HARDY CREEK CHUM SALMON SPAWNING HABITAT IMPROVEMENT PROJECT 5507300

SHORT DESCRIPTION:
Examine the extent of changes in the channel profile, bed composition and spawning habitat of Hardy Creek resulting from sediment transport and deposition.

SPONSOR/CONTRACTOR: USFWS
US. FISH AND WILDLIFE SERVICE
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GOALS

GENERAL:
Supports a healthy Columbia basin, Maintains biological diversity, Maintains genetic integrity, Increases run sizes or populations, Provides needed habitat protection, Adaptive management (research or M&E)

ANADROMOUS FISH:
Research, M&E

NPPC PROGRAM MEASURE:
No response

TARGET STOCK	LIFE STAGE	MGMT CODE (see below)
Chum salmon	Adult, egg, alevin, fry	N,P,W
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AFFECTED STOCK	BENEFIT OR DETRIMENT
Chinook Salmon	Beneficial
Coho Salmon	Beneficial

BACKGROUND

STREAM AREA AFFECTED

Stream name:
Hardy Creek

Subbasin:
Hardy Creek

Stream miles affected:
2

Land ownership:
public

Hydro project mitigated:
Bonneville

Habitat types:
Spawning

HISTORY:
This project was approved for 1997, but funding was deferred until 1998 because of unforeseen flood events. Emergency restoration activities during late FY 96 included bank stabilization, removal of over 200 yards of silt deposits, and structural improvements for fish habitat in over 1800 feet of creek. Monies from the refuge have allowed us to purchase most of the equipment necessary for the project, including traps and sampling equipment.

BIOLOGICAL RESULTS ACHIEVED:
Too soon to measure any biological outcome.

PURPOSE AND METHODS

SPECIFIC MEASUREABLE OBJECTIVES:

1. Chum and coho escapement
2. Egg to smolt survival
3. Outmigration timing and abundance
4. Temporal changes in physical habitat characteristics
5. Impact of non-native vegetation, reed canarygrass (Phalaris arundinacea L.), encroachment on spawning grounds
6. Determiniation of sediment load and point source locations
7. Intergravel dissolved oxygen

CRITICAL UNCERTAINTIES:

It is unknown where the sediment in lower Hardy Creek is coming from and why it is not flushing out of the system. The effects of reed canarygrass on sediment transport are unknown. If sediment is removed from spawning habitat areas, natural production of chum salmon will increase survival at the egg to fry lifestage.

BIOLOGICAL NEED:

Historically, the Columbia River supported populations of chum salmon above Bonneville Dam as far upstream as the Walla Walla River (Phelps et al. 1995). Those spawning areas have been inundated by dam construction and at present, fewer than 200 chum salmon pass Bonneville Dam each year. Hardy Creek is one of only three populations of chum slamon being monitored in the lower Columbia River basin. These populations are listed as stocks considered at moderate risk of extinction. (Nehlsen et al. 1991). In a preliminary decision of the status of chum salmon from Washington, Oregon, and California, the National Marine Fisheries Service's Biological Review Team concluded that these populations are "likely to become endangered throughout a significant portion of their range in the foreseeable future." Future establishment of reed canarygrass in the channel is reducing velocities and trapping sediments. Preliminary assessments indicate that accumulations of fine sediment is threatening spawning habitat in Hardy Creek.

The Service has monitored salmon escapement in Hardy Creek since 1984. Since that time, increase in the amount of reed canarygrass and sedimentation has compromised the quality of spawning habitat in much of the creek.

HYPOTHESIS TO BE TESTED:

Spawning habitat is disappearing in Hardy Creek due to increased sedimentation.Removal of reed canarygrass from the spawning habitat will increase flushing flows and remove some of the sediment by reducing streambed roughness and resistance.

METHODS:

BIOLOGICAL MONITORING

Annual spawning ground surveys and adult escapement estimates will be made each year. Depending upon the number of returning adults, a maximum of two redds will be sampled for egg viability and or capped with emergent traps. Since chum are being considered for listing as endangered, numbers of fish handled will be kept to a minimum. An outmigration trap will be placed in Hardy Creek to estimate outmigration numbers of chum if water levels in Hardy Creek allow. Intergravel dissolved oxygen levels will be measured with a metal standpipe inserted 8 to 10 inches deep in specified redds. Using a peristaltic pump, water will be drawn out of the redd and dissolved oxygen concentration will be measured weekly until emergence using an orion dissolved oxygen meter.

STREAM SURVEY

A representative reach in each segment of Hardy Creek will be identified and surveyed. The Division of Engineering, U.S. Fish and Wildlife Service will complete the surveying using a total station (electronic distance meter and transit). Five cross section profiles will be established in each reach. Bed and bank materials at all survey points will be described and sampled for particle size distribution. Particle size analysis will be done using dry sieving (Gordon et al., 1992). Information from each profile will be used to calculate bank slope, bankfull width and depth. Maps will be made of each reach by extending a tape down the longitudinal axis of the stream and measuring the distance to banks, thalweg, and other features at right angles to the tape. The placement of the tape will be tied into a reference point using the total station. Maps will include a description of spawning gravels, pools, and riffles, thalweg, banks, bars, bedrock outcrops, woody debris, and riparian and aquatic vegetation, including

the extent of invasion of reed canarygrass. Reaches and cross-sections will be surveyed and mapped annually for 2 years. A paired t-test will beused to compare elevational differences from the profile surveys. Photographs from fixed points will also be used to identify changes inthe stream channel.

A gaging station will be established by USFWS in a stream segment not influenced by any backwater effects during high flows. A Marsh McBirney current meter and wading rod will be used to measure velocity and cross sectional area. Stream stage will be read from a staff gauge placed at the station and a stage-discharge relationship will be established. When the creek is not wadeable during high flows, discharge will be estimated using survey information and Manning's equation (Gordon et al., 1992).

SUSPENDED SEDIMENT
To identify sources and sinks of sediments, samples of suspended sediment will be collected at three sites: 1) upstream of the bridge on the upper study segment, 2) the small tributary just downstream of the pond, and 3) the lower study segment of the creek. Flow and suspended sediment data will permit a mass balance analysis of the amount of sediment entering, leaving and stored in Hardy Creek. Suspended sediment samples will be collected daily during representative periods of high flow and weekly throughout an entire year. Suspended sediment concentrations are extremely variable during high flows and the more frequent sampling during these periods is necessary to identify error margins. Sampling and reconnaissance will be conducted further upstream to identify any obvious sources of sediment (landslides, logging sites, culvert failures). Suspended sediment concentrations will be collected with a depth-integrating suspended sediment sampler (US DH-48 or equivalent). Concentrations will be determined by weighing the mass of sediment retained by a glass fiber filter from a known volume of sample (APHA, 1989).

FLUSHING FLOWS
For the portion of lower Hardy Creek that has become filled with fine sediment, it is important to know the flushing flows required to remove sediments from the channel bed surface. Knowing the water depth and channel gradient, and assuming values for sediment and fluid densities and viscosity, Shield's function (1936) can be used to estimate the mobility of different sizes of particles. These estimates can be used to help evaluate management alternatives for reducing sediment deposition.

HABITAT IMPROVEMENT IMPLEMENTATION MEASURES
Strategies including the removal of reed canarygrass, and/or the placement of sediment traps upstream of the spawning areas to reduce sedimentation will be implemented and evaluated as to their effectiveness.

PLANNED ACTIVITIES

SCHEDULE:

OUTCOMES, MONITORING AND EVALUATION

SUMMARY OF EXPECTED OUTCOMES

Present utilization and convservation potential of target population or area:
Implementation of management strategies, (i.e. removal of reed canarygrass and installation of sediment traps) will increase the overall spawning habitat available to salmon in Hardy Creek and result in the increased survival and production of chum salmon. The chum population in Hardy Creek will increase as more suitable spawning habitat becomes available to them.

MONITORING APPROACH

Provisions to monitor population status or habitat quality:
Egg to fry survival and adult escapement will be monitored throughout the study (see METHODS). If sediment traps and/or removal of canarygrass are warranted, 2 more years of monitoring will take place. This will include sediment sampling and discharge measurements to evaluate these activities.

RELATIONSHIPS

OPPORTUNITIES FOR COOPERATION:
US. Geological Survey, Washington Department of Fish and Wildlife, Lower Columbia Fish Enhancement Group

COSTS AND FTE

FUTURE FUNDING NEEDS: **PAST OBLIGATIONS (incl. 1997 if done):**

FY	$ NEED	% PLAN	% IMPLEMENT	% O AND M
1998	$137,880		94%	6%
1999	$102,169		98%	2%
2000	$102,169		98%	2%
2001	$102,169		98%	2%

OTHER NON-FINANCIAL SUPPORTERS:
Washington Department of Fish and Wildlife, Lower Columbia Fish Enhancement Group

1997 OVERHEAD PERCENT: 33%

HOW DOES PERCENTAGE APPLY TO DIRECT COSTS:
all