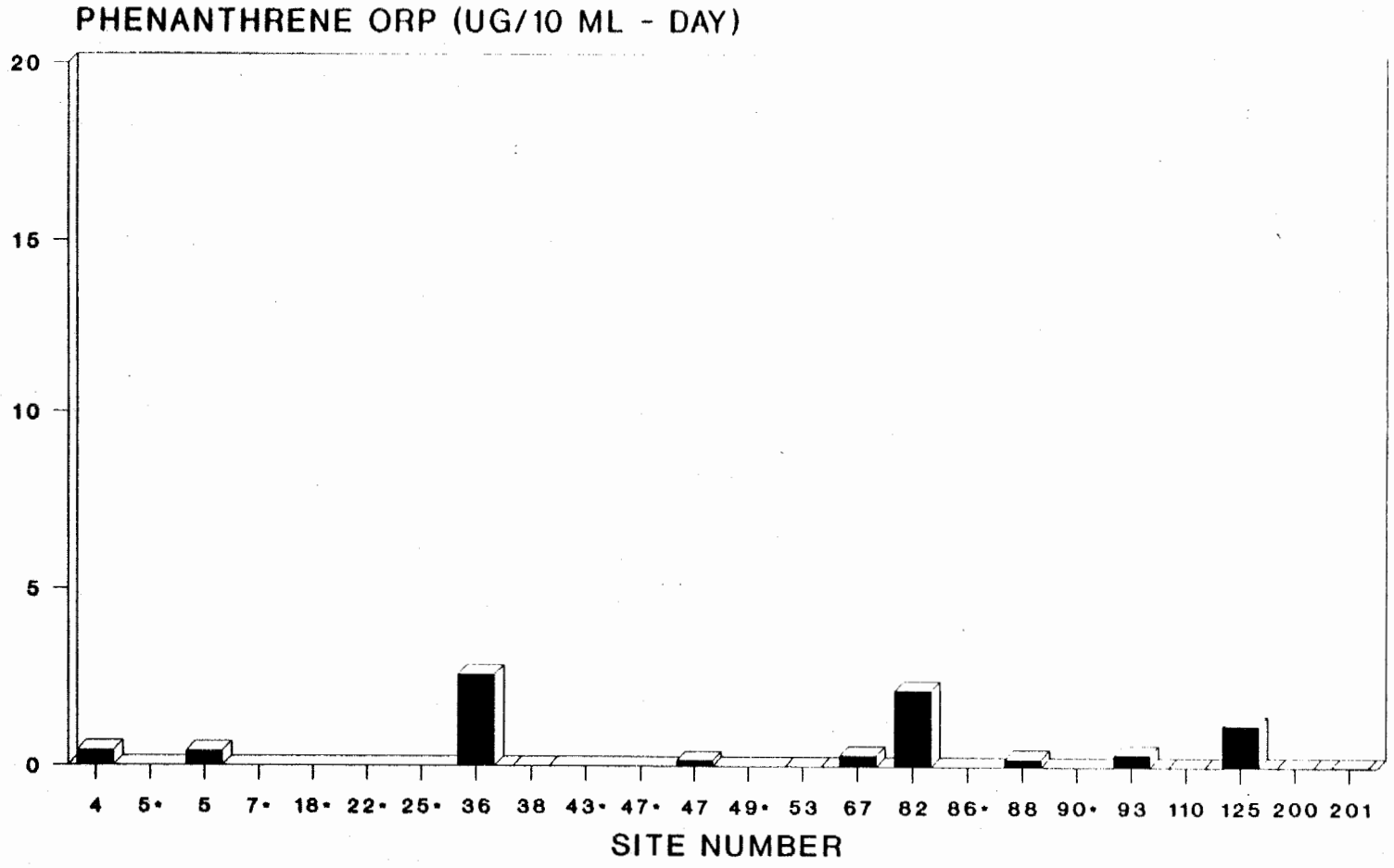

Figure 15

• Assay not performed for this incubation/isobath/isotope scenario

PHENANTHRENE ORP - TR01
0 - 2 DAY INCUBATION PERIOD

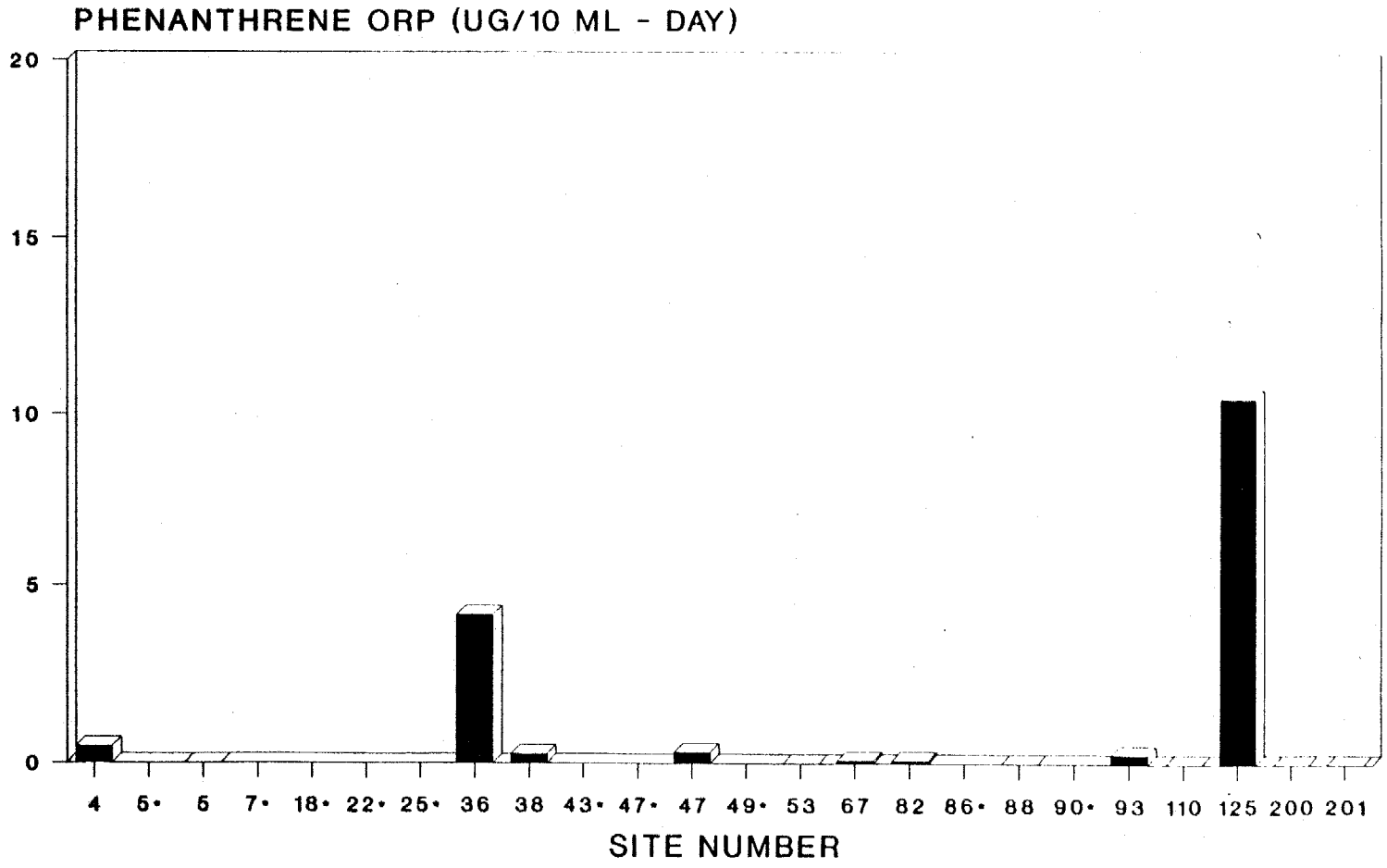

Figure 16

• Assay not performed for this incubation/isobath/isotope scenario

PHENANTHRENE ORP - TR03
0 - 2 DAY INCUBATION PERIOD

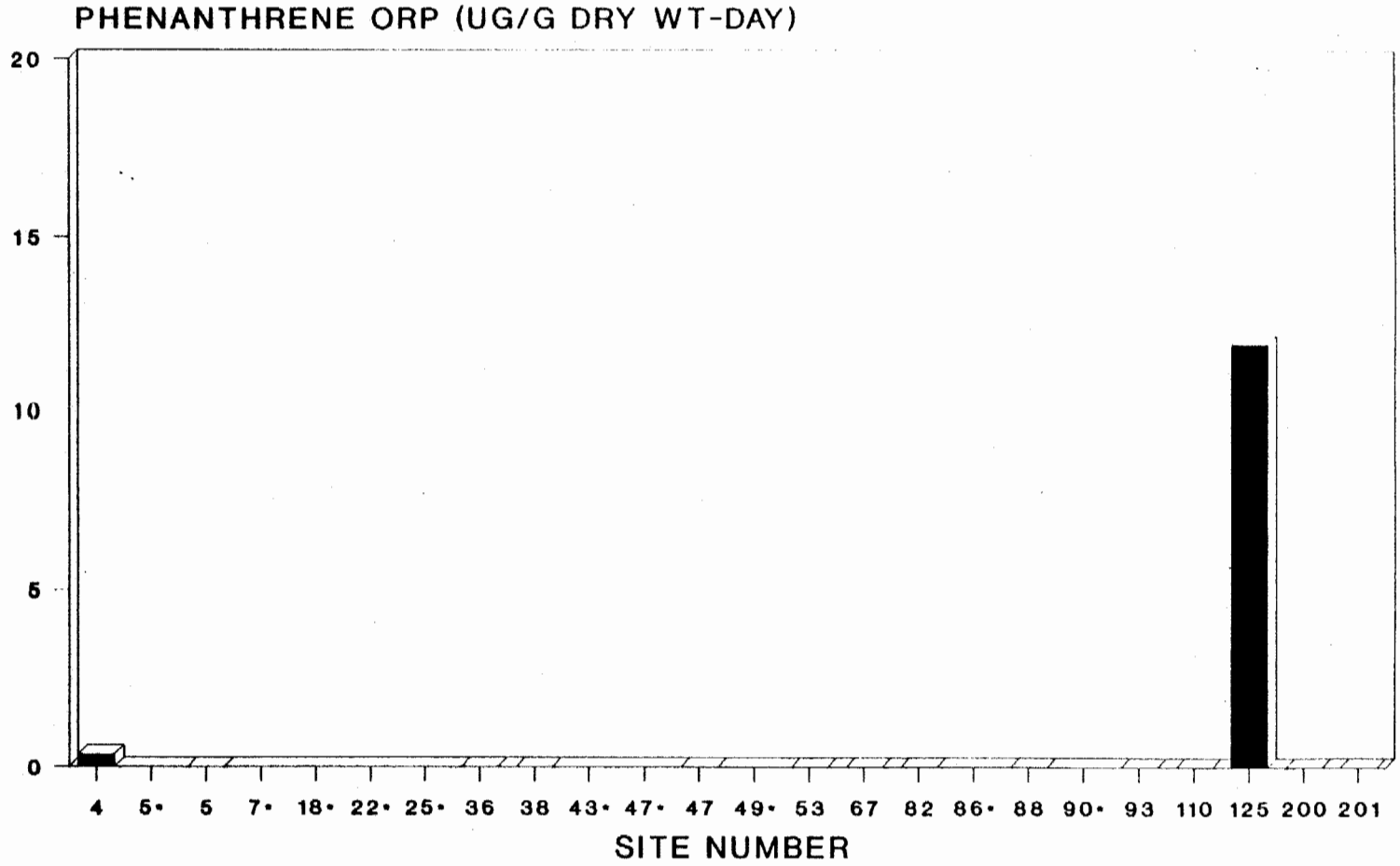

Figure 17

• Assay not performed for this incubation/isobath/isotope scenario

NAPHTHALENE ORP - POREWATER
0 - 10 DAY INCUBATION PERIOD

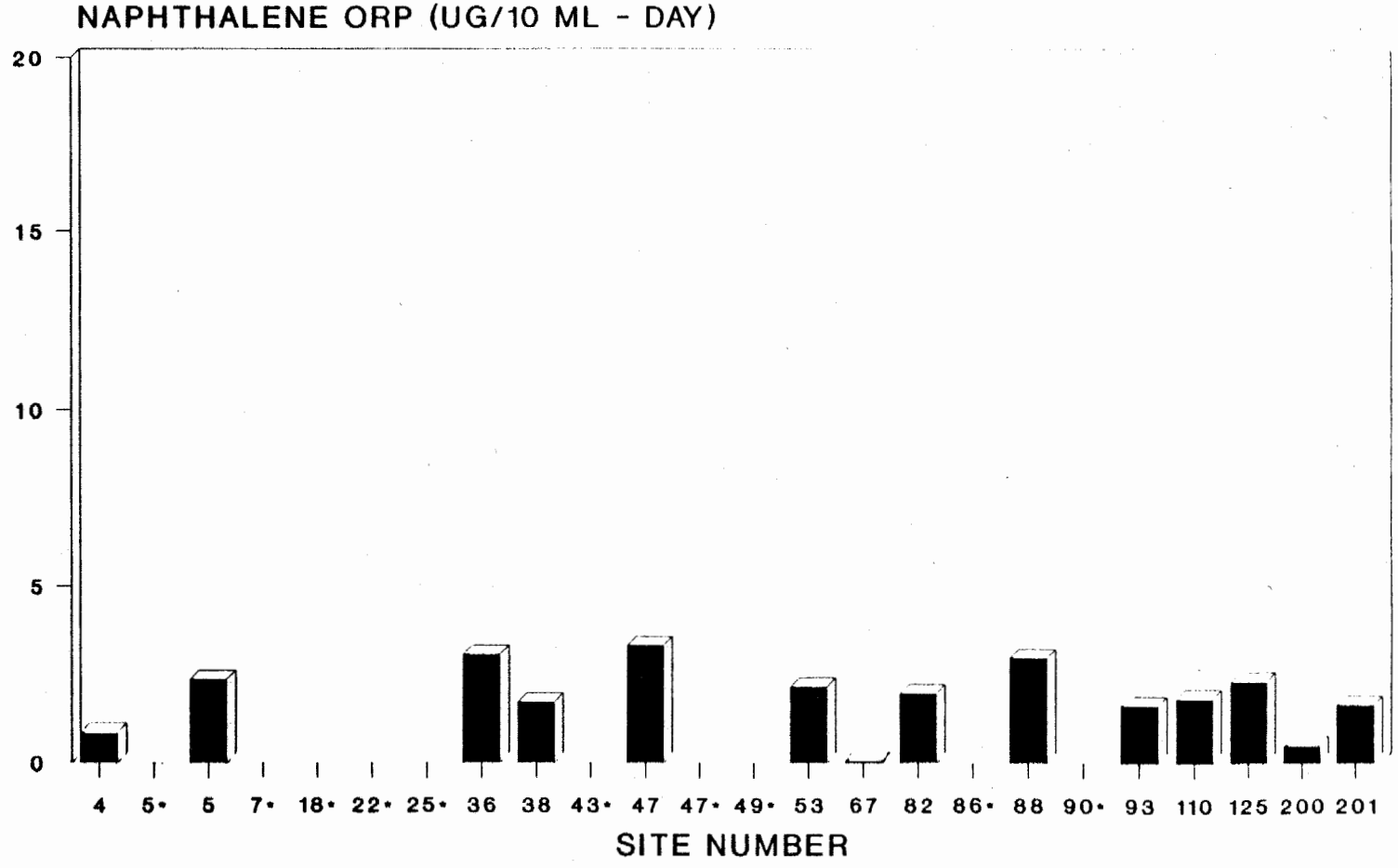

Figure 24

• Assay not performed for this incubation/isobath/isotope scenario

NAPHTHALENE ORP - TR01
0 - 10 DAY INCUBATION PERIOD

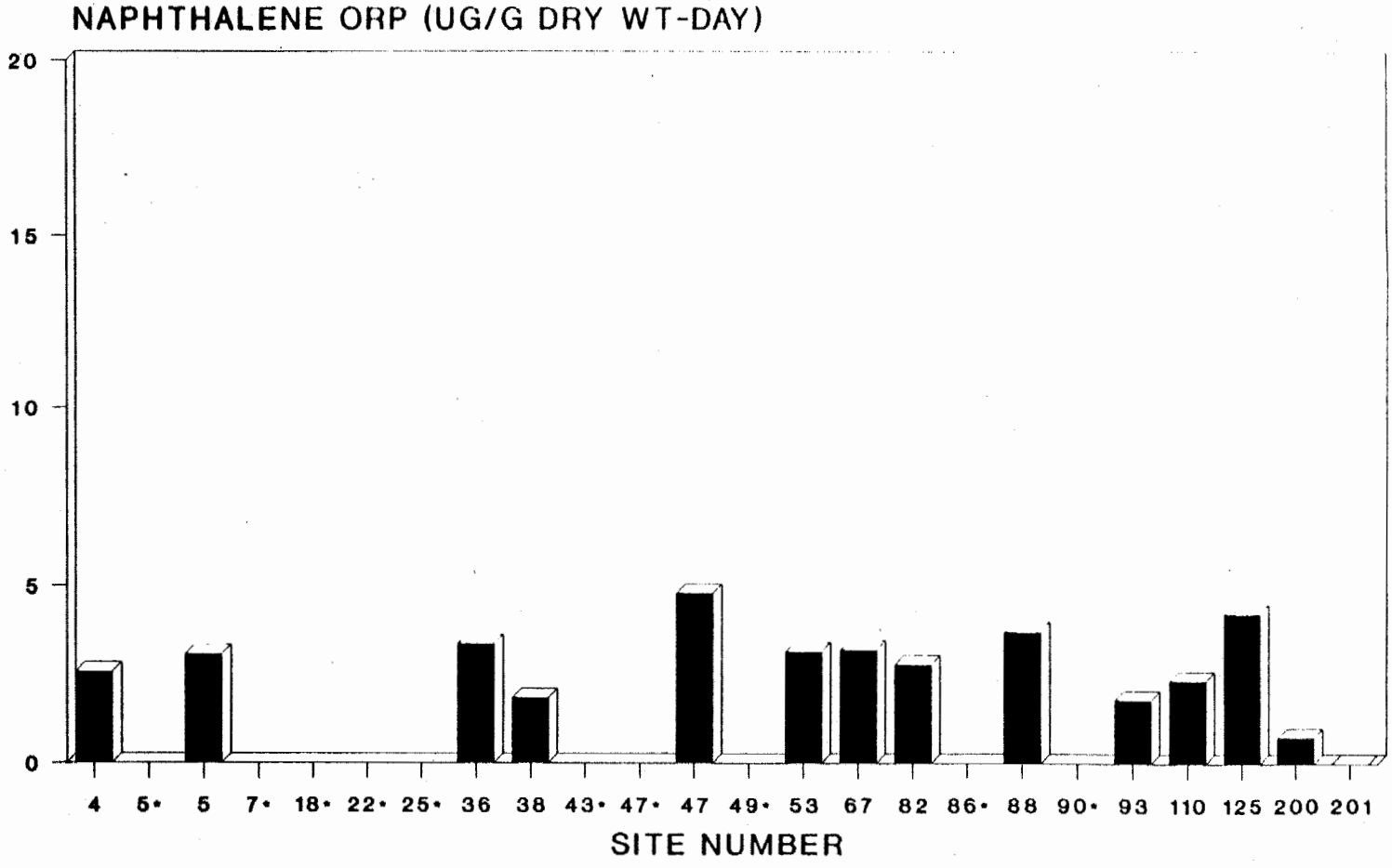

Figure 25

• Assay not performed for this incubation/isobath/isotope scenario

NAPHTHALENE ORP - TR03
0 - 10 DAY INCUBATION PERIOD

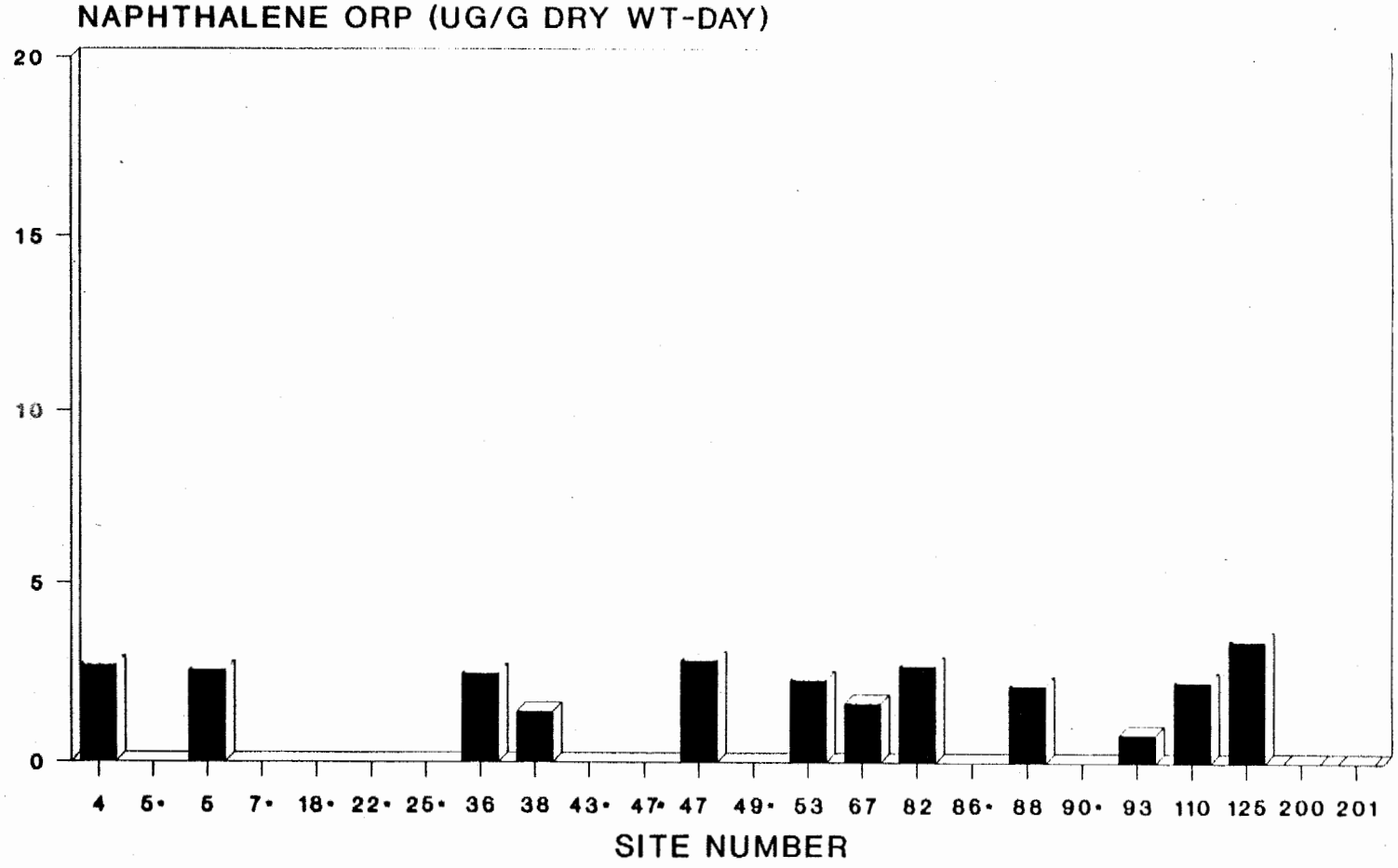

Figure 26

• Assay not performed for this incubation/isobath/isotope scenario

PHENANTHRENE ORP - POREWATER
0 - 10 DAY INCUBATION PERIOD

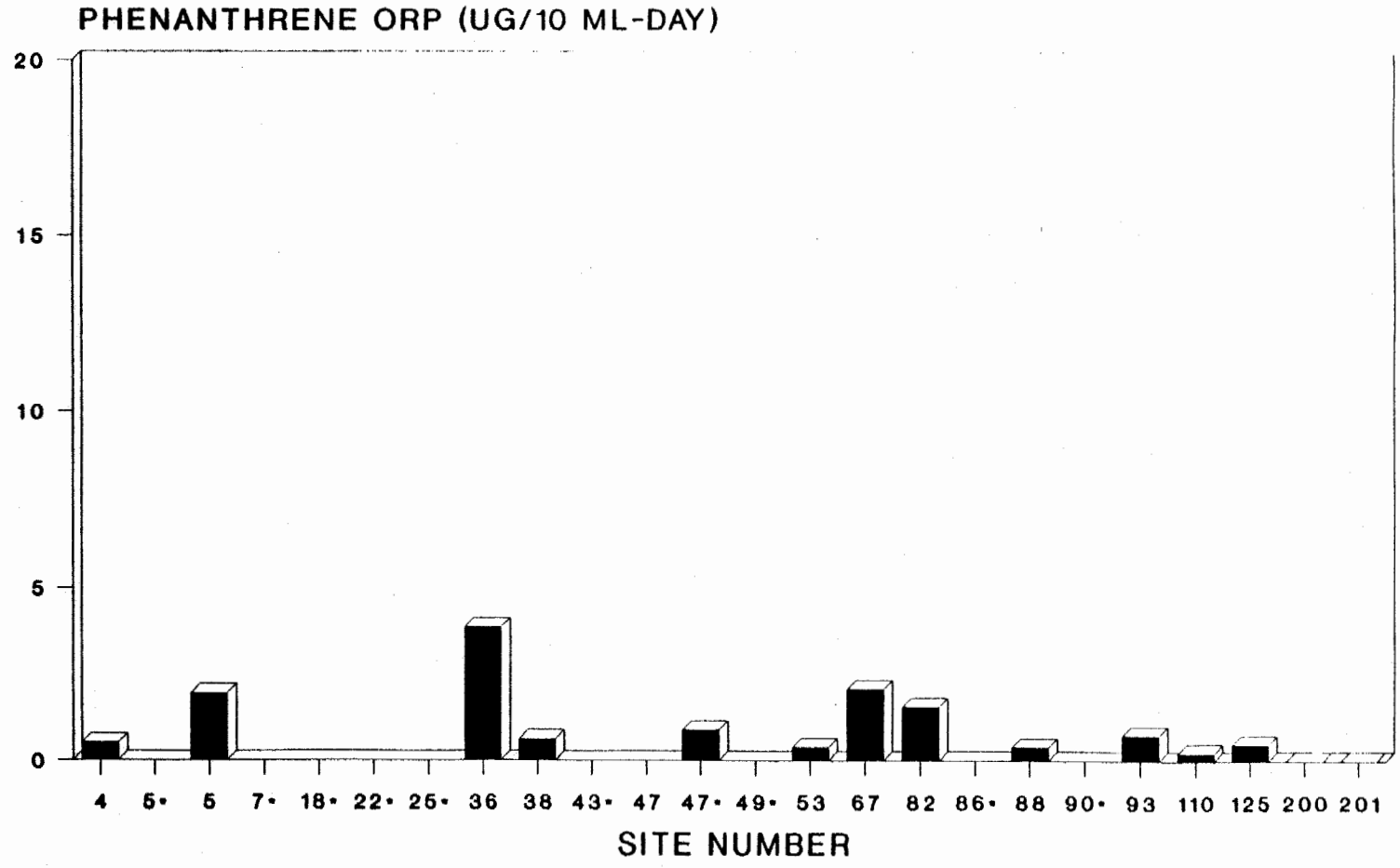

Figure 27

• Assay not performed for this incubation/isobath/isotope scenario

PHENANTHRENE ORP - TR01
0 - 10 DAY INCUBATION PERIOD

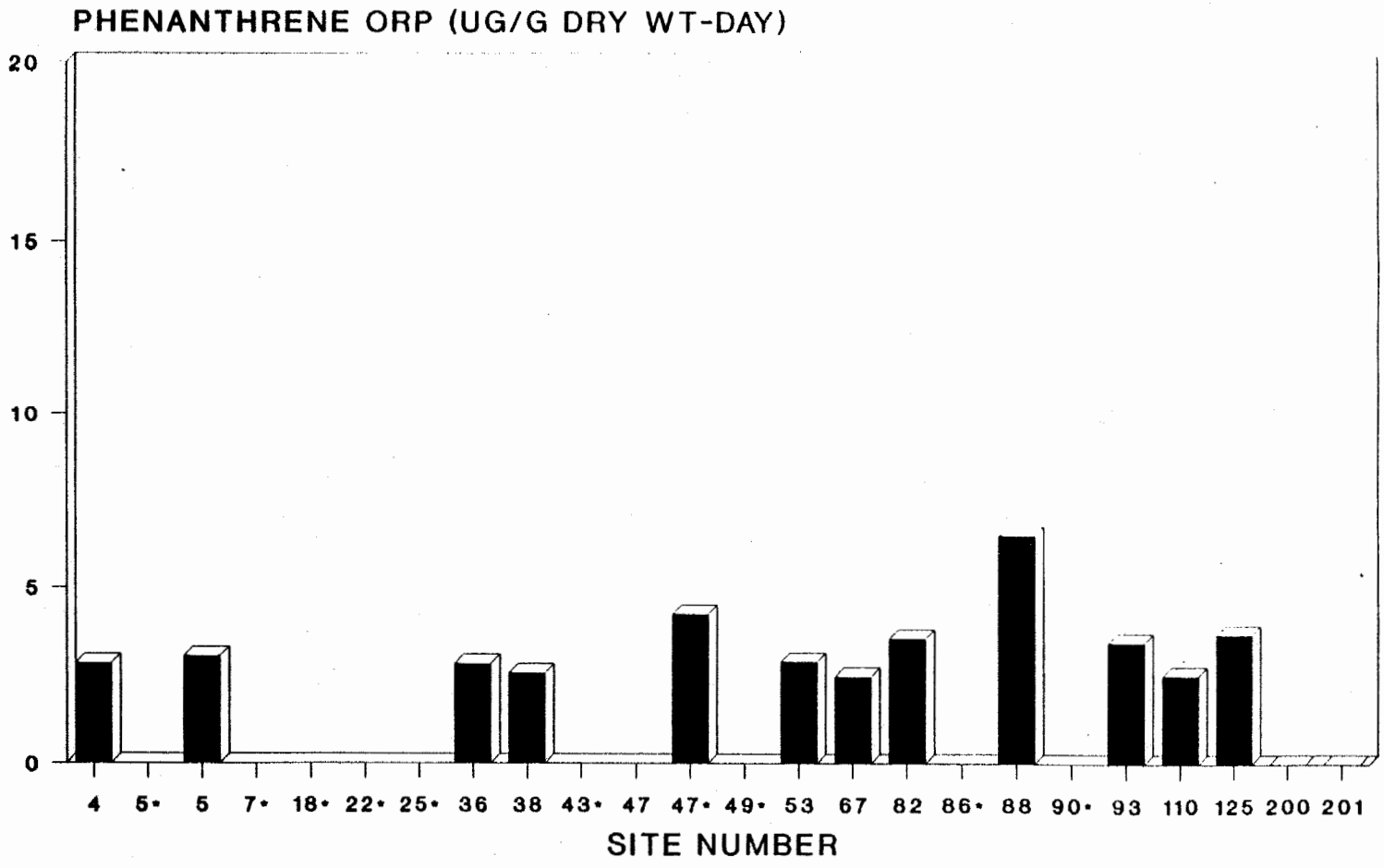

Figure 28

• Assay not performed for this incubation/isobath/isotope scenario

PHENANTHRENE ORP - TR03
0 - 10 DAY INCUBATION PERIOD

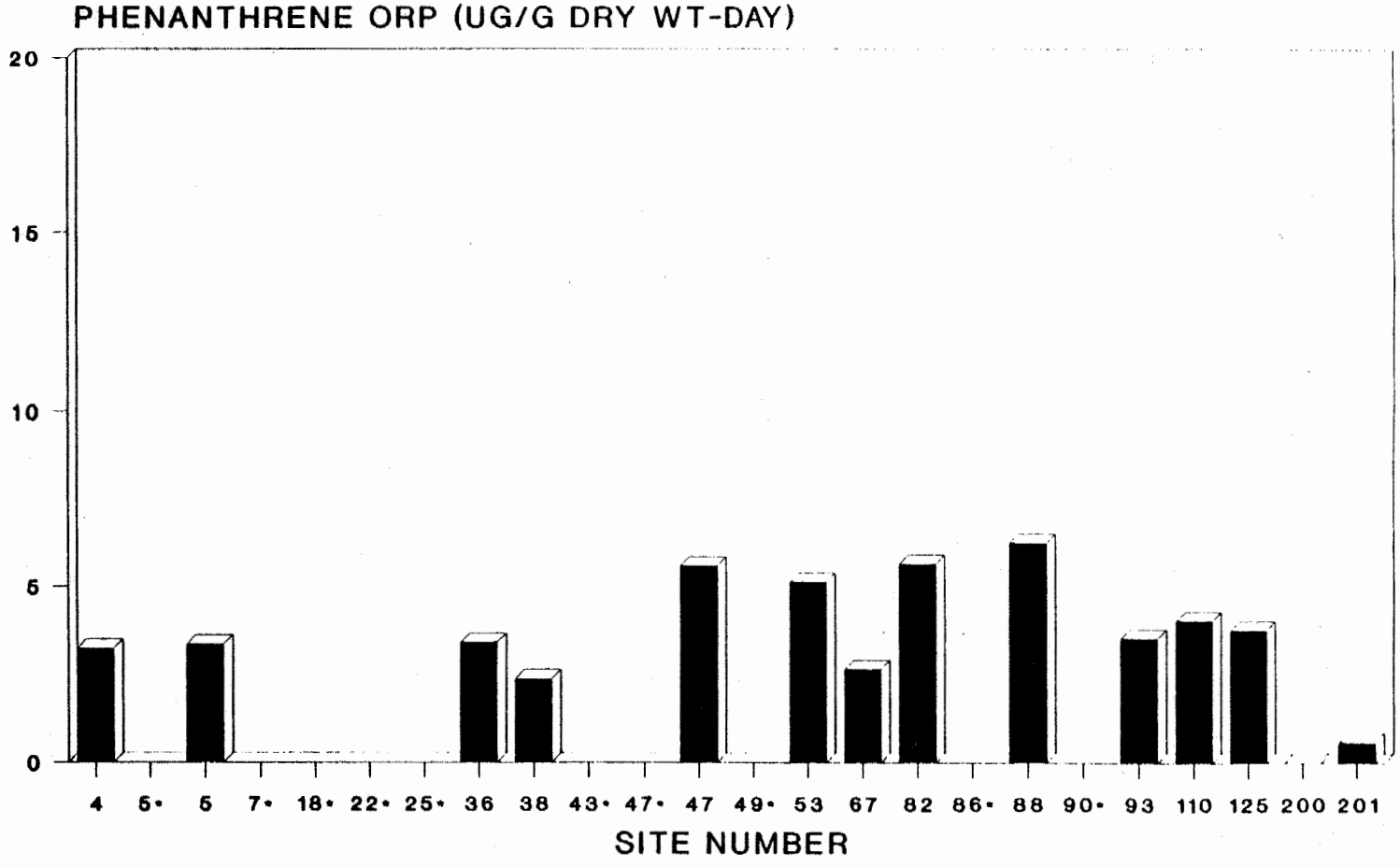

Figure 29

• Assay not performed for this incubation/isobath/isotope scenario

PRWG
AA

CONFIDENTIAL

Oil Spill Restoration Planning Office
437 "E" Street, Suite 301
Anchorage, Alaska 99501

MEMORANDUM 15 MARCH 1990

TO: Restoration Planning Work Group

FR: Stan Senner

RE: Participants in Technical Workshops

Here is a list of confirmed and potential participants for technical workshop 1-A, scheduled for 3-4 April 1990. There are a number of slots to fill or confirm, and it is critical that we do so quickly. Brian Ross will be working on this over the next several days, so please contact him with any names you can supply or confirm. We are also woking on a refined agenda, and that too will be circulated.

Frankie Pillifant is working on an agenda and list of participants for the workshop 1-B, cultural and recreational resources, which is scheduled for 5 April. These will be circulated shortly.

Beyond the participants themselves, a number of details still need resolution. One of them concerns costs for 1-2 outside experts, which are not covered by the contractor retained by EPA. Does any agency volunteer to cover these costs (travel, per diem, and consulting fee)?

As noted above, please direct any feedback to Brian at 271-2464. I will be out of town until the night of 25th.

CONFIDENTIAL

TECHNICAL WORKSHOP NO. 1-A 3-4 April 1990

GROUP (mark one): (A) Fish and Shellfish XX
Coastal Habitats/Air & Water
Mammals
Birds

(B) Cultural
Recreation

PARTICIPANTS BY CATEGORY:

Summary Scientist for Damage Assessment Results: C. Meacham**

Group Chairman: B. Ross**

Principal Investigators: K. Hepler**
J. Hillsinger**
S. Sharr**
A. Wertheimer (Meacham to contact)
C. O'Clair "

Peer Reviewers: 1st choice, P. Mundy (? to contact)
2nd choice, R. Hilborn "

"Outside" Experts: H. Feder**
1st choice, W. Barber (Versar to contact)
2nd choice, D. Armstrong "

Agency Representatives:

B. Allee,	ADF&G	(Meacham to contact)
D. McBride	"	"
U. Varanasi,	NOAA	(Morris to contact)
? ,	"	"
? ,	USFS	(Ross ask Gibbons)
? ,	USFWS	(Ross ask Gertler)

**participation confirmed

[03-15-90]

CONFIDENTIAL

TECHNICAL WORKSHOP NO. 1-A 3-4 April 1990

GROUP (mark one): (A) Fish and Shellfish
Coastal Habitats/Air & Water XX
Mammals
Birds

(B) Cultural
Recreation

PARTICIPANTS BY CATEGORY:

Summary Scientist for Damage Assessment Results: D. Gibbons
(Ross to contact)

Group Chairman: F. Pillifant

Principal Investigators: J. Lindstrom**
J. Rice (Meacham contacted;
not available; final word?)
D. Wolfe (Morris to contact)

Peer Reviewers: R. Spies (? to contact)

"Outside" Experts: H. Sanders**
M. Foster**

Agency Representatives:

L. Trasky,	ADF&G	(someonefromHabitat)
A. Weiner,	ADEC**	
? ,	ADNR	(Frankie to contact)
? ,	NOAA	(Morris to contact)
? ,	USEPA	(Ross to contact)
? ,	"	"
? ,	USFS	(Ross ask Gibbons)
? ,	NPS	(Ahlstrandtocontact)

**Participation confirmed

[03-15-90]

TECHNICAL WORKSHOP NO. 1-A 3-4 April 1990

GROUP (mark one): (A) Fish and Shellfish
Coastal Habitats/Air & Water
Mammals XX
Birds

(B) Cultural
Recreation

PARTICIPANTS BY CATEGORY:

Summary Scientist for Damage Assessment Results: R. Nowlin**

Group Chairman: B. Morris**

Principal Investigators: K. Frost (Nowlin to contact)
W. Testa (tentative)
M. Dahlheim (Morris to contact)
____?____, (Ross ask Gould)

Peer Reviewers: none

"Outside" Experts: J. Burns (Versar to contact)
W. Troyer (tenative?)
J. Hall (alternative)

Agency Representatives: W. Regelin, ADF&G
___?___, USFWS (Ross ask Gould)
S. Zimmerman, NOAA (Morris to contact)
___?___, other agency?

**participation confirmed

[03-15-90]

CONFIDENTIAL

TECHNICAL WORKSHOP NO. 1-A 3-4 April 1990

GROUP (mark one): (A) Fish and Shellfish
Coastal Habitats/Air & Water
Mammals
Birds XX

(B) Cultural
Recreation

PARTICIPANTS BY CATEGORY:

Summary Scientist for Damage Assessment Results: ?? (Brian ask Gertler)

Group Chairman: S. Senner**

Principal Investigators: S. Patten**
? (Brian ask Gertler)
? "
? "

Peer Reviewers: 1st choice, M. Fry (? to contact)
2nd choice, G. Hunt (? to contact)

"Outside" Experts: N. Snyder (tentative)
D. Norton (tentative)

Agency Representatives: T. Rothe or D. Rosenberg, ADFG**
?, USFWS (Brian ask Gertler)
?, " "
?, ?

**participation confirmed
[03-15-90]

RWG
AA

CONFIDENTIAL

TECHNICAL WORKSHOP NO. 1

GROUP (mark one): (A) Fish and Shellfish ✓
Coastal Habitats
Mammals
Birds

(B) Cultural
Recreation

PARTICIPANTS BY CATEGORY:

Summary Scientist for Damage Assessment Results: Chuck Meacham

Group Chairman: Brian Ross

Principal Investigators: Dick Rowan

Hepler
Hillsinger
Shar

Wertheimer
O'Claire (Auk Bay)

Peer Reviewers:

Mundy, #1
Hillborn, #2
} only one → Call Gary Fischer

"Outside" Experts:

Ken Chew
Howard Feder
Both - Sheehy

Agency Representatives:

Eggers
Allen
MacBride
} ADF+G

• Usha Varanasi, Dir. Env. Conserv. Seattle
_____
_____
} NMFS (ask Byron)

_____, Forest Service (ask Dave)
_____, USFWS (ask Rowan)

DRAFT DRAFT DRAFT DRAFT

CONFIDENTIAL

TECHNICAL WORKSHOP NO. 1-B 5 APRIL 1990

GROUP: CULTURAL

PARTICIPANTS BY CATEGORY

Group Chair: F. Pillifant?

Summary Scientist for Damage Assessment Results: Bob Shaw or Judy Bittner

Principal Investigator: Jerry Clark, project manager for D.A.

Peer Reviewers: SUGGESTED
Advisory Council Historical Preserveration (Fed. Agency-Claudia Nissley-Denver, Colo.)

Archaeological Conservancy
National Trust-responded to damage assessment study plan.

"Outside" Experts: Gary Summers, NPS, Hawaii National Parks
Robert Thorn, Ctr. for Arch. Research

Agency Representatives: ADNR-Bob Shaw, Chuck Holmes
NPS- Ted Birkedal
USFS- John Mattson
USFWS- Chuck Diters
NATIVE ORGS.- ?

CONFIDENTIAL

TECHNICAL WORKSHOP NO. 1-B 5 APRIL 1990

GROUP: COASTAL HABITAT/AIR/WATER

PARTICIPANTS BY CATEGORY:

Summary scientist for Damage Assessment Results: ~~Dave Gibbons~~ Art Weiner

Group Chairman: F.Pillifant

Principal Investigators: Ray Highsmith ##
Steve Jewett ##
Josh Schimel ##
Jon Lindstrom**
Jeep Rice ##
Doug Wolfe##

Peer Reviewers: ~~Pete Peterson ##~~
~~Don Bosch ##~~

"Outside" experts: H. Sanders ** WHO ARE THESE TWO GUYS
M. Foster **

Agency representatives: ADFG- Kim Sundberg (not lance Trasky?)
ADEC- Art Weiner
ADNR- Rick Thompson ?
NOAA-?
USEPA-? two listed originally. Is there a real need for more than one?
USFS-?
NPS-?
USFWS-?

** Participation confirmed
Need to be contacted still

CONFIDENTIAL

TECHNICAL WORKSHOP NO. 1-B 5 APRIL 1990

GROUP: RECREATION

PARTICIPANTS BY CATEGORY:

Summary Scientist for Damage Assessment Results: NONE

Group Chairman: Gary Ahlstrand

Principal Investigators:

Peer Reviewers: Poppy Benson, Maritime National Wildlife Refuge, Homer, Ak. 235-6546 (planner) (Fed. agency w/USFWS)
Alan Jubanville, UAF, planner
Roger Clark, USFS

"Outside" Experts: NPS???
Bernie Shanks, Sacramento State University
Public lands mgmt., recreation
Roderick Nash, U.C.Santa Barbara

Agency Representatives: USFWS- D.Patterson
ADNR- A. Meiners
USFS- A. Albrecht
NPS- ?????

Bob Maynard —
— recommend econ
for lead-in on
Rec.

CONFIDENTIAL

TECHNICAL WORKSHOP NO. 1-A 3-4 APRIL

GROUP: fish/shellfish

PARTICIPANTS BY CATEGORY:

Summary Scientist for Damage Assessment Results: Chuck Meachum**

Group Chair: Brian Ross **

Principal Investigators: K. Heplar ##
Hillsinger ##
Sam Sharr ##
A. Wertheimer ##
Chuck O'Clair##

Peer Reviewers: P. Mundy ##
State → R. Hillborn##

Outside Experts: Howard Feder**
Will Barber ##
D.Armstrong##

Agency Representatives: D.Eggers##
Brian Allee##
D. McBride##
U. Varanasi, NOAA##
Bill Meehar ##?, USFS
USFS ## ?

** participation confirmed
need to confirm

TECHNICAL WORKSHOP 1-A 3-4 APRIL 1990

GROUP: Birds

PARTICIPANTS BY CATEGORY:

Summary Scientist for Damage Assessment Results: R. Leedy ##

Group Chair: Stan Senner**

Principal Investigators: S. Patten **
?
?

Peer Reviewers: M. Fry ##
G. Ford ##

Outside Experts: N. Snyder**
D. Norton ##

Agency Representatives: T. Rothe, ADFG
USFWS ## ?

** participation confirmed
participation requires confirmation

TECHNICAL WORKSHOP NO. 1-A 3-4- APRIL 1990

GROUP: MAMMALS

PARTICIPANTS BY CATEGORY:

Summary Scientist for Damage Assessment Results: Roy Nowlin, ADFG**

Group Chair: Byron Morris **

Principal Investigators: K. Frost ##
Marilyn Dalheim, NOAA ##

Peer Reviewers: NONE

Outside Experts: J. Burns ##
Will Troyer ##

Agency Representatives: ADFG, Wayne Regelin ##
USFWS, ##
NOAA, S. Zimmerman ##
USFS, Tom Hanley, ##

** participation confirmed
participation not confirmed

B. Ross - EPA 3/30/90 RPG AA

TECHNICAL WORKSHOP (1-A) ON RESTORATION ALTERNATIVES
1-A: ECOLOGICAL RESOURCES

CONFIDENTIAL

April 3-4, 1990
(If necessary, workshop will continue April 5.)

PURPOSE:

To provide technical input to the decision-making process to enable scientifically valid decisions regarding restoration alternatives.

Following the workshop, information discussed will provide the basis for a written report. Note that outputs and objectives listed below refer only to the workshop itself.

OUTPUTS:

1. List of broad scientific guidelines suggested for use in selecting restoration alternatives.

2. Broadly-inclusive matrix of restoration alternatives that warrant further evaluation.

3. Information needs and/or feasibility studies which will be needed to evaluate candidate restoration alternatives.

OBJECTIVES:

1. Review initial damage assessment results with respect to potential restoration alternatives.

2. Describe the state of the art in restoration technology and the feasibility of applying these technologies to Prince William Sound and the Gulf of Alaska.

3. Develop broad scientific guidelines for evaluating restoration technologies.

4. Develop a broadly-inclusive matrix of restoration alternatives (including restoration, replacement, and acquisition of equivalent resources) that warrant further evaluation.

5. Based on broad scientific guidelines, identify information needs and/or feasibility studies necessary to evaluate candidate restoration alternatives.

CONFIDENTIAL 3/30/90

Get RPWG name/address list to hand out

PROPOSED DRAFT AGENDA

Tuesday, April 3

8:30 Restoration Planning Process
Expectations of Workshop

9:00 Fate and Status of Oil

9:30 Summary of Natural Resource Damage Assessment Results

12:00 Break for Lunch

1:00 Work Group Assignments —

1:30 Work Groups convene concurrently
(Coastal Habitat, Fish/Shellfish, Mammals, Birds)

Tasks:

Review state of the art in restoration technology and the feasibility of applying these technologies to Prince William Sound and the Gulf of Alaska.

Develop broad scientific guidelines for evaluating restoration alternatives.

Discuss initial damage assessment results with respect to potential restoration alternatives.

5:00 Break for Dinner

7:00 Session chairs meet to review progress and develop overall scientific guidelines which can be applied across all work groups.

ADD'L HANDOUTS -

ADEC - MICROBIO.

ADF&G - FISH RESULTS

3/30/90

CONFIDENTIAL

Wednesday, April 4

8:00 Plenary Session: Summary of Day 1

8:30 Reconvene Work Groups

Task:

Develop broadly-inclusive matrix of restoration alternatives (including restoration, replacement, and acquisition of equivalent resources) that warrant further evaluation.

12:00 Break for Lunch

1:00 Reconvene Work Groups

Task:

Based on broad scientific guidelines, identify information needs and/or feasibility studies necessary to evaluate candidate restoration alternatives.

4:00 Plenary Session: Summary Reports

5:00 Break for Dinner

7:00 Session chairs meet to discuss work products

Thursday, April 5

8:30 If necessary, key individuals may meet to continue discussion of work products.

TECHNICAL WORKSHOP NO. 1-A 3-4 April 1990

GROUP (mark one): (A) Fish and Shellfish
Coastal Habitats/Air & Water XX
Mammals
Birds

(B) Cultural
Recreation

DRAFT

PARTICIPANTS BY CATEGORY:

Summary Scientist for Damage Assessment Results: D. Gibbons, USFS

Group Chairman: F. Pillifant, ADNR

Principal Investigators: J. Lindstrom, ADEC
D. Wolfe, NOAA
S. Jewett, UAF
R. Highsmith, UAF-?
Schimel, ?
K. Sundberg, ADFG

Peer Reviewers: C. Peterson

"Outside" Experts: H. Sanders, Woods Hole
M. Foster, Moss Landing

Agency Representatives: L. Trasky, ADFG
A. Weiner, ADEC
___?___, ADNR
J. Clark, USEPA
J. Ford, USEP
___?___, USFS
___?___, NPS
R. Slothower, USFWS

[03-29-90]

TECHNICAL WORKSHOP NO. 1-A 3-4 April 1990 (5th, if necessary)

GROUP (mark one): (A) Fish and Shellfish XX
Coastal Habitats/Air & Water
Mammals
Birds

(B) Cultural
Recreation

DRAFT

PARTICIPANTS BY CATEGORY:

Summary Scientist for Damage Assessment Results: C. Meacham, ADFG

Group Chairman: B. Ross, USEPA

Principal Investigators: K. Hepler, ADFG
J. Hillsinger, ADFG
S. Sharr, ADFG
A. Wertheimer, NOAA
C. O'Clair, NOAA
H. Feder, UAF/ADFG

Peer Reviewers: P. Mundy, independent

"Outside" Experts: W. Barber, UAF

Agency Representatives:
D. McBride, ADFG
C. Manen, NOAA
G. Chapman, USEPA
?-B. Meehar, USFS
E. Wilson, USFWS

[03-29-90]

CONFIDENTIAL

TECHNICAL WORKSHOP NO. 1-A 3-4 April 1990 (5th, if necessary)

GROUP (mark one): (A) Fish and Shellfish
Coastal Habitats/Air & Water
Mammals XX
Birds

(B) Cultural
Recreation

DRAFT

PARTICIPANTS BY CATEGORY:

Summary Scientist for Damage Assessment Results: R. Nowlin, ADFG

Group Chairman: R. Nowlin, ADFG

Principal Investigators: K. Frost,ADFG
?-W. Testa, UAF/ADFG
T. DeGange, USFWS
D. Burn, USFWS

Peer Reviewers: ?-D. Siniff, Univ. MN

"Outside" Experts: A. Johnson, retired USFWS

Agency Representatives: W. Regelin, ADFG
R. Gould, USFWS
?-J. Sease, NOAA
M. Habler, USEPA
M. Wheeler, ADEC

[03-29-90]

CONFIDENTIAL

TECHNICAL WORKSHOP NO. 1-A 3-4 April 1990 (5th if necessary)

GROUP (mark one): (A) Fish and Shellfish
Coastal Habitats/Air & Water
Mammals
Birds XX

(B) Cultural
Recreation

DRAFT

PARTICIPANTS BY CATEGORY:

Summary Scientist for Damage Assessment Results: K. Wohl/B. Leedy
USFWS

Group Chairman: S. Senner, ADFG

Principal Investigators: S. Patten, ADFG
L. Denlinger, USFWS
K. Oakley, USFWS
D. Irons, USFWS
K. Kuletz, USFWS
P. Schempf, USFWS (part-time)
D. Nysewander, USFWS "

Peer Reviewers: ?-M. Fry, UC-Davis

"Outside" Experts: N. Snyder, independent (AZ)
P. Mickelson, PWSC (Cordova)

Agency Representatives: T. Rothe or D. Rosenberg, ADFG
P. Gertler, USFWS
J. Parker, USFWS
A. Fairbrother, USEPA

[03-29-90]

TECHNICAL WORKSHOP (1-B) ON RESTORATION ALTERNATIVES
1-B: CULTURAL AND RECREATIONAL RESOURCES

3/30/90

April 5, 1990
(If necessary, workshop will continue April 6.)

CONFIDENTIAL

PURPOSE:

To provide technical input to the decision-making process to enable scientifically valid decisions regarding restoration alternatives.

This workshop (1-B) closely parallels technical workshop 1-A (Ecological Resources). There are, however, important differences. Since there are almost no results to report from the formal Natural Resources Damage Assessment, information on damages will be largely anecdotal. Further, restoration of recreational resources does not require the same degree of technical considerations as restoration of ecological resources. As a result, primary emphasis here will be on development of a matrix of restoration alternatives and identifying information needed to evaluate those alternatives. Primary participants will be agency personnel with management responsibilities.

Following the workshop, information discussed will provide the basis for a written report. Note that outputs and objectives listed below refer only to the workshop itself.

OUTPUTS:

1. List of broad scientific guidelines suggested for use in selecting restoration alternatives.

2. Broadly-inclusive matrix of restoration alternatives that warrant further evaluation.

3. Information needs and/or feasibility studies which will be needed to evaluate candidate restoration alternatives.

OBJECTIVES:

1. Review initial damage assessment results with respect to potential restoration alternatives.

2. Describe the state of the art in restoration technology and the feasibility of applying these technologies to Prince William Sound and the Gulf of Alaska.

3. Develop broad scientific guidelines for evaluating restoration technologies.

4. Develop a broadly-inclusive matrix of restoration alternatives (including restoration, replacement, and acquisition of equivalent resources) that warrant further evaluation.

5. Based on broad scientific guidelines, identify information needs and/or feasibility studies necessary to evaluate candidate restoration alternatives.

3/30/90

PROPOSED DRAFT AGENDA

CONFIDENTIAL

Thursday, April 5

8:30 Restoration Planning Process
Expectations of Workshop

9:00 Fate and Status of Oil

9:30 Summary of Site Damages

10:30 Work Group Assignments

11:00 Work Groups convene concurrently
(Cultural, Recreational)

Tasks:

Review state of the art in restoration technology and the feasibility of applying these tecnhologies to Prince William Sound and the western Gulf of Alaska.

Develop broad guidelines for evaluating restoration alternatives

12:00 Break for Lunch

1:00 Work Groups convene concurrently

Tasks:

Develop broadly-inclusive matrix of restoration alternatives (including restoration, replacement, and acquisition of equivalent resources) that warrant further evaluation.

Based on guidelines, identify information needs and/or feasibility studies necessary to evaluate candidate restoration alternatives.

4:00 Plenary Session: Summary Reports

5:00 Session chairs meet to discuss work products

Friday, April 6 (morning only)

8:30 If necessary, key individuals may meet to continue discussion of work products.

CONFIDENTIAL

TECHNICAL WORKSHOP NO. 1-B 5 April 1990

GROUP (mark one): (A) Fish and Shellfish
Coastal Habitats
Mammals
Birds

(B) Cultural
Recreation XX

DRAFT

PARTICIPANTS BY CATEGORY:

Summary Scientist for Damage Assessment Results: Ann Castellino (sp.-?), NPS
A. Meiners, ADNR

Group Chairman: G. Ahlstrand or S. Rabinowitz, NPS

Principal Investigators: None

Peer Reviewers: None

"Outside" Experts: T. Gasbarro or A. Jubenville, UAF

Agency Representatives: ?-D. Patterson, FWS
A. Meiners, ADNR
K. Kurtz, USFS
J. Maxwell, ADFG
____?____, ADFG (someone from Sport Fish)

CONFIDENTIAL

TECHNICAL WORKSHOP NO. 1

GROUP (mark one): (A) Fish and Shellfish
Coastal Habitats
Mammals
Birds

DRAFT

(B) Cultural XX
Recreation

PARTICIPANTS BY CATEGORY:

Summary Scientist for Damage Assessment Results: R. Shaw, SHPO
?-Jean Schafe, NPS

[redacted]

Group Chairman: ____?____, DNR

Principal Investigators: none

Peer Reviewers: none

"Outside" Experts: R. Thorn, Univ. MS

Agency Representatives: C. Holmes, ADNR
T. Birkadal, NPS
J. Mattson, USFS
C. Diters, USFWS
J. Fall, ADFG (Subsistence Division)

[03-29-90]

3/30/90
CONFIDENTIAL

Principal Investigators:

The following are questions you should take into account as you prepare for the work group discussions at the technical workshop, April 3-4. We are most interested in your thoughts regarding possible restoration activities.

1. What is the importance of the resource to the ecology and/or human services of Prince William Sound and the western Gulf of Alaska?

2. What is the nature, severity, and extent of the damage?

   a. What is the pattern of the damage? (The purpose of this question is to determine how the pattern of damage might influence natural recovery of damaged resources.)

   b. What is planned for the future? How long will it take to determine additional damage?

3. How was the damage determined? (What studies, approaches, etc.)

4. What is known about what caused the damage?

5. How long do you think natural recovery will take? What is the basis of your estimate?

6. What, if any, restoration activities do you think should be undertaken to restore the resource? How long will it take to see results?

Damage Assessment Questions -
Habitat Loss:

1. What is the importance of the resource to the ecology of Prince William Sound?

2. What is the nature of the damage? (acute toxicity, scouring, etc)

3. What is the extent of the areal extent of damage?

4 What is the pattern of the damage?

5. What is the areal extent of undamaged resource?

6. How did you determine the damage?
   a. Direct measurement of lost area
   b. Comparison with undamaged area

7. What caused the damage? (Oil toxicity, cleanup or ?)

8. How long do you think natural recovery will take?

9. What if any Restoration activity do you think should be undertaken to restore the resource?

Population Loss:

1. What is the ecological and/or economic importance of the population?

2. What is the nature of the damage direct mortality, sublethal chronic effect e.g. lesions etc

3. What percentage of the population was effected?

4 How did you determine the damage?
   a. Body counts
   b. Comparison with undamaged areas (If this method what is natural spatial variability in population?)

5. What caused the damage?

6. Based on previous experience how long do you feel natural recovery will take?

7. What, if any restoration activity do you recommend?

Cultural:

1. What was damaged?

2. How did damage occur?

3. What historical or other records were lost?

4. What restoration options do you recommend?

REVISED (3/22/90) DRAFT OUTLINE
EXXON VALDEZ OIL SPILL
RESTORATION REPORT

CONFIDENTIAL

I. INTRODUCTION

A. Purpose and goals of the restoration planning effort

B. Definition of restoration for this report

C. Overview

1. Nature of report (working document, to be updated as needed and as additional information becomes available)
2. Linkage between damage assessment and analysis of restoration of alternatives
3. Linkage between restoration uncertainty and recommendations for candidate 1990 demonstration projects

II. HABITATS AND RESOURCES POTENTIALLY DAMAGED

A. Matrix of Potentially Damaged Resources

1. Review of options for relating habitats to resources: an ecosystem approach focusing on relationship between target resources (fish/shellfish, birds, mammals, benthic), coastal habitat zones, and other factors such as specific location and water quality.
2. Develop matrix of resources (with life stages) and habitat areas.

B. Overview of Damage assessment by population and/or habitat

1. What was damaged and how was it damaged?
2. What is the effect of the damage, is it an acute or chronic effect?
3. What is the significance of damage relative to Prince William Sound and/or the Gulf of Alaska?

III. DEVELOPMENT OF CANDIDATE RESTORATION ALTERNATIVES

A. Basic overview of the State-of-the-Art for High Latitude Ecological Restoration

1. What has been attempted?
2. What has been the past performance?
3. What are the current controversies?

B. Prince William Sound/Gulf of Alaska Restoration Alternatives

1. Specific restoration objectives
2. Criteria and measurable attributes for selecting restoration alternatives. For example:
   a. How fast will this speed natural recovery
   b. Probability of success (uncertainty)
   c. What is the probability or consequence of collateral damage?
   d. What is the life cycle cost? (dollars or manpower)
3. Relative importance of criteria/attributes for selection
4. Range of alternatives considered
   a. Objective of each
   b. Description of what is to be done.
5. Evaluating alternatives based on selection criteria and specific measurable attributes
6. Recommended list of candidate restoration alternatives
7. Synthesis (Discussion of the relative merits of above individual restoration alternatives and possible combinations of alternatives)

IV. CANDIDATE DEMONSTRATION PROJECTS (for each project)

A. Purpose

1. Specific objective or hypothesis to be tested.
2. Define performance evaluation criteria

B. Rationale

1. What information is needed?
2. What is the state-of-the-art?
3. What relevant information will this specific project provide.

C. Approach/Study Design

1. Description of what is to be done
2. Experimental design including proposed statistical analysis for performance measurement. (How will success be measured?)

D. Resources Required

1. Equipment and materials
2. Travel
3. Personnel

CONFIDENTIAL

Questions to Guide Work Group Discussions

STATE OF THE ART:

Note: To the extent possible, discussion should focus on high latitude work.

What is the state of the art in restoration technology for this resource (coastal habitat, fish/shellfish, birds, mammals)?

What has been accomplished?

What has been the past performance of restoration activities?

What are the current trends and controversies?

What is the feasibility of applying these technologies to Prince William Sound and the Gulf of Alaska?

BROAD SCIENTIFIC GUIDELINES:

What broad scientific guidelines should decision-makers consider in evaluating restoration alternatives? (For example, probability of success, extent of collateral damage, cost-effectiveness.)

How can these guidelines be best measured or quantified?

INITIAL DAMAGE ASSESSMENT RESULTS:

See questions provided to principal investigators.

MATRIX OF RESTORATION ALTERNATIVES:

What is the full range of options which can be considered?

For each possible restoration alternative, discuss:

- What is the objective?
- What could be done?
- How does the alternative fit the guidelines?
- What is the possible role of monitoring?
- What is the estimated cost to implement the alternative?

Which alternatives can be combined? What are the potential benefits of such combination?

IDENTIFICATION OF INFORMATION NEEDS AND/OR FEASIBILITY STUDIES:

What scientific uncertainties limit full evaluation of restoration alternatives?

What additional information is necessary to reduce those uncertainties?

What feasibility studies or demonstration projects could be conducted to gather necessary information?

As time permits, further clarify possible feasibility studies by answering the following questions for each possible project:

- What would be the objective of the project?
- How would project performance be evaluated?
- What necessary information would the project gather?
- What would be done?
- What statistical design would be used to measure success?
- What resources would be required (equipment and supplies, travel, personnel)?

RPW
AA

Cleanup Technology Review Workshop
November 28-30, 1989
Anchorage, Alaska

Tuesday, November 28

8:00 - 9:00 a.m.	Registration
9:00 - 9:15 a.m.	Introduction and Welcome John Robinson, NOAA
9:15 - 9:45 a.m.	State of the Shoreline - NOAA Perspective Dr. Jacqui Michel
9:45 - 10:15 a.m.	State of the Shoreline - Alaska Perspective Dr. Erich Gundlach
10:15 - 10:45 a.m.	Morning Break
10:45 - 11:15 a.m.	State of the Shoreline - Exxon Perspective Andy Teal
11:15 - 11:45 a.m.	Natural Processes and Oil Removal: A Historical Perspective Ed Owens, Woodward-Clyde Consultants
11:45 a.m. - 1:20 p.m.	Lunch
1:20 - 1:45 p.m.	Physical Aspects of Cleanup: A Review of Available Technologies Jim O'Brien, OOPS
1:45 - 2:15 p.m.	Physical Technologies - Alaska Perspective Dr. Erich Gundlach
2:15 - 2:45 p.m.	Afternoon Break
2:45 - 3:45 p.m.	Physical Cleaning Techniques Utilized by Exxon Scott Nauman, Exxon Alternate: Bill Spillings, Exxon
3:45 - 4:15 p.m.	The U.S. Coast Guard as a Clearinghouse for New Technologies Dr. Bob Hiltabrand, U.S. Coast Guard Research and Development Center
4:15 - 4:45 p.m.	Physical Technologies - The U.S. Coast Guard and the EXXON VALDEZ Oil Spill Gary Reiter, Commander, U.S. Coast Guard
4:45 p.m.	Adjourn Day 1

Cleanup Technology Review Workshop
November 28-30, 1989
Anchorage, Alaska

Wednesday, November 29

8:30 - 9:00 a.m.	Shoreline Cleanup from the Canadian Perspective Gary Sergy, Environmental Services, Canada
9:00 - 9:30 a.m.	Recovery Following the AMOCO CADIZ Oil Spill - The French Perspective Bernard Fichaut
9:30 - 10:30 a.m.	General Discussion and Questions - Participants
10:30 - 11:00 a.m.	Morning Break
11:00 a.m. - 12:00 noon	Panel Discussion and Summary of Physical Technologies
12:00 - 1:30 p.m.	Lunch
1:30 p.m. - 2:30 p.m.	Chemical Cleaners: Laboratory and Field Experimental Results Bob Fiocco, Exxon
2:30 - 3:00 p.m.	Results of the DEC Protocol Workshop and the Use of Chemical and Biological Technologies: Alex Viteri, State of Alaska DEC Alternate: Amy Kruse
3:00 - 3:30 p.m.	An International Perspective on Chemical Applications Hugh Parker, International Tanker Owners Pollution Federation Ltd.
3:30 - 4:00 p.m.	Evaluation of Chemical Beach Cleaners Merv Fingas, Environment Canada
4:00 p.m.	Adjourn Day 2

Cleanup Technology Review Workshop
November 28-30, 1989
Anchorage, Alaska

Thursday, November 30

8:30 - 9:30 a.m.	General Discussion and Questions on Chemical Technologies - Participants
9:30 - 10:00 a.m.	Panel Discussion and Summary of Chemical Technologies
10:00 - 10:30 a.m.	Morning Break
10:30 - 11:30 a.m.	Results of EPA's Bioremediation Studies Dr. Hap Pritchard, U.S. EPA
11:30 a.m. - 1:00 p.m.	Lunch
1:00 - 2:00 p.m.	Field Application of Bioremediation Techniques Fred Kaiser, Exxon Alternate: Steve Hinton, Exxon
2:00 - 2:30 p.m.	Results of the Summer Survey Program - Microbiological Activity and Oil Removal Dr. John Lindstrom, Alaska DEC
2:30 - 3:00 p.m.	Afternoon Break
3:00 - 4:00 p.m.	General Discussion and Questions on Biological/Bioremediation Technologies) - Participants
4:00 - 5:00 p.m.	Panel Discussion and Summary of Biological/Bioremediation Technologies
5:00 - 5:30 p.m.	Workshop Summary (All Panel Chairs)
5:30 p.m.	Adjourn Workshop

Panel Members, November 28-30 Workshop

Physical (Day 2)

Erich Gundlach, E-Tech, Chairperson
John Bauer, State of Alaska Department of Environmental Conservation (DEC)
Hans Jahns, Exxon
Jack Lamb, Cordova District Fishermen United
Howard Fader*, University of Alaska, Fairbanks
Jim O'Brien, O'Brien Oil Pollution Services
Pamela Bergmann, U.S. Department of the Interior

Chemical (Day 3)

Sharon Christopherson, NOAA, Chairperson
Alex Viteri, State of Alaska DEC
Hans Jahns, Exxon
Royal Nadeau, U.S. EPA
Jeff Short, National Marine Fisheries Service
Bela James, Continental Shelf Associates, Inc.
Gary Reiter, U.S. Coast Guard
Merv Fingas, Environment Canada
Hugh Parker, International Tanker Owners Pollution Federation Ltd.

Biological (Day 3)

Hap Pritchard, U.S. Enviromental Protection Agency (EPA), Chairperson
John Wilkinson, Exxon
Mark Kuwada, State of Alaska Department of Fish and Game
Jacqui Michel, Research Planning Institute
Bela James (or designate), Continental Shelf Associates, Inc.
Jon Lindstrom, State of Alaska DEC
Judy Kitagawa, State of Alaska DEC

*Commitment pending

11-13-89

@ Reg 10

Testing Protocols Workshop

1st FL Fax
Fax @ 0175

Intros

Alex Viteri - Mgr, Oil Spill Treatment Tech Group DEC

Gary Chapman - Newport EPA lab

Amy Kruse - Aquatic Biologist - DEC

Rod Parrish, Jim Clarke, Gulf Breeze

Brian Ross, Arch

Ed Long, OAD, NOAA (Seattle) - Recolonization following oiling - Str. of Juan de Fuca - early work

Rod Tjeerdema Univ. Calif, Santa Cruz - Has worked on toxicity of Corexit 9527 (main approved chem. in Calif.)

Jim Payne, SAIC

John Sainsbury - EPA Reg 10

Howard Feder, IMS, UAF - invert. zool - 4 students in last few years, studies of Port Valdez communities organisms. (Barnacles, Mytilus)

(Recently, limpet work - 3/6 appt + Fuci → limpets spawning in Oct - larvae may be in substrate over winter & emerge in spring.

(X) Peter Chapman, EVS - is working for Exxon doing Rhepoxynius Oyster larval bioassays - can't give results, but generally tracking w/ chem. data. Is looking @ bioassays from "So what" perspective. "So what if oil is still seeping out, is it having an effect?"

- Timeline for devel't is end Dec., for presentation to RRT (Ak)
  Est 2½-3½ MM gal oil studies in substrate
  (To then be implemented by March 15)

Desired endpoint - outline of document for determining how to decide when to approve use of chemicals.

Rod - Need to separate efficacy of oil recovery, from fate & effects

Nov 16, 89

RESTORATION FRAMEWORK

1. IDENTIFY RESOURCES (HABITATS AND ECOSYSTEMS) AT RISK, INCLUDING GEOGRAPHICAL DIFFERENCES

   (A) Identify injured resources

      (1.) Identify resources (habitats and ecosystems) at risk, including geographical differences

2. BACKGROUND LITERATURE SEARCH AND BRAINSTORMING

(1) Identify potential opportunities for restoration in terms of both resource quantity as well as services provided.

a. Restoration techniques used elsewhere

(a) assemble information base (literature search, assemble library, conferences, etc.)

b. Applicability to species or groups identified under (1)

(b) identify initial list of potential restoration alternatives for resources at risk

3. IDENTIFICATION OF INJURED RESOURCE COMPONENTS: DAMAGE ASSESSMENT PROJECT RESULTS AND GEOMAPPING

(B.) Initiate restoration methodology

a. What resources are damaged

(3.) Identify extent of injury (pre- and post- spill) in terms of quantity of and services provided by resource

b. To what extent are resources damaged (by location and pre-spill conditions including causal nexus)

(3.) Identify extent of injury (pre- and post- spill) in terms of quantity of and services provided by resource

c. What are the biological, economic and social effects of the damage to the resource

(2.) Identify biological, economic, and social effects of injury to resources and relationship between resources (e. g., develop matrix)

d. Evaluation of effects of no action

(a.) include No Action-Natural Recovery alternative

e. Evaluation of restoration techniques (includes cost effectiveness)

(3.) Develop and evaluate alternatives for replacement, modification, or restoration of injured resources/habitats or services.

(b.) consider all restoration techniques available in biological and physical sciences, engineering, economics and other management sciences

f. Relationship between resources (timing)

(d) consider short-term, long-term and indirect impacts (economic, social, biological) of each alternative on other resources

g. Opportunities for substituting resources if other restoration techniques are not feasible

(f.) identify opportunities for substituting resources if other ~~restoration~~ techniques are not feasible.

h. Need for monitoring

(VI.) Evaluate Results

(A.) Review monitoring reports

(B.) Determine success, failure, or uncertainty of project results

(C.) Decide on continuation, modification, termination of projects

(D.) Repeat evaluations annually until termination

4. CHOOSE SPECIFIC TECHNIQUES FOR SPECIFIC SITES (SPECIES) OR APPROPRIATE ALTERNATIVES SUCH AS EQUIVALENT RESOURCES (MIGHT BE PILOT PROJECTS)

(2.) Identify and conduct selected pilot projects to determine feasibility of potential restoration methods

(g.) describe alternatives in sufficient detail to evaluate cost-effectiveness

(4.) Determine cost and time necessary to implement each alternative

(a.) develop cost and the schedule for expenditures

(b.) utilize discount rates in accordance with 43 CFR 11.84 (e)

(c.) calculate diminution of use values in accordance with 43 CFR 11.84 (g)

(5.) Recommend restoration alternatives for injured resources

5. IDENTIFICATION AND EVALUATION OF PROJECTS BASED ON EXTENT OF DAMAGE, FEASIBILITY, PROJECTED COST, AND ENVIRONMENTAL AND SOCIAL BENEFIT

(6.) Prepare Restoration Methodology Plan

(7.) Conduct internal peer and legal review of Restoration Methodology Plan

(8.) Conduct review of Restoration Methodology Plan to include potentially responsible parties, natural resource trustees, other affected federal or state agencies or Indian tribes and any other interested members of the public

(II.) Alternative Selection

(A.) Catalog, consider and take appropriate action on comments

(B.) Select methods to be used for replacing, restoring or acquiring equivalent lost resources/services

(C.) Prepare Report of Assessment

(1.) Compile injury determination documentation

(2.) Compile injury quantification documentation

(3.) Prepare damage determination

(4.) Include restoration methodology plan

(5.) Include all comments and responses to both the damage assessment plan and restoration methodology plan

6. DEVELOPMENT OF DETAILED PROJECT PLANS

III. Present Natural Resource Damage Claim

IV. Develop Final Restoration Plan

- A. Develop detailed restoration/replacement elements
- B. Conduct peer review
- C. Finalize Plan

7. IMPLEMENTATION

Ⓥ Implement Plans

- Ⓐ Establish implementation schedule for each plan element
- Ⓑ Fund and manage restoration contracts
- Ⓒ Monitor progress of restoration

Additional items identified in expanded version

- c. determine consistency with state/federal law
- e. consider constraints to federal land acquisition

RESTORATION FRAMEWORK

1. IDENTIFY RESOURCES (HABITATS AND ECOSYSTEMS) AT RISK, INCLUDING GEOGRAPHICAL DIFFERENCES — Apr 89
2. BACKGROUND LITERATURE SEARCH AND BRAINSTORMING — Dec 88 - Feb 91
   a. Restoration techniques used elsewhere
   b. Applicability to species or groups identified under (1)
3. IDENTIFICATION OF INJURED RESOURCE COMPONENTS: DAMAGE ASSESSMENT PROJECT RESULTS AND GEOMAPPING
   a. What resources are damaged
   b. To what extent are resources damaged (by location and pre-spill conditions including causal nexus) — Oct. 89 - Dec. 91
   c. What are the biological, economic and social effects of the damage to the resource
   d. Evaluation of effects of no action
   e. Evaluation of restoration techniques (includes cost effectiveness)
   f. Relationship between resources (timing) — Dec. 89 - Feb 91
   g. Opportunities for substituting resources if other restoration techniques are not feasible
   h. Need for monitoring
4. CHOOSE SPECIFIC TECHNIQUES FOR SPECIFIC SITES (SPECIES) OR APPROPRIATE ALTERNATIVES SUCH AS EQUIVALENT RESOURCES (MIGHT BE PILOT PROJECTS) — Feb. 91 - Feb. 91
5. IDENTIFICATION AND EVALUATION OF PROJECTS BASED ON EXTENT OF DAMAGE, FEASIBILITY, PROJECTED COST, AND ENVIRONMENTAL AND SOCIAL BENEFIT — Nov. 91 - Mar. 92
6. DEVELOPMENT OF DETAILED PROJECT PLANS — contingent on Funding
7. IMPLEMENTATION — contingent on Funding

PRELIMINARY RESTORATION TIMELINE

I. A.
1. April, 89
2. October, 89 - March, 90
3. March, 89 - December, 91

B.
1. December, 89 - February, 91
2. February, 90 - February, 91
3. December, 89 - February, 91
4. December, 89 - February, 91
5. February, 91
6. March, 91 - July, 91
7. July, 91
8. August, 91

II. A. November, 91

B. December, 91

C. January, 92 - March, 92

III. March 24, 1992

IV. Contingent on Funding

V. - - -

VI. - - -

Range 20 ~ GS-13 w/ COLA
22 ~ GS-13 + ~~$3~~ $2K
24
25

ALASKA OIL SPILL BIOREMEDIATION PROJECT
Status Report
November 27,1989

EPA's Alaska Oil Spill Bioremediation Project was initiated in the aftermath of the March 24, 1989, EXXON VALDEZ oil spill. The objective of the project is to demonstrate a method of enhancing the cleanup of oil contaminated shorelines by adding nutrients to stimulate the growth of naturally occurring oil degrading microorganisms. The project is managed by EPA's Office of Research and Development with cooperation and support from the Exxon Company USA under the authority of the Federal Technology Transfer Act.

After planning, mobilizing staff and facilities, and selecting test sites in Prince William Sound, Alaska, nutrient application began on June 8, 1989. Nitrogen and phosphorous nutrients were added to the oil contaminated shoreline sites in the form of oleophilic, slow release, water soluble fertilizers. The oleophilic fertilizer Inipol EAP 22 is a liquid which adheres to the oil once it is applied to the beaches. It is sprayed onto the test plots from a hand-pumped, backpack sprayer. The slow release fertilizers tested were commercially available briquettes and granules. Netbags of briquettes were placed on the shoreline surface in a designated pattern and the granules were broadcast on the beaches with whirlybird-type spreaders. In another test, inorganic nitrogen and phosphorous were added to seawater and applied to the beaches at low tide using sprinklers.

Test plots were established in two locations on Knight Island in Prince William Sound, Snug Harbor and Passage Cove. The shoreline surfaces were both mixed sand and gravel and cobble. Beach materials were sampled both before and after application of the fertilizers and results were compared to untreated control beaches. Samples were processed to determine changes in the quantity and composition of oil residues following fertilizer application. Changes in microbial activity and abundance were also examined. Monitoring for potentially adverse environmental side effects was also performed. These included measurements of algae growth (eutrophication) due to nutrient buildup in seawater adjacent to the treated beaches and toxicity of the fertilizer to marine species. In addition to the field tests, laboratory and microcosm experiments were conducted to examine nutrient-enhanced oil degradation under more controlled conditions.

Data from the tests were collected and are being processed and analyzed. Although the evaluation is not complete, the following general conclusions can be drawn:

* Visual inspection of beaches treated with both the inorganic nutrients (using the sprinkler system) and the oleophilic fertilizer showed that oil was removed from the treated shorelines.

* No oil slicks were observed in the seawater following proper application of the fertilizers.

* Samples of the oil taken from the surfaces of the beaches at the time the oil was visually beginning to disappear showed changes in composition indicating extensive biodegradation.

* Laboratory studies confirm that both the oleophilic fertilizer and inorganic nutrients enhanced the extent and rate of oil degradation relative to untreated shoreline material.

* The laboratory tests have also shown that the mechanism of action of the oleophilic fertilizer is biodegradation and not the chemical removal or dispersal of oil.

* Oil biodegradation, as observed in the laboratory studies, is accompanied by significant changes in the physical consistency of the oil, producing a flaky, particulate material consisting of degraded oil, degradation products and microbial cells. This process commences after approximately one to two weeks following incubation.

* Addition of fertilizer to oiled shorelines did not cause an increase in planktonic algae or bacteria or measurable nutrient enrichment in adjacent embayments.

* The concentration at which the oleophilic fertilizer is toxic to various marine species has been established. Toxicity information on ammonia was obtained from the published literature. Toxicity to the most sensitive marine species (oyster larvae) was measured in seawater collected directly over the beaches treated with a combination of the oleophilic and water soluble fertilizer. A 50% dilution of this seawater which would occur through tidal mixing within a few feet of the treated shoreline would reduce this toxicity to background levels.

Statistical analyses of the results of the field studies are still underway. These analyses are confounded by several factors including: (1) the high rate of natural oil biodegradation due to significant natural concentration of nutrients in seawater and freshwater, (2) the high variability in oil concentration and distribution in beach material, (3) the extensive degradation of pristane and phytane which are normally used as conserved internal standards to measure changes in oil composition, (4) and the inability to detect increases in numbers of microorganisms following fertilizer application because of the high number of naturally occurring oil degrading microorganisms. A thorough statistical trend analysis is required before we can fully verify the above conclusions, and statistically demonstrate that fertilizer addition enhanced the natural biodegradation processes.

11.28

J. Michel –

E. facing shorelines - would expect most change, as a result of Early Nov. storm (winds >30 mph.

SEPT/OCT/NOV SURVEYS

La Touche - below ~ 10 cm surface veneer of cobble (that was cleaner after storm) - persistent oil saturation in poorly-sorted layer below - also, cobbles, even if well-sorted, @ > 20 cm were still heavily oil coated.

Pt Helen (Stn 1 NOAA) - Poorly sorted substrate - little change in oiling was @ surface. (as would expect from ↑)

Sleepy Bay (Stn 18) (~100 m from stream mouth) - Surface pebbles cleaner, but still heavily oiled beneath.

Penguin Bay, S. tip (Stn D-17) - little Δ. (Offshore, but a small pocket beach)

Other sheltered sites showed little/no Δ in degree of oiling, surface or depth

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(NOAA using fresh PB Crude as reference oil in all chemical comparisons)

Rich Gunlach –

Re: Amoco Cadiz – oiled sand was deposited @ high spring tide, as not reworked by subsequent storms for 1st 5 years, still a band beneath surface. (Note – sandy gravel shoreline).

+ Spill in Patagonia

On PWS cobble shoreline – noted that the lower beachface substrate (surface) is less mobile than the upper face, where algal mats build up.

DEC has 22 sites in PWS – (visits diving survey – collecting sediments too)
~10 sites in Homer + Kodiak –

Aerial surveys are showing oil coming off shores this winter – no terrible storms this winter.

257-1312

2

[Should have Erich address Restn workgroup re: Amoco Cadiz, Patagonia, + other spill]

Andy Teal - gave status.

Ed Owens — missed - @ 5th + E

Jim O'Brien — methods, out of shoreline manual.

Erich G. — Amoco C. — Guidelines.

- Where to go next — based on walking survey, where are vols. of remaining oil largest.
- Recovery is emphasis, + activity should not increase the persistence as occurred in France, where heavy equip. was used.
- Don't do more biol damage than would occur naturally.
- Removal of asphalt pavement (in high-use areas).

Options — Surface removal + replacement can be considered, but severe.

Subsurface — Hot water injection

— removal + replacement.

Limited list...

Nelson/Spilleys - Eppley's Physical techniques

9 @ 9.50

= 85.50

7:15 -
7:30

Dick Chuck Jim ( )
Brian Conrad Royal
Carol Dave
→ Mgmt Team ?