

# **Restoration Effectiveness Monitoring Plan for the Western Oregon Stream Project**

v. 2.0

**Monitoring through June 2008**

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# Introduction

## Purpose

The purpose of this plan is to outline the continued monitoring of stream restoration work completed as part of the Western Oregon Stream Project. This revised plan has been developed out of a need to monitor a subset of restoration projects from all areas of the Western Oregon Stream Project (Figure 1). This plan encompasses the monitoring period of January 2000 to June 2008, and is a continuation of monitoring activities that were started in the fall of 1995 on the North Coast and continued into the Mid-coast in 1996 and 1997. Much of this plan is a compilation of the original North Coast and Mid-Coast monitoring plans (Hodgson 1996, Thom and Moore 1995). Modifications have been made to better define the monitoring activities, increase efficiency, and strengthen the scientific credibility of the project.

Four main questions will be answered as a result of the monitoring activities outlined in this plan. They are:

- How much stream restoration work has been completed?
- Is the stream restoration work that is completed leading to improved habitat conditions for salmonids in the treated stream reaches?
- What fish are utilizing the restored habitats?
- What are the trends in juvenile abundance in the restored stream reaches?

The monitoring data will be used to improve restoration techniques as well as provide baseline information for longer term monitoring of the projects. The moderate intensity of this monitoring plan will allow the quantitative analysis of habitat change in the project areas over time. Ongoing monitoring of the restoration projects has been conducted since the inception of the North Coast Stream Project in 1995 (Rowe and Spangler 1997, Thom 1997). This plan continues that monitoring into the future and links the monitoring of restoration effectiveness with the overall habitat and fish monitoring being conducted as part of the Oregon Plan for Salmon and Watersheds (OPSW). This monitoring will provide a consistent and stable framework from which to evaluate restoration effectiveness.

Juvenile salmonid snorkel surveys will provide a general indicator of direct project benefits and fish use of the enhanced stream reaches. Late winter snorkeling will be used to ascertain the importance of the projects in providing winter habitat for juvenile coho salmon. The observations of fish use of constructed habitats will also be used to further improve project design. Due to the many factors that affect fish survival, any quantitative changes in fish abundance will not be directly attributable to the restoration projects.

## **Project History**

Stream restoration activities funded through the Oregon Wildlife Heritage Foundation (OWHF), Oregon Department of Fish and Wildlife (ODFW), Oregon Department of Forestry (ODF), Oregon Watershed Enhancement Board (OWEB), U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), and private landowners have been carried out in coastal Oregon streams since 1995. These projects originally targeted coho salmon (*Oncorhynchus kisutch*) habitat in the North Coast and have since expanded throughout anadromous salmonid habitat in Western Oregon. Restoration in the Willamette River basin (upstream of Willamette Falls) and coastal streams south of the Rogue River have focused primarily on steelhead (*Oncorhynchus mykiss*) and chinook salmon (*Oncorhynchus tshawytscha*) habitats. The following types of activities have been conducted:

- In-stream wood placements
- In-stream boulder placements
- Construction of off channel ponds
- Culvert replacement for fish passage improvement
- Culvert replacement for flow improvement and sediment reduction
- Riparian enhancements for conifer re-generation
- Riparian enhancements for bank stabilization and vegetation generation
- Fencing and livestock management to protect riparian areas.
- Barrier Removals

Stream habitat restoration projects that have been completed typically have had two major goals. In the short term (2-30yrs.) projects were intended to increase the quantity and quality of habitat for juvenile salmonids, specifically coho salmon. In the long term (10 – 100 yr) they are intended to restore the physical and biological processes that create and maintain salmon habitat. As the project has progressed over time, short-term goals have focused on increasing habitat for all anadromous salmonids.

From 1995-1999 over \$3,000,000 has been spent on coastal stream restoration activities (Rod Brobeck, pers. comm.). This work has also involved the time of eight full time habitat biologists and numerous individuals from the timber industry, the OWHF, ODFW, ODF and private landowners.

## **Approach**

Only those projects designed and carried out as part of the North Coast Stream Project or Mid- Coast Habitat Restoration Project were monitored under this plan from 1995 - 1998. The Umpqua was added in the winter of 1999 and the current version expands the plan to all project areas. This plan focuses on the monitoring of physical and biological attributes resulting from in-stream placement of woody debris, boulders, and construction of off channel ponds. This monitoring will consist of evaluating a network of treated areas for change over time and comparing this change to a subset of streams sampled as

part of stream habitat monitoring being conducted under the OPSW. Culvert replacement projects will also be monitored for fish presence. A subset of riparian enhancement projects will be monitored using photo records, plantation drawings, and sampling a subset of plots for survival for 2 years.

Due to the large number of projects completed every year, it will not be possible to intensively monitor all projects that are completed. The approach used in this program is to provide a basic level of documentation on all projects and then to monitor consistent, repeatable and measurable attributes that are the key indicators of stream health and salmonid abundance within a subset of the projects that are completed. These key variables will be monitored over different time scales using a pulsed monitoring strategy as outlined by Bryant (1995). While the work described in this plan only continues until 2008, the data gathered in this initial intensive phase will serve as a foundation from which to evaluate the projects into perpetuity.

### **Coordination with ongoing ODFW activities**

Monitoring activities will be coordinated with other projects whenever possible to minimize costs and provide the maximum benefit. All of the monitoring contained within this plan relies heavily on current coast-wide monitoring efforts that are part of the OPSW. Habitat surveys that are conducted as part of OPSW monitoring activities will serve as a baseline from which to evaluate treated stream reaches. The monitoring activities outlined below compliment other monitoring activities being conducted by the ODFW Aquatic Inventories Project, the ODFW Salmonid Life History Project as well as ODFW Watershed personnel, watershed councils, and interested landowners. The more detailed monitoring of restoration activities and the more general evaluation of the status of coho salmon and stream habitat throughout Western Oregon are both needed to gain a better understanding of the effect restoration activities are having at the reach, stream, watershed and gene conservation group scale.

Information gained from the ODFW Adult Salmonid Inventory Project will be used to compliment spawning survey information gathered by the project biologists.

Downstream migrant traps are currently located in many basins that have received restoration work or will have restoration work completed in the future (Table 1). Monitoring activities will be targeted in these basins whenever possible to maximize the use of information gained in all of ODFW's monitoring programs.

**Table 1. Location of juvenile and adult salmonid trap sites in the North Coast and Mid-Coast Coho Gene Conservation Group Areas (CGCGA).**

<b>CGCGA</b>	<b>Stream</b>	<b>Target</b>
North Coast	North Fork Nehalem River	Smolts/adults
North Coast	Little South Fk Kilchis River	Smolts
North Coast	Little North Fork Wilson River	Smolts
North Coast	Nehalem River	Smolts
Mid-Coast	Mill Creek, Siletz	Smolts/adults
Mid-Coast	Cummins Creek	Smolts
Mid-Coast	Tenmile Creek	Smolts
Mid-Coast	Mill Creek, Yaquina	Smolts/adults
Mid-Coast	Cascade Creek	Smolts/adults
Mid-Coast	East Fork Lobster Creek	Smolts
Mid-Coast	South Fork Lobster Creek	Smolts
Mid-Coast	Knowles Creek	Smolts

# Methods

## **Project Documentation**

All projects will receive a basic level of documentation. Project proposals will be developed for each project that will outline the work to be done and the biological reasons for the project. Projects will have pre-and post treatment diagrams of work planned and completed as well as documentation on location, type, and materials used. As part of the project documentation, the starting and ending points of a restoration reach, as well as individual site locations will be permanently marked after project completion. All projects will be reported to the Oregon Watershed Enhancement Board (OWEB) using the OPSW Watershed Project Reporting Form by December 31 of each year. All in-stream project diagrams will be updated at least every three years to record changes in stream habitat and structure location. A subset of projects will have all wood that is placed into the stream channel tagged with an identifying number.

## **Photopoint Documentation**

Photopoints will be taken on projects where quantifiable measurements have not been taken to monitor effectiveness. Photos can also be taken of projects that have quantifiable measurements in order to maintain a visual record of observed changes. However, high quality photographs of in-channel work are very difficult to obtain, and do not have to be taken at every site. A subset of photos will be taken both pre and post treatment and 2 years after initial construction. Information recorded will be by basin, creek, legal, GPS location, number, film type, date, and focal length. The photos should be taken conservatively and generally from a higher location for repeatability. Photo points should be well described, shot annually at the same flow and week of the year, and marked or sufficiently described for repeatability. Video or other digital recordings of in-stream projects may also be used to record project changes.

## **Physical Habitat Monitoring**

A subset of projects will receive more intense habitat monitoring. The projects that receive more detailed evaluation will be selected based on a minimum amount of work completed (2 structure sites within a 500m segment), the type of work completed, and a random selection process. Habitat surveys that are conducted as part of OPSW monitoring activities will serve as a baseline from which to evaluate treated stream reaches.

The documentation of physical changes in stream habitat for the duration of this plan will form the base of a long-term monitoring strategy quantifying habitat change over time. While in the case of coho salmon it is believed that winter habitat is the most limiting freshwater habitat, summer habitat has been the most extensively monitored physical character. Summer habitat data on pool depth, and woody debris levels may be used to determine winter habitat quality. However, the amount of winter habitat cannot currently be quantified from summer habitat information. This plan outlines surveys of both

summer and winter habitat, at least until a clear relationship between summer and winter habitat quantity and quality can be determined.

Every year up to ten (10) pre-treatment and (10) post-treatment physical habitat surveys will be conducted in each restoration area (Figure 1). The sites selected for surveys will be randomly chosen, but will be equally spread among the different geologies and ecoregions in western Oregon. Initially, only one year of pre-treatment and post-treatment data will be collected at each treated site selected for monitoring.

In the summer of 2001 and winter of 2002, as well as every three years thereafter, 45 sites will be surveyed for physical habitat from amongst the treated reaches with initial survey information. The sites selected for surveys will be randomly chosen, with equal sample numbers in each of the four ecoregions of the study area. The projects that will be surveyed will be 4-6 yr. post-treatment.

Physical habitat surveys will consist of a 500 m treatment segment in each site selected for monitoring. The methods used for physical habitat surveys will be modified from the ODFW Aquatic Inventories protocols (Moore et al. 1998). Modifications to the survey methods include:

- All unit lengths and widths will be measured- to avoid bias in estimations over short segment lengths
- Three riparian transects will be taken at 125, 250 and 375 meters through the surveyed area
- Modified winter surveys will quantify habitat area, depth, and wood and spawning gravel quantity.

Physical habitat surveys that are being conducted as part of the OPSW monitoring activities will be used as a reference condition from which to compare changes in the treated areas. The sites selected for the reference surveys will be randomly selected from throughout the anadromous salmonid bearing tributaries of the study areas. Any segments used as reference sites will have similar channel width, gradient, and reach morphology as the treated stream reaches. The reference streams will not contain habitat structures. These reference surveys will represent the range of stream conditions in potentially treatable reaches that have been left untreated.

Aquatic habitat information will be analyzed to determine if the treated stream reaches are increasing in both habitat quality and quantity as compared to the reference reaches. This analysis will compare changes in treated reaches before and after treatment with the changes in the reference reaches over time. In order for a treatment effect to be recognized, any significant increase in habitat in the treated reaches will have to be over and above any changes in the reference reaches that may occur due to natural fluctuations in habitat over time.

As part of district monitoring activities, habitat surveys may be conducted for the full length of a treated stream. These surveys will help to describe the overall effect of both in-channel and upslope restoration activities. These surveys will be conducted as time permits.

## **Juvenile Salmonid Monitoring**

### Snorkeling

A majority of the effort expended to monitor biological response will be put towards the monitoring of juvenile salmonid use of the treated stream reaches. A subset of projects with habitat survey information will be sampled for juvenile abundance and use. As part of the juvenile monitoring for coho salmon, the pool units contained within ten (20) 500 m treatment reaches will be snorkeled during late summer and late winter to enumerate the numbers of juvenile coho salmon. Winter snorkel surveys will be both diurnal and nocturnal. Every pool will be snorkeled within the 500 m reach and all snorkeled units will be denoted as natural or enhanced. A 500 m section must contain at least two enhancement structures.

Length, width, depth, temperature, flow, visibility class, and wood complexity class for each pool sampled will be noted. During snorkel surveys, all salmonid fishes observed will be identified and enumerated. Fish size will be noted to the nearest 10 mm. All trout less than 90 mm will be pooled as 0+trout. All other fishes and invertebrates will be documented as to their presence or absence. The winter snorkeling survey work will be done at night and the summer juvenile snorkeling will be done in the day. Block nets should be used if the pool unit borders the beginning or end of a 500 m reach unit. Wood class and visibility will be noted for all habitat units surveyed. Snorkeling should be conducted with a minimum of a 2 rating and/or with 1.5 m of visibility. Approximately 10-20% of the sites should be resurveyed within the same weekly period. A reference reach will be surveyed that is upstream or downstream of the project reach. Surveys will be conducted in the summer prior to implementation and the prior winter if possible. Surveys will also be conducted after implementation of the project in the summer and winter. A summer and winter reference reach should also be surveyed. The goal of the snorkeling is to try and get 5 pre and 5 post surveys done in each district where restoration work is occurring. The sampling strategy will provide paired samples across the landscape. The purpose of the snorkeling is to get relative abundance and trend of juveniles in the reference and restored reaches. Another purpose is to document utilization of the habitat structure types, habitat feature, (pool type etc), flow and wood complexity class by species and age class. Redistribution of animals may occur between reference reaches and restored reaches, but this is not part of this analysis. Juvenile densities will be the defining method for these comparisons. Fish assemblage information may be teased from the data as well.

During 1997 and 1998 the Mid-Coast Fish District has conducted snorkel surveys in restored stream reaches as part of ongoing monitoring activities (Rowe and Spangler 1998). The methods used in these snorkel surveys differ slightly from the snorkel survey

methods proposed in this plan. The snorkel surveys in the Mid-Coast Fish District can be continued into the future as time permits, but it must be realized that the differing methods do not allow the direct comparison of data collected under the two sampling regimes.

### Alcove Monitoring

Off channel ponds represent a short-term restoration approach designed to quickly increase the numbers of juvenile salmonids. They also represent a more intense form of restoration activity that requires more detailed monitoring and planning. All alcoves will be monitored over time to assess their effectiveness at providing winter habitat, and to assure that negative impacts are not occurring to salmonids, or other aquatic species. As part of on-going monitoring, wood cover class, mean and maximum depth, depth of water at the outlet during spring, and outflow will be recorded for each constructed pond. Depth will be assessed to determine the longevity of the ponds, in relation to filling, and outflow will be monitored to assess the potential of the ponds to trap salmonids. Pond vegetation communities will be noted as time permits. Sampling methodology will be to use monofilament live box traps for a period of at least two days to trap salmonids in the pond areas. All fish will be marked, measured and released. If less than 11 coho salmon are trapped over a two day period, trapping will cease. If 11 or more coho salmon are captured, trapping will continue until 50% of the coho salmon are recaptures (Carle 1978). Depending upon the success of trapping fish the above method may be changed in order to obtain alcove utilization information.

### **Additional Monitoring Activities**

#### Adult Salmonid Monitoring (optional)

Counts of adult salmon spawning in a subset of restoration reaches will be conducted in the winter of each year. These counts will allow the observation of long term trends in adult returns to the project areas. Adult salmonids will be enumerated in restoration project reaches using methods of the Coastal Adult Salmonid Inventory Project. The density of adult spawners in the treated areas will be compared to the overall density of spawners in each restoration area to determine if the treated reaches are more favorable for spawning salmon. As time goes on there may be considerable overlap between restoration reaches and reaches selected from a random selection process used by the Adult Salmonid Inventory Project. Therefore, habitat biologists will only need to survey those restoration sites that do not overlap with the Salmonid Inventory Project.

#### Amphibians

Amphibian monitoring will be coordinated with ODFW District Wildlife personnel and watershed councils. The goal is to document the presence or absence and relative abundance of amphibious species in and around the project areas. This monitoring is not designed to quantify changes in absolute numbers over time. Amphibian monitoring is

especially important around off channel habitat areas because of the large amount of excavation and modification conducted in these projects.

### Beaver

The persistence of beaver dams will be monitored as part of the adult salmon surveys that are conducted. The presence of beaver activity will also be documented as part of all habitat surveys that are conducted.

### Other Aquatic Species

Other aquatic species will be documented as part of normal project monitoring activities. This documentation will consist mainly of presence/absence surveys, although more detailed abundance estimates may be conducted at some sites as time and funding permits. Examples of other aquatic species that may be monitored include mussels and crayfish.

### Water Quality

A majority of the water quality sampling that will be conducted in and around the project areas will be coordinated with and conducted by the landowners and watershed councils of the affected areas. Water quality attributes are less directly attributable to in-channel restoration activities and it is more appropriate to monitor these attributes on a larger watershed scale. Stream temperature however will be recorded by the monitoring biologists at some sites. Stream temperature data will be used as a project planning measure, in order to pinpoint limiting factors in a reach.

## Description of Product

An annual report of monitoring activities and summaries of information on monitored sites will be prepared by the project biologists. This report will bring together all information from the direct monitoring as well as an analysis of the differences between the restored reaches and the conditions within western Oregon as a whole. Any other information from coordinated monitoring activities will be summarized. The ODFW Aquatic Inventories Project will prepare a separate report on habitat changes observed in the year 2001 and third year surveys. All reported information will be provided as an OPSW data report. The project biologists will also prepare a yearly list of recommendations for improving habitat restoration projects. These recommendations will be forwarded to all ODFW habitat biologists.

## Project Schedule

All monitoring activities will follow an annual schedule with the exception of the third year ODFW Aquatic Inventories surveys, which will be conducted in the years 2001-2002, 2004-2005, and 2007-2008. All activities will be carried out by the habitat biologist, monitoring biologist, or the ODFW Aquatic Inventories Project. The habitat biologists will be responsible for project layout, design, and documentation. The monitoring biologists will be responsible for setting up the physical habitat surveys, conducting summer snorkel surveys, and temperature monitoring in summer, and assisting with the winter habitat and snorkel surveys. The monitoring biologist will also assist in data analysis and compilation of the monitoring report. The Aquatic Inventories Project field staff will be responsible for collection and analysis of all habitat survey data. The Aquatic Inventories Project staff will also assist with the winter snorkel surveys.

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## **Summary of proposed monitoring activities**

### **Project Documentation**

- Written documentation of all projects
- Photo documentation of a subset of projects

### **Habitat monitoring**

- 40 before and 30-40 after treatment habitat surveys per year in summer and winter.
- 45 randomly selected after treatment surveys every three years in summer and winter

### **Biological monitoring**

- 10 (5?) before treatment and 10 (5?) after treatment juvenile snorkel surveys per year in summer and winter.
- Annual presence/ absence surveys for coho in all off channel pond projects in spring.
- Annual population estimates in a subset of off channel pond projects in spring.
- Annual presence/absence surveys for beaver activity during spawning and habitat surveys.
- Documentation of amphibian presence/absence during habitat surveys.