CONFIDENTIAL

STATE/FEDERAL NATURAL RESOURCE DAMAGE ASSESSMENT
DETAILED STUDY PLAN

Project Title:	INJURY TO SALMON SPAWNING AREAS IN PRINCE WILLIAM SOUND
Study ID Number:	Fish/Shellfish Study Number 1
Lead Agency:	State of Alaska, ADF&G; Commercial Fish Division
Cooperating Agency(ies):	Federal: USFS State: DNR
Principal Investigator:	Sam Sharr, Fishery Biologist
Assisting Personnel:	
Date Submitted:	October 11, 1989

	Signature	Date
Principal Investigator:		
Supervisor:	C Meacham	10-11-89
Consulting Biometrician:	Brian L. Bue	Oct. 11, 1989
OSIAR Senior Biometrician:		
OSIAR Program Manager:		
OSIAR Director:		

INTRODUCTION

The project is designed to evaluate possible changes in numbers and distribution of pink and chum salmon spawning in intertidal and upstream areas relative to oil contamination from the Exxon Valdez spill. A significant amount of pink and chum salmon spawning in Prince William Sound occurs in intertidal areas (up to 75% in some years). These intertidal areas are extremely susceptible to marine contaminants and may adversely affect spawner distribution and success in Prince William Sound.

The Alaska Department of Fish and Game performed spawning ground surveys of the major anadromous spawning streams in Prince William Sound from the late 1950's through 1985. Approximately 116 streams were surveyed at least once annually during the peak of spawning. Program funding was severely curtailed in 1987 and 1988; consequently, only 58 streams have been walked annually in recent years. This study will again expand the number of spawning streams surveyed in order to document the effect of the oil spill on pink and chum salmon intertidal spawning. The study will determine the post oil spill distribution of spawning, help in the evaluation of streams for inclusion in the Injury to Salmon Eggs and Pre-emergent Fry in Prince William Sound study (OSIAR study F/S 2) and the Salmon Coded-wire Tag Studies in Prince William Sound (OSIAR study F/S 3), and provide an atlas of aerial photographs and detailed maps for important spawning sites.

OBJECTIVES

1. Determine the presence or absence of oil on intertidal habitat used by spawning salmon.

2. Document the physical extent of oil distribution on intertidal spawning areas.

3. Estimate the numbers of spawning salmon by species within standardized intertidal and upstream zones for 140 streams in Prince William Sound.

4. Produce a catalogue of aerial photographs and detailed maps of spawner distribution for each stream sampled.

5. Identify potential alternative methods and strategies for restoration of lost use, populations, or habitat where injury is identified.

METHODS/DATA ANALYSIS

Study Design

Three crews of two people each will perform foot surveys of intertidal and upstream portions for 140 major pink and chum salmon spawning streams. Each stream will be surveyed three times at approximately two week intervals during the spawning season.

Streams to be surveyed will be selected according to the following criteria:

1. The stream is included in the aerial survey program.
2. All streams in the pink and chum salmon egg deposition and pre-emergent fry projects will be included.
3. Streams enumerated in prior spawning ground foot survey programs will be included.
4. Streams utilized by salmon stocks from the early, middle and late run stocks will be included.

During each stream survey the following data will be recorded:

1. Anadromous stream number and name (if available);
2. Latitude and longitude of the stream mouth;
3. Date and time (24 hour military time);
4. Tide stage;
5. Observer names;
6. Counts of live and dead salmon by species and tide zone (0.0-1.8 m, 1.8-2.4 m, 2.4-3.0 m, and 3.0-3.7 m above mean low water and upstream);
7. Weather and comments on visibility, lighting, and other survey conditions.

All data will be recorded on pre-printed mylar data sheets which will overlay a map of the stream. Stream maps will be drawn from three sets of aerial photographs prior to the survey. Maps will be improved and modified during the survey to show the location of tide zones, stakes and key land marks for identifying zones, spawner distribution within each zone, and the upstream limit of spawning. Particular attention will be given to spawner density and distribution observations for the 46 streams to be sampled during the Pink and Chum Salmon Pre-emergent Fry Sampling project (OSIAR study F/S 2).

Streams will be surveyed in a systematic order around Prince William Sound. The ADF&G R/V Montague will house and support three survey crews of two people each. Each two man crew will use a skiff for transport between the R/V Montague and the survey streams.

On the first circuit of Prince William Sound one crew of two people will measure and mark tide levels at each stream to be enumerated. The stream bed location of tide levels 1.8, 2.4, 3.0, and 3.7 meters above mean low water will be determined using a professional grade surveyors level and will be marked with colored coded surveyors stakes (orange, blue, green, and white, respectively). The bench mark for measuring the tide levels at each stream will be based on the tide level at the time of the survey. Location and time specific tide levels

will be obtained from a commercial tide stage computer software package run on a microcomputer aboard the R/V Montague. The tide level will be relayed to the shore based crew via radio.

During the first survey circuit, a composite sample of mussels (Mytilus sp.) will be collected at the mouth of each stream for hydrocarbon analysis. Results of the analysis will be used to document the level of oil impact sustained by the stream. Each sample will consist of enough mussels to provide 10 grams of tissue (approximately 30 mussels) for analysis. The mussels will be collected 0-2 m above mean low water in the immediate vicinity of each stream mouth and will be collected above water to avoid contamination by hydrocarbons on the water surface. Samples from each stream will be stored in separate glass jars with teflon lined lids. Each jar and lid will be pre-rinsed three times with dicloromethane, dried, and kept in locked storage prior to use. Care will be taken not to contaminate the jar or lid prior to or during sampling. Each sample jar will be neatly labeled with indelible ink or pencil on "Rite-In-The-Rain" paper. The label will bear a sample number, sampling date and time, tide stage, species, the ADF&G stream name and number, the stream mouth latitude and longitude, and the sampler name(s). The samples will be stored in the freezer aboard the R/V Montague until the boat reaches port. At that time they will be moved to locked shore based freezer storage. Appropriate chain of custody forms will accompany each sample.

Counts of live and dead salmon will be made for the five tide zones (the intertidal zones < 1.8 m, 1.8-2.4 m, 2.4-3.0 m, 3.0-3.7 m above mean low water and the upstream zone) from the 1.8 m tide level to the limit of upstream spawning on all 140 streams for all three circuits. Tide stage will be monitored continuously and survey times and direction will be adjusted accordingly. If the tide stage at the time of the walk is at or below the 1.8 m level the stream walk will begin at the mouth of the stream and progress upstream. The mouth or downstream limit of the stream will be defined as the point where a clearly recognizable stream channel disappears or is submerged by salt water. Fish seen below the downstream limit will be included in an estimate of fish off the stream mouth and noted as a comment on the data form. If the intertidal portions of the stream above the 1.8 m level are submerged when the walk begins, the crew will proceed to the upstream limit of the walk, walk downstream, and coincide the end of the walk with the time predicted for the tide to at or below the 1.8 m level. The upstream limit of a walk will be determined by the presence of natural barriers to fish passage (ie. waterfalls), by the end of the stream, or by the upstream limit of spawning. The upstream limit of spawning will be marked on U.S. Geological Survey color aerial photos of each stream following each survey.

Count of live and dead fish on each stream will be done by a crew of two technicians or biologists. For streams of moderate size and having a single channel the crew members will walk together but independently count live fish. Each member will tally their count on a mechanical tallywhacker. At the end of each zone the two crew members will compare counts. If both are comfortable with their counts and the difference between the two is less than 10% of the lower of the two counts for the zone, the two counts will be averaged. If the two counts differ by more than 10% of the lower of the two counts both surveyors will re-count the zone until their counts differ by 10% or less. Upstream counts in a single channel will be similarly compared at convenient stopping points (ie. log jams or other clear counting delineators). To avoid confusion with counts

of live fish, counts of dead fish will be recorded on the return leg of the stream walk. For large braided or branched streams duplicate counting and comparisons will not be possible and each crew member will count separate channels or upstream forks. To avoid perpetuating counting biases within a counting crew, personnel will be rotated between crews daily.

Data Analysis

Total salmon escapement to each stream will be estimated using the counts form the three foot surveys and streamlife data. Estimation methods will be similar to those used by Johnson and Barrett (1988) and streamlife estimates will come from past studies in Prince William Sound (McCurdy 1984, Helle 1961).

Streams will be divided into 4-5 categories based on levels of hydrocarbon contamination (as determined from visual observations and hydrocarbon level in mussel tissues). Counts of salmon by species, stream zone, and stream will be assigned to one of the hydrocarbon categories. Categorical data analysis techniques such as log linear models using chi-square statistics will be used to compare differences in spawning level for these streams, and relate these disruptions to the level of hydrocarbon contamination. Counts and spawner distribution data will also be compared with historical stream survey data and related to the level of hydrocarbon impact.

Statistics that will be estimated include:

1. Counts of spawning salmon by anadromous stream code, date, time, and tide stage will be used to estimate percent usage by stream zone.
2. Total spawning escapement by species for each stream.

SCHEDULES AND REPORTS

Date(s)	Activity
July 1989	Replicate surveys of 140 streams.
Aug. - Sept. 1989	Laboratory work and data entry.
Oct - Nov. 1989	Data analysis.
January 1989	Draft report on impacts of oil on salmon spawning distribution in Prince William Sound.
March 1 1990	Prepare final study plan for the 1990 field season.
July 1990	Replicate surveys of 100 streams.

PROJECT BUDGET [1]

Line Item	Category	Budget
100	Personnel Services	$ 52,200
200	Travel	$ 5,500
300	Contractual	$ 58,100
400	Commodities	$ 17,900
500	Equipment	$ 11,100
700	Grants	$ 0
Total		$144,800

[1] Budget is for all activities performed from March 27, 1989 to February 28, 1990.

FUNDED PERSONNEL

Class	PCN	Name	PFT_mm	SFT_mm
FB II	11-		0	
FB I	11-			6
FT III	11-			2
FT II	11-			4
FT I	11-			2

LITERATURE CITED

Helle, J.H., R.S. Williamson, and J.E. Bailey. 1961. Intertidal ecology and life history of pink salmon at Olsen Creek, Prince William Sound, Alaska. U.S. Fish and Wildlife Service S.S.R. -Fisheries No. 483.

Johnson, B.A., and B. Barrett. 1988. Estimation of salmon escapement based on stream survey data. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report No. 4K88-35, Kodiak.

McCurdy, M.L. 1984. Eshamy district pink salmon streamlife study, 1984. Alaska Department of Fish and Game, Division of Commercial Fisheries, Prince William Sound Area Data Report, 84-18, Cordova.